Climate 2050

Technology and Policy Solutions

Conference Proceedings

INSTITUT

Veolia Environnement

October 24-26, 2007

Montreal, Canada

This document is a summary of the various presentations and public comments made by experts at the Climate 2050 conference. All efforts were made to accurately represent the public discussions that occurred at the conference, any errors or omissions fall under the responsibility of the editor and directors of this publication. The statements and opinions expressed herein do not necessarily reflect those of the three conference organizers, collectively or individually.

Edited by Sarah Gagnon-Turcotte,
under the direction of Ludivine Houssin and Karel Mayrand.

The Organizers

A platform for exchange and dialogue

The Institut Veolia Environnement (France) is a non-profit organization created in September 2001. The Institute aims to propose a forum for dialogue and interchange with academia, institutions and the different actors in society.

Besides its publishing programme to promote the research undertaken by its academic partners, the Institut Veolia Environnement has also a programme for a series of Conferences on Future Environmental Trends internationally. These events are jointly organized with qualified partners, with the aim of creating a forum for discussion and raising awareness on the major themes defined by the Institute among university circles, institutional organizations and civil society.

Achieving a balance

The National Round Table on the Environment and the Economy (NRTEE, Canada) is dedicated to exploring new opportunities to integrate environmental conservation and economic development, in order to sustain Canada's prosperity and secure its future. NRTEE current project focuses include Climate Change Adaptation and Energy and Climate Change.

In June 2006, the NRTEE released Advice on a Long-Term Strategy on Energy and Climate Change. The strategy was based on a technology-driven scenario developed by the NRTEE that examined how to, by 2050, meet the energy needs of a growing economy, achieve substantial reductions in carbon emissions, and improve the air quality in Canada.

Working together... because climate change is serious business

The Pew Center on Global Climate Change (USA) is an independent, nonprofit, nonpartisan organization dedicated to promoting practical and effective climate change policies in the United States and internationally. The Center produces expert analysis of climate science, economics, solutions, and policy issues; facilitates dialogue among policymakers, stakeholders, and experts; and contributes directly to the policymaking process. The Center's work is closely informed by its Business Environmental Leadership Council, a group of 45 major companies in diverse sectors, with a combined market value exceeding $2.8 trillion, committed to advancing solutions on climate change. With 27 major companies and five other NGOs, the Center is a founding partner of the US Climate Action Partnership, which supports mandatory national climate policies in the United States. It also is actively engaged with governments and business in exploring options for a post-2012 international climate framework. The Pew Center was established in May 1998 by The Pew Charitable Trusts, one of the United States' largest philanthropies and an influential voice in efforts to improve the quality of the environment, and is funded entirely by charitable sources.

List of Acronyms

APEC	Asia-Pacific Economic Cooperation
CCS	Carbon Capture and Storage
CDM	Clean Development Mechanism
CoP	Conference of the Parties
EEG	Renewable Energy Resources Act (Erneuerbare-Energien-Gesetz)
EOR	Enhanced Oil Recovery
EPA	Environmental Protection Agency
EU	European Union
LEED	Leadership in Energy and Environmental Design
IEA	International Energy Agency
ICCC	Inter-ministerial Commission on Climate Change
INE	National Institute of Ecology
IPCC	Intergovernmental Panel on Climate Change
GHG	Greenhouse Gas
MDG	Millennium Development Goals
MoP	Meeting of the Parties
NGO	Non-governmental organizations
NRTEE	National Round Table on the Environment & the Economy
OECD	Organisation for Economic Cooperation and Development
PAM	Policy and Measures
PV	Photo voltaic
R&D	Research & Development
REDD	Reduction of Emissions from Deforestation and Degradation mechanism
SEMARNAT	Mexican Ministry of the Environment and Natural Resources
SIDS	Small Island Developing States
TOD	Transit-Oriented Development
UN	United Nations
UNEP	United Nations Environment Programme
UNFCCC	UN Framework Convention on Climate Change
US	United States of America
USCAP	United States Climate Action Partnership
VMT	Vehicle Miles Traveled
WBCSD	World Business Council on Sustainable Development
WTO	World Trade Organisation

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Introduction

The **Veolia Environment Institute** (France), the **Pew Center on Global Climate Change** (USA), and the **National Round Table on the Environment and the Economy** (Canada) hosted the Climate 2050 conference at the Palais des congrès de Montréal (Canada) on October 24-26, 2007.

The objective of the conference was to generate substantive, multidisciplinary and cross-sectoral discussions to improve understanding of long-term climate change strategies that will lead to meeting the 2050 targets. The conference program was designed to connect research, business and policy in order to identify solutions to the various sectoral and regional climate change challenges.

Climate 2050 brought together notable speakers from government, business and academia to explore the critical technology and policy challenges. In sessions focused on key sectors, the conference highlighted technology potentials and gaps, innovative action in the public and private sectors, and critical policy needs. In cross-cutting sessions, the conference also examined the broader policies and strategies needed at the national and international levels to mobilize action across economies and the globe.

Through this combination of sectoral and cross-cutting perspectives, the conference helped to identify technology pathways and innovative policies to deliver effective climate action over the next half century. The present document offers a summary of the various presentations and public comments made by experts at the Conference.

Opening Ceremony

Jean Charest
Quebec Premier

Thierry Vandal
President and CEO
Hydro-Québec

Sheila Watt-Cloutier
Former Chair
Inuit Circumpolar Conference

The Opening ceremony of the Climate 2050: Technology and Policy Solutions conference was the occasion to hear three high-level speakers address the major issues of climate change mitigation and adaptation in North America and discussed the human dimensions of climate change in the Arctic.

Jean Charest, Quebec Premier, started his allocution by pointing out that Canada, a country with a small population of about 33 million people and representing only 3% of the global economy, has nonetheless invested an important amount of time, energy and resources in fighting climate change. This is because Canada, especially its northern population, will be affected very rapidly by climate change. In addition, climate change will have important geopolitical impacts for Canada, related to the North-West passage. As a developed country, Canada must lead by example in order to persuade other nations, like the US, to join the fight against climate change.

Quebec's own commitment has taken the shape of diverse initiatives in four broad sectors with the goal of meeting the Kyoto protocol objectives by 2012. First, the Quebec government has developed policies and a law that aims at incorporating sustainable development into decision-making processes throughout its public administration. The Charter of Rights has also been modified to include the right to a clean environment.

Second, Quebec's energy policy is emphasizing clean and renewable energy power with the development of 4 500 MW of new hydroelectric energy and 4 000 MW of wind power in the coming years. With the creation of new power transmission lines, Quebec also hopes to increase its export and hence substitute clean energy to more polluting sources including coal power plants in Ontario and the United-States. Other alternatives, such as cellulosic ethanol are also being explored.

Third, Quebec is deploying efforts in order to increase the supply of collective transportation and hence increase the use of mass transit. And finally, Quebec formulated a diversified strategy to reduce its GHG emissions based on a new carbon tax on fossil fuel that will generate 200 million CAD dollars in revenues per year, to be entirely affected to different projects and policies to reduce GHG emissions. This tax is a central piece of a 1.2 billion plan over a 6-year period.

Jean Charest concluded by stressing that Canada needs to work with its neighbours in the future and take example of regional and local initiatives. It is interesting that regional governments so far have been more active than national governments. Manitoba, British Columbia and California, for example, all have aggressive policies to reduce their GHG emissions. Quebec is also part of a forum with Vermont, New Hampshire, Massachusetts, Rhode Island and Maine, where climate change is approached at a regional scale. Moreover, the Premier noted that new economic instruments such as tradable permits and a carbon stock exchange are needed to help society deal with carbon emissions.

Thierry Vandal, President and CEO of Hydro-Quebec, complemented the Premier's description of the Quebec context by describing the public utility's climate change strategy. Hydro-Quebec's strategy is based on three broad orientations: renewable energy, energy efficiency and technological innovation. The utility presently has a production capacity of 41 000 MW, 97% of which comes from clean, renewable hydroelectric energy. Moreover, Hydro-Quebec is committed to becoming a world reference for successful and reliable integration of large scale wind power on a transmission grid. Hydro-Quebec's administration also believes that energy efficiency is another absolute necessity to address climate change. It will thus invest $1 billion over a period of four years to improve energy efficiency in Quebec. Finally, Hydro-Quebec believes that technology innovation, in the not too distant future, will allow for a significant penetration of electric transportation with plug-in hybrid vehicles. It is thus investing in next generation technologies such as electric motors and advanced battery materials. These technologies have the potential to reduce emissions equivalent to taking 82.5 million cars off the road by 2050.

"Studies for the US market suggest a potential savings of 450 million tons of GHG by 2050 with plug-in hybrids, the equivalent of taking 82.5 million cars off the road."

- Thierry Vandal

Following the first two presentations focusing on climate change mitigation policies, **Sheila Watt-Cloutier** provided a perspective on the challenge of adapting to climate change–and the human rights issues raised by environmental change–by describing the experience of the Inuit people in the Arctic, one of the most affected regions of the world.

She presented the Arctic as a climate change barometer and the Inuit as its mercury. So far, the Inuit have been able to adapt to modern change extremely well. They have moved from dog sleds and igloos to planes and

permanent homes; from the ice age to the space age, within one generation. But now the rapid warming of the Arctic has important consequences on the Inuit and their traditional culture.

With the melting of the ice, streams are turned into rivers, as hunters are forced to reroute from previously faster and safer routes, more drowning accidents occur. Climate change affects virtually every facets of Inuit life. Moreover, according to the 2004 Arctic Climate Impact Assessment[1], the Inuit lifestyle is threatened and their hunting culture may even be eliminated as reductions in sea ice causes the species on which they depend to decline and possibly become extinct. With the unprecedented and staggering speed of sea ice melt, the direst predictions even look toward an ice free Arctic Ocean by the summer of 2013.

The Inuit have been disproportionately impacted by climate change. Hence, they presented a petition to the Inter-American Commission of Human Rights contending that the destruction of the Arctic environment and the culture and economy of Inuit as a result of virtually unrestricted emissions of GHG by the US is violating their rights to hunt, health, subsistence and property; rights that are enshrined in the 1948 American Declaration of the Rights and Duties of Man. The petition, however, was not confrontational; it was meant to reach out, to help turn public opinion into public policy and give a human face to the climate change issue.

"How would you respond if an international assessment was to predict that your age-old culture and economy might well be doomed, if your ancient way of life was destined to become a footnote in the history of globalisation?"

- Sheila Watt-Cloutier

In conclusion, Sheila Watt-Cloutier noted that her people's initiative put a human face to the issue of climate change and has given the Kyoto protocol a heartbeat and a renewed sense of urgency. They did this simply by reminding people far from the arctic that there are Inuit hunters that are falling through the thinning ice and that they are connected to the car we drive, the policy we make, and the disposable world that we have come to live in. Mitigating and adapting to climate change are perhaps the greatest challenges we face as the human species, she added, they are overarching, complex and required urgent and immediate action. However, they offer the greatest opportunity to unite and come together as a species, in spite of our differences.

[1] An international project of the Arctic Council and the International Arctic Science Committee (IASC).

Opening Plenary
Setting the context: 2050

Chair:
Pierre Marc Johnson
Counsel, *Heenan Blaikie* &
former Premier of Québec

Experts:
Henri Proglio
President and CEO
Veolia Environnement

Eileen Claussen
President
Pew Center on Global Climate Change

Robert Page
Vice-Chair
National Round Table on the Environment and the Economy (NRTEE)

John P. Holdren
Director, Science, Technology & Public Policy Program
John F. Kennedy School of Government, Harvard University

Around the world, countries and corporations are pursuing a wide range of strategies aimed at reducing greenhouse gas emissions while maintaining or strengthening economic growth. However, stabilizing greenhouse gas concentrations and preventing dangerous climate disruptions will require a 60% to 80% reduction in global emissions by 2050. Achieving this goal will require sweeping technological advances driven by effective government policies. The opening plenary will present an overview of the present-day contexts of technology and policy, setting the stage for a deeper and broader exploration of key sectors and challenges over the course of the conference.

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In opening the event, Pierre Marc Johnson pointed out that the purpose of the conference is not to debate the existence of global warming but rather to generate ideas and promote action, and to consider activities that will diminish the effects of climate change, based on sound science. John P. Holdren noted that how we understand the current science of climate change must inform how we think about technologies and policies to address it.

The science of climate change

Holdren discussed the general scientific backdrop of climate change. He started by saying that the term global warming is a misnomer, as it implies something "gradual, uniform, and possibly benign." However, what is happening now is rapid (compared to the pace of adjustment of ecological and human systems), strongly non uniform and harmful. He believed that a more accurate term should be "global climatic disruption." He then pointed out that this phenomenon and its human causes (especially the releasing of CO_2 into the atmosphere through the burning of fossil fuels and deforestation) are beyond any reasonable scientific doubt. He then listed many ways in which global warming is already changing our world, including rising sea levels, unprecedented rates of summer sea ice melt, changing ocean circulation patterns as well as permafrost thawing. Holdren also warned that if we continue business as usual, by the year 2100 the mean global

"2005 has been the hottest year on record; the 13 hottest summers all occurred since 1990, 23 out of the 24 hottest since 1980."

- J. Hansen et al.

temperature will have increased by 3◦C degrees. The last time the Earth had similar temperature levels was 25 million years ago, and sea levels were 20 to 25m higher than they are today.

Holdren stressed that the 1992 UNFCCC called for "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system". If there is still no consensus as to what constitutes "dangerous anthropogenic interference", it is becoming clear that the current level of interference is already dangerous since global temperature average would rise by 0.6◦C to 1.4◦C even if GHG concentrations were stabilized today. Moreover, there is a risk of reaching a tipping point where catastrophic change may grow more rapidly if the temperature increases to more than 2◦C above pre-industrial level[2]. In order to avoid exceeding an average temperature increase of 2◦C, CO_2 emissions must peak no later than 2015-2025 and fall steadily thereafter.

Mixed set of focused solution is the only recipe for success

To solve this global emergency, Holdren explained, solutions must include a mix of both mitigation and adaptation. However, he argued that the "cheapest, fastest, cleanest and surest" way to reduce GHG emissions is to increase the efficiency of energy use for buildings, industry, and transportation. Increased efficiency creates win-win situations as it means a decrease in operational costs for businesses. Reduced deforestation and increased reforestation and afforestation, modified agricultural practices and GHG emissions reduction from the energy sector will form the basis of global emissions reduction, according to Holdren. He also suggested implementing a sufficient tax on emissions as a good way to encourage change.

Henri Proglio, like Holdren, proposed to focus on increasing the efficiency of buildings and transportation in cities, and review urban planning to avoid urban sprawl. However, he noted that the burning of fossil fuel cannot be cut out of the picture for the moment: an immediate switch to alternative fuels would not sustain the cities and lifestyles prevailing today. Technology innovation will thus be necessary. According to Proglio, all components of society must unite and work together to meet the climate challenge. He put a lot of importance in the fact that individuals need to change their behaviours and influence their governments to implement new policies. He also stressed the importance of cities, since in 10 years about 60% of the global population will be living in urban areas and call for a "reinvention of the cities".

[2] IPCC. 2007. *Climate Change 2007* and UN Scientific Experts Group. 2007. *Report on Climate Change and Sustainable Development.*

Robert Page also spoke about the importance of adaptation and mitigation, supporting Holdren in saying that both are needed. Yet, like Proglio, he strongly argued for technology innovation as an essential component of any climate change mitigation strategy. In this regard, he noted that clean coal technology combined with carbon capture and storage are areas of great promise. Public policy will be essential to incite the very high levels of new investments that are required. Moreover, he stressed that financing this huge change will require new market mechanisms and a global carbon market including emissions trading.

Eileen Claussen mentioned different ways in which countries are already taking steps forward, for example in Japan, where the most efficient products set the new minimum efficiency standard for future products. Claussen also pointed out that although the US's lack of international involvement and commitment is disappointing, many efforts are being undertaken by other authorities such as individual states and cities in the US. Examples include the state of California, where there are strict GHG standards for vehicles, and the Congress in Washington DC which holds many conferences on global warming and plans to reduce emissions by 70% by the year 2050.

International climate policy

What we are facing today is a major, complex global issue, said Henri Proglio. At the heart of this issue is the question of who should be the first to take action. Holdren believed that developed, industrialized countries have the responsibility to pay upfront costs needed to solve this crisis as it is they who have caused ¾ of the problem. Eileen Claussen was also adamant about the need for all countries, developed or developing, to make contributions. However, she argued that it is the big leaders such as the US that must take the first initiative. Also, while all countries must be included in the solution, differentiated commitments should be made to fit each country's national circumstances in terms of development and growth.

Conclusion

All experts stressed the importance of immediate action, and of concrete and binding international commitments. While voluntary and individual actions are good, they are not enough to reach the target goals of the 60-80% reduction in emissions, necessary to mitigate the effects of global warming. Therefore, a vast array of solutions must be implemented in various sectors, which will require the involvement from individuals, cities and governments alike.

Parallel Session 1A
Carbon Capture and Storage

Chair:
Truman T. Semans
Director of Markets and Business Strategy
Pew Center on Global Climate Change

Experts:
Mark P. Demchuk
Team Lead, Weyburn Eastern Oil Business Unit
EnCana Corporation

Michael D. Dancison
Director, New Generation Development
American Electric Power

Franklin M. Orr, Jr.
Director, Global Climate and Energy Project
Stanford University

Brian Williams
Manager, CO_2 Geological Storage
British Petroleum

Coal is the largest source of energy-related greenhouse gas emissions and by 2030 is projected to contribute nearly 40% of global emissions. One of the most critical challenges to addressing climate change is the wide-scale deployment of technologies to capture carbon emissions from coal-fired power plants and bury them underground.

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The role of carbon capture and storage

Truman Semans presented carbon sequestration from coal-fired plants as one of the necessary, major components of an appropriate response to the challenge of global warming. Coal power plants will play an important role at a global level for the supply of energy to growing populations and expanding economies. Those future coal power plants will generate tremendous quantities of GHG emissions unless appropriate solutions such as carbon storing technologies are implemented. Carbon capture and storage, Semans argued, is a critical technology which reconciles the use of fossil fuels with substantial emissions reductions. It is, he added, a "bridge technology, buying the time" for change until a broader range of low- and zero-emitting energy technologies can respond to the emerging challenges brought forth by climate change.

Are we ready for large-scale geological CO_2 storage?

Separation and capture processes

The first phase of carbon capture and storage is carbon separation from other gases. Although the process is now technically possible and available for commercial scale, noted Franklin Orr, current technologies are expensive and their energy efficiency is still low (≈15%) and most likely improvable.

The second step is the carbon capture. Michael D. Dancison presented cutting-edge carbon capture processes currently being explored and used experimentally and/or commercially by American Electric Power (AEP). The post-combustion capture process using chilled ammonia has the advantage that it can be put in place in existing units. The modified-combustion

capture process (oxy coal firing technology) which is being researched now has not yet been proven feasible at a commercial scale. Lastly, the pre-combustion capture process, generally based on the Integrated Gasification Combined Cycle (IGCC), is the technology that was chosen for the FutureGen[3] design. All of them (with the exception of the "oxy coal firing process") are using technologies commercially available in other industrial applications. The choice of a specific capture technique is important since capture represents the bulk (3/4 or more) of the total CO_2 cost of the operation.

Reservoirs availability and capacity

Another technical aspect of carbon storage is the availability of reservoirs for anthropogenic CO_2 storage. Oil and gas fields are obvious potential sinks for CO_2, but are unevenly distributed and entail long distances from power plants and capacity constraints since they have the lowest volume capacity. Two other CO_2 storing structures have been considered so far; saline aquifers (brines) and coal beds. Those structures represent a considerable volume and are thus adequate *a priori* for the storage of carbon at a global scale. Natural mechanisms ensure that CO_2 does not leak into other underground strata or escape into the atmosphere. Those mechanisms include, for example, capillary trapping and CO_2 water dissolution in saline aquifers. Orr observed that knowledge of carbon storing capacity in those three types of potential reservoirs varied greatly. While oil and gas reservoirs provide a known geological seal to CO_2 and saline aquifers have been shown to store carbon effectively, current knowledge of and experience with coal beds is more scarce.

Enhanced Oil Recovery

Mark Demchuk addressed another technology; Enhanced Oil Recovery (EOR) through carbon injection in oil fields. EnCana Corporation is currently implementing EOR technology in Weyburn, Canada where industry-produced CO_2 is injected in underground strata, thereby enhancing oil extraction in the nearby oil plants (raising production by around 60%). It is the largest CO_2 EOR project in Canada and the world's largest geological storage project with over 9 million tons stored to date. The Weyburn project also aim to develop practical protocols to guide further field implementation. It is also host to a world class independent research program by the IEA. Enhanced Oil Recovery represents a commercially viable opportunity for developing technologies which will prove crucially important in dealing with future challenges brought forth by climate change.

[3] "FutureGen is a public-private partnership to build a first-of-its-kind coal-fueled, near-zero emissions power plant. (…) It will use cutting-edge technologies to generate electricity while capturing and permanently storing carbon dioxide deep beneath the earth. The plant will also produce hydrogen and by-products for possible use by other industries." For more information, see FutureGen Alliance at <http://www.futuregenalliance.org/about.stm>.

Conclusion

Brian Williams concluded with a quick overview of technology and policy considerations. Above all, he noted that, as highlighted by the IPCC, the main technologies necessary for efficient large scale carbon capture and storage projects are already available today. Therefore with appropriate site selection, remediation techniques and within appropriate monitoring programs and regulatory frameworks backed by policy, projects are viable on a large scale and commercial basis. The IEA estimated that carbon capture and storage has a mitigating potential as high as 10 000 billion GHG emissions tons, making CCS a solution that cannot be missed.

Parallel Session 1B
Green Buildings

Chair:
Simon Knight
President and CEO
Climate Change Central (C3)

Experts:
Robert S. Bennett
Clinton Climate Initiative
William J. Clinton Foundation

Marilyn Brown
Professor of Energy Policy
Georgia Institute of Technology

Bernard Saint-André
Executive Vice-President, Strategy
Dalkia

William M. Sisson
Director, Sustainability,
United Technologies Corporation

Energy use in homes and offices is a large and growing source of greenhouse gas emissions worldwide. Developing environmental management services as well as innovative designs and stronger building codes can lead to cleaner on-site energy, greater energy efficiency and a new generation of "smart buildings" that reduce emissions and energy costs without sacrificing comfort or functionality.

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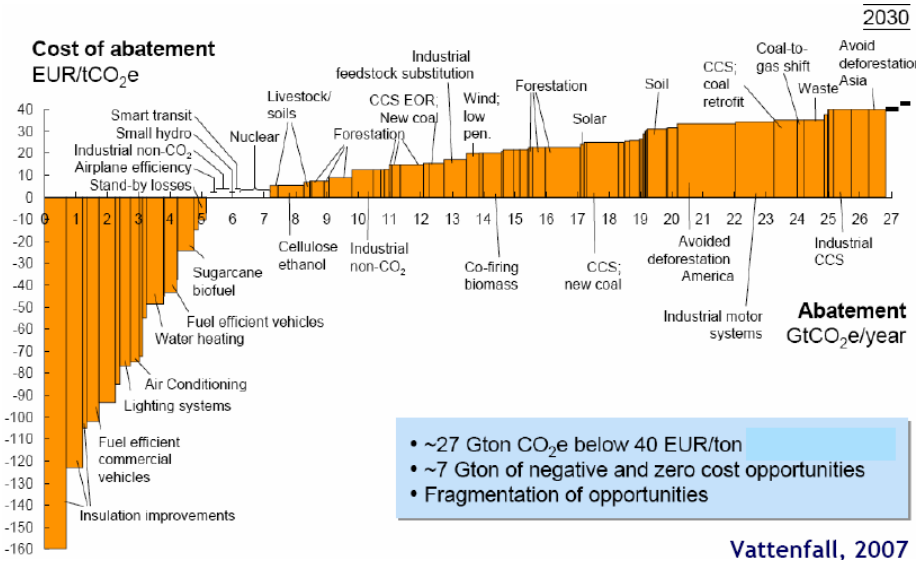
Decreasing CO_2 emissions by saving energy: great potential at low cost

The building sector is a major user of energy, accounting for 72% of US electricity and 54% of natural gas consumption. It is also an important emitter of CO_2. For example, 80% of New York's emissions are generated by its building stock. This sector offers an important potential for energy savings through efficiency improvements. Moreover, energy efficiency improvements are among the fastest, cheapest and cleanest energy resources. As compared to wind (6.5 cents/kWh), nuclear (6.3 c/kWh), coal (5.6 c/kWh) or gas (5.5 c/kWh), energy efficiency improvements' cost is estimated to be only 3.4 cents per kWh.[4]

[4] Energy Information Administration. 2007. *Annual Energy Outlook 2007* at Figure 56 and American Council for an Energy Efficient Economy. 2004. *Five Years In: An Examination of the First Half-Decade of Public Benefits of Energy Efficiency Policies* at table 5.



Studies evaluating diverse CO_2 mitigation options highlight numerous green building options as being cost negative.[5]

Along with its comparatively low costs, energy efficiency's potential in buildings makes it attractive. Studies investigating different policy scenarios, presented by Marilyn Brown, suggest that, by 2020, electricity consumption in the US could be reduced by 24% at no net cost to the American economy. [6] In other words, half of the expected growth in demand for electricity over the next 15 years could be met cost-effectively by improvements in energy efficiency.[7] The IPCC in its Mitigation of Climate Change report estimates that by 2020 a 23% emissions reduction potential exists worldwide in the building sector.

Robert S. Bennett, also quoting the IPCC, pointed out that projected global emissions from buildings could be reduced by 30% by 2020, or even by a higher percentage if there was a price on carbon, while UNEP estimates that Europe could easily cut 20% of its present buildings energy consumption. Bernard Saint-André described how, by doubling the energy distributed through heating networks (*réseaux de chaleur*) in Europe, around 51 million tons of oil-equivalent energy and approximately 400 million tons of CO_2 could be saved, representing about 10% of actual EU emissions.

[5] This image was taken from Marilyn Brown's presentation.
[6] Energy Policy, Vol.29, No. 14, Nov. 2001, pp. 1177-1333.
[7] Leadership Group. 2006. *National Action Plan for Energy Efficiency*. Washington, DC: US Department of Energy and US Environmental Protection Agency. Available at <http://www.epa.gov/eeactionplan>.

But are the technologies available?

Marilyn Brown, looking to the future, believes that there are various promising technologies leading us toward net-zero houses.[8] Integrated heat pump systems, for example, can capture wasted heat and put it to use elsewhere within the unified system. Other prospects include the use of phase change material, such as cellulose insulation, and new hybrid solar lighting (HSL). Marilyn Brown also highlighted that green buildings represent a "no regret strategy" to mitigate climate change since they are providing in themselves a set of advantages independent of their final goal of reducing CO_2.

Bennett and Saint-André both presented broad initiatives, like the Southeast False Creek project in Vancouver or the "éco-quartiers" of Narbonne and Lyon, where multiple energy savings technologies and strategies are combined, taking into account the urban design and architectural aspects of projects.

Even if easily accessible, net-zero houses or green projects are still few in number. In Vancouver, around 2% of annual building investments are greener than what the city code requires[9], while in the US, the US Green Building Council estimates that only 5% of new commercial buildings achieve the US Green Building Council's LEED Green Building Rating System standards.

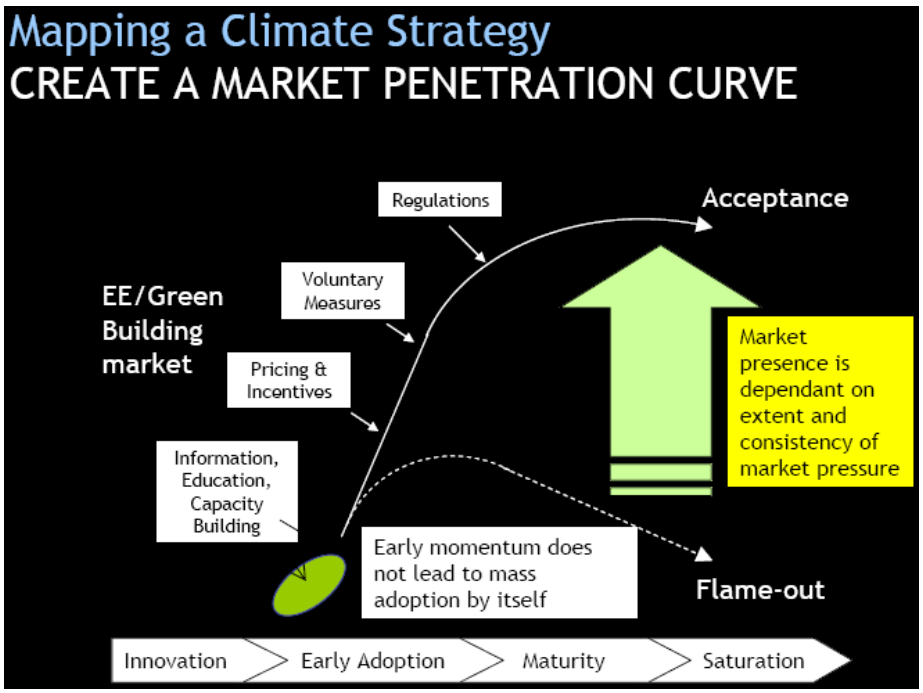
Trying to explain this trend, William Sisson quoted key results of a WBCSD report showing that the building sector market is still undervaluing the emissions contributions from buildings and perceiving green building expenses to be higher than they actually are.

Which approach should be adopted?

For green buildings to have a real impact on climate change, new green technologies need to be phased in and integrated into the market so that they become the new benchmark for the construction of an estimated 300 billion square feet of new buildings by 2030 in the US alone. A focus should also be placed on renovations and modernisation of existing buildings, since their renewal rates are relatively small as indicated by Saint-André: only one percent for residential and 1.6 percent for commercial buildings annually.

[8] A net-zero energy house is one in which the amount of energy provided by on-site renewable energy sources is equal to the amount of energy used by the building. To reach this goal it is first necessary to improve the energy efficiency of the building.
[9] Sustainable Building Centre, 2006.

To increase global acceptance and wider use of green building technologies, diverse strategies can be adopted. There was consensus in this session on the necessity to develop a comprehensive framework combining regulations, public policy, financial incentives, and public education. [10]



Marilyn Brown emphasized the need to address market and policy failures, by reforming and creating new policies to alleviate the barriers to cost-effective strategies. She also urged the destruction of many myths about buildings and energy. By pointing out at how capital intensive energy production truly is (for example, 15 trillion dollars in the US alone, renewed every 40 years), she illustrated that green buildings are not that expensive.

Bennett argued that a systematic approach that looks at cost-effective strategies needs to be developed at the municipal level, an approach that needs to be comprehensive and that integrates other dimensions such as transportation and land use. He presented a variety of regulatory and economic incentive strategies that are already being used by cities to enhance green buildings such as systematic audit programs, LEED-based requirements and standards, and financial and non-financial incentives such as On-Bill financing, tax credits, fee waiver programs, and density bonuses.

[10] The following image was taken from Robert Bennett's presentation.

The necessity for professional training was put forward by Saint-André, who pointed out that few enterprises or research centres possess comprehensive and diversified knowledge about green buildings in their larger urban context. He also called for greater education and information of the general public in order to create a support base and encourage commitment.

Finally, Sisson suggested that a supportive framework aim at developing the green building markets must be established around a set of business recommendations. This approach would necessitate encompassing the building industry across all segments, from master planning, performance and design to life cycle and operations.

Conclusion

While bottom-up approaches focussing on the role of actors such as cities, communities and the business sector were favoured during the seminar, it was also agreed that there is still a need for a more systematic framework based on more stringent policy as well as greater incentives. Finding the most cost-effective strategies both in terms of public policy and investment strategies therefore remains essential.

The real power driving green buildings today, said Bennett, seems to be the connection between energy efficiency and buildings, but, as Simon Knight suggested, green buildings must be seen within their larger context. Comprehensive initiatives that weave land use, transportation, water, energy, climate change and other infrastructures need to be explored and promoted while dimensions such as human health, air quality and even landscape beauty also need to be taken into account.

Parallel Session 1C
Biofuels

Chair:
Tom Browne
Program Manager, Mechanical Pulping and Sustainability
Paprican

Experts:
Alex Farrell
Assistant Professor, Energy and Resources Group
University of California, Berkeley

Jesse Fleming
Technical Advisor, Fuels Policy and Programs
Natural Resources Canada

Timothy R. Haig
President and CEO
BIOX Corporation

Dennis Magyar
Industry Manager North America
DuPont Biofuels

Following Brazil's dramatic ethanol success, other countries are turning to biofuels to help reduce emissions and dependence on oil imports. As scientists and investors aim for the next generation of biofuel technologies, the key challenge for policymakers will be securing biofuels' energy and climate benefits without driving up food prices or introducing new environmental risks.

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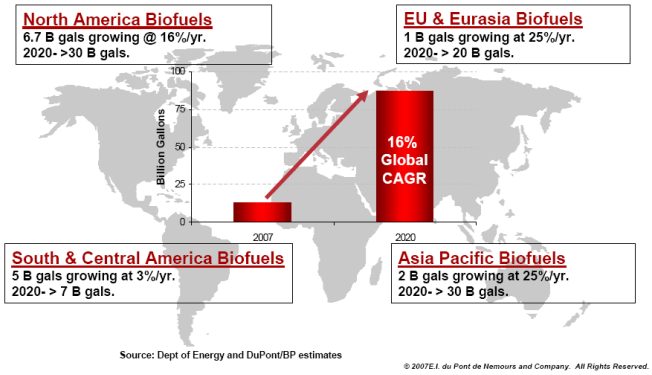
According to Jesse Fleming, there are four major energy policy drivers that shape energy decisions globally and influence the advancement of biofuels: energy security, environment, economic development and ease of implementation. Numerous countries, mainly in North America and the EU, are now implementing new policies and programs promoting the use of biofuels. By 2020, a growth of over 80 billion gallons of biofuels is expected globally. Recent research from the NRTEE, presented by Timothy Haig, suggested that Canada's ethanol production should increase to reach 8.2 billion litres of ethanol per year by 2050 as part of a scenario to reduce its carbon emissions by 60% below the level of 2003. Still, the biofuels sector is far from mature. Technological, environmental and policy issues remain and need to be tackled. [11]

Biofuels Growth - 2020 Estimates by Region



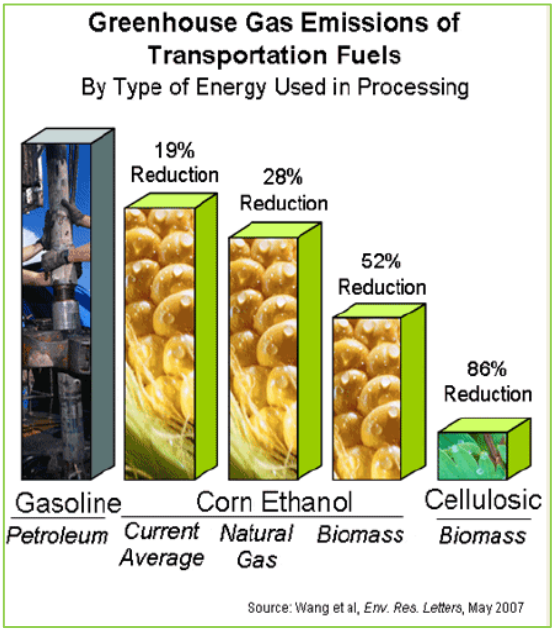
[11] The following image was taken from Dennis Magyar's presentation.

Technical challenges

Biofuels are interesting alternatives to oil for two main reasons: they are compatible with the existing fuel infrastructures and they are made out of traditional renewable feedstock (90% of biofuels produced around the world are ethanol made out of maze or sugarcane[12]).

Part of the actual R&D and technology development taking place in the public and private sectors is building on these attributes in order to develop an economically and environmentally sustainable biofuels sector. For example, DuPont is focussing on improving the productivity, profitability and sustainability of corn-based ethanol production.

However, according to Alex Farrell, ethanol is still not necessarily *the* long-term solution to gasoline. Other molecules and technologies - with far better properties in terms of energy density and efficiency, including cellulosic ethanol for example - still need to be explored.[13]



He also argues that one of the main goals of ongoing research is to drive away from the use of more arable land. Even though starch and sugar based biofuels are the most common types today, he believes that the next generation of biofuels will be using feedstock that comes either from degraded land or, like algae, requires no land at all and produces neither waste or residue.

For example, cellulose based ethanol is one of these new biofuels that is being developed. Using an agricultural integration approach, where edible crops go to food and non edible crops (the bio-mass) go to fuel, vast amount of feedstock could already be available for this cellulosic biofuel.

[12] US Energy Information Administration, British Petroleum, Renewable Fuels Association.
[13] The image was taken from Jesse Fleming's presentation.

Environmental challenges

Potential mass production of biofuels leads to important environmental concerns over land use. According to Tom Browne, a global switch from oil to biofuels could have negative impacts such as intensified deforestation, loss of biodiversity, increased consumption of water and fertiliser, erosion and land degradation. Such changes could even result in the creation of more CO_2 than what could be saved by the use of biofuels.

Alex Farrell argues that such outcomes would result from the global competition for land use. For example, American farmers switching from soy to corn production to supply a nearby ethanol plant could cause an increase in soy prices due to lower American exports. The price increase would then motivate farmers around the world to put additional land into soy production. In a country like Brazil, this could result in the loss of rainforest or grasslands. The former can lead to emissions of between 100 and 400 tons of CO_2 per acre, therefore releasing more CO_2 in the atmosphere than what would have been saved by the original switch from soy to corn (-0.6 ton per acre per year).[14]

The policies that will support the next generation of biofuels and a broad diffusion of its technologies will need to consider all the implications of biofuel production to avoid perverse impacts and ensure their overall compatibility with climate stabilisation.

Policy challenges

Today, biofuel policies are essentially agricultural ones, designed to promote the interest and increase the income of growers and producers in the developed world. To achieve goals of GHG reduction and climate stabilisation, however, all the panellists agreed that a long-term policy framework will be needed.

Integrated and complementary policies and programs that include all sectors and stakeholders will be essential to the commercial success of biofuels. Therefore, incentives to innovation should be put in place while attention should be given to the demand side of the equation.

In addition, the adoption of specific targets, such as low carbon fuel standards, would increase demand while sending strong signals into the market and inducing innovation, as would the introduction of subsidies and sustainability requirements. Most importantly, a long-term and concerted vision needs to emerge to ensure the development of a sustainable biofuels sector.

[14] Searchinger et al. (2007) cited by Alex Farrell.

Conclusion

In conclusion, biofuels can be an important component of an overall strategy to reduce GHG emissions but it should not be considered the "silver bullet" to climate change. Biofuels have the potential to reduce global GHG emissions but they also need to be combined with energy efficiency and conservation measures that aim to reduce the overall demand for fuels. Nonetheless, biofuels are presently the best transportation fuel pathway available, even though much work still needs to be done to achieve long-term sustainability.

Luncheon Address
Elyse Allan, GE Canada

For **Elyse Allan**, President and CEO of GE Canada, climate change is a universal problem that requires global action and collaboration from all sectors of society to arrive at an effective and lasting solution. Given that business contributes approximately 50% of global GHG emissions, the corporate community needs to demonstrate leadership.

Elyse Allan believes that it is possible to reduce GHG emissions while strengthening the economy. Climate change, she says, is not a cost, it is an opportunity. She contends that being a steward of the environment and being competitive are not opposites and that, in fact, there is a great deal of common ground to enhancing environmental and economic sustainability. Four elements are necessary to help the business community become a real partner in GHG reduction: technology, targets and pricing, business leadership, and a national plan.

Elyse Allan maintains that the key to a sustainable future rests mainly in technological innovation. Such innovations have been seen already with the deployment of wind power, new developments in solar and wave power or with the carbon capture and sequestration technology, for instance. Building new infrastructure based on those technologies can result in win-win situations where emissions and air pollutants are reduced while marketable technologies and a globally competitive energy sector are developed.

According to a scenario explored by the NRTEE, Canada could achieve a 60% reduction by 2050 through Pacala and Socolow's Wedges' approach developed by the Princeton Carbon Mitigation Initiative. There are many 'wedges' of action which can help reduce the gap between predicted and desired emissions levels. These wedges demonstrate that we can make significant inroads through the technology we have readily available today – the only challenge rests in spreading the adoption of these technologies through appropriate policies and market signals.

Indeed, in order to achieve significant GHG reductions over the long term, Canada will need to develop a nurturing, market driven policy environment where carbon has a real, solid, government-backed value which would allow innovative firms to realize their full reduction potential. Subsidies and investment incentives will be needed to ensure a transition to more environmentally-friendly technologies. And consistency around climate

change regulation will be critical, particularly to remove cross-jurisdictional differences that impede businesses. Finally, clear timelines for GHG reductions will be essential, since long lead times and the extended lifetime of projects and strategies require stability and predictability.

Then, she presented a few successes and lessons learned through GE's Ecomagination program: a business and investment strategy to drive the development of new products and services aimed at benefiting customers and society. From the implementation of the program, GE has learned that customers need acceptable payback, such as efficiency or operating performance to induce them to transfer to the new technology. "Green" is not enough: sustainability is achieved by providing real added-value to customers. Also, it is essential to have a pipeline, with new products coming through all the time: it is not enough to meet the demands of a passing fad.

According to Elyse Allan, the way forward is fairly clear: we need to invest and innovate in new clean technologies, establish market-based solutions to drive the technology forward and focus resources where the biggest emissions reduction can be achieved, find win-win situations so green can be profitable, and reflect the needs of ecology and economy in a national plan. She concluded by expressing the conviction that together, we can make a profound impact on climate change.

Parallel Session 2A
Renewable Energy

Chair:
Joanna Lewis
Senior International Fellow
Pew Center on Global Climate Change

Experts:
Claude Demers
Science Communicator
Hydro-Québec

Robert Hornung
President
Canadian Wind Energy Association

Daniel Kammen
Director, Renewable and Appropriate Energy Laboratory
University of California

Kyle Kasawski
President and Managing Director
Conergy Sales Canada

Mahesh Vipradas
Head, Regulatory Affairs
Senergy Global Pvt Ldt

From China to Europe to North America, governments are setting aggressive renewable energy targets, driving new investment in wind, solar and other clean energy sources. As technological breakthroughs bring down costs and open new zero-carbon pathways, renewables can play a significant role in addressing climate change while meeting the growing demand for energy.

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World energy outlook

In order to achieve a complete transition toward a low-carbon economy, the world needs a global shift away from fossil energy supplies. Electricity production, which according to Claude Demers counts for about 40% of global GHG emissions, can provide an opportunity for substantive emissions reductions through renewable energy sources such as sun, wind, water, biomass or geothermal power.

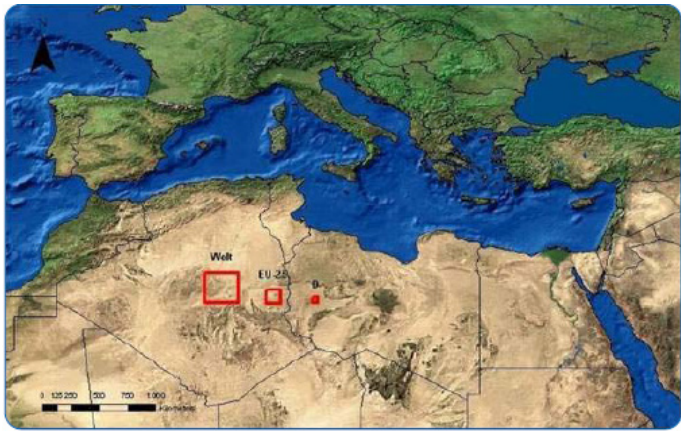
At the present time, coal-based energy constitutes 50% of the US energy supply, two thirds of China's and the majority of India's thermal power. But coal is not the only issue: high energy prices allow for greater deployment of unconventional fossil fuels such as tar sands and shale oil, which produce even greater GHG emissions. Moreover, world predictions forecast a three-fold increase in energy demand by 2050.

In this context, renewable energy holds great promises for powering the world transition to a low carbon economy, according to Joanna Lewis. Moreover, it offers the opportunity to significantly reduce GHG emissions in the short term. Other alternatives such as the large scale deployment of green hydrogen, mass construction of new nuclear plants or global commercialization of clean coal all seem to be only achievable in a long term perspective. Robert Hornung stressed that we need to find a way to make important reduction by 2020; to get us on the path of much larger reductions. Renewable energy is such a solution.

Three sources of renewable energy were discussed in details during the session; solar, wind and hydro power.

Solar energy

Conventionally considered the most expensive of all renewable energy, solar energy has developed quickly over the last decade with the emergence of new and more efficient technologies. Germany, Japan and California have been important R&D investors in the field and technologies are becoming more competitive. Kyle Kasawski stated that the cost of PV panel production drops by 20% every time the manufacturing capacity doubles worldwide. Moreover, the unique flexibility and mobility of solar panels has stimulated a growing demand in developing countries. Finally, with skyrocketing prices for fossil fuels, solar energy holds a great potential, even more so as its supply is simply "enormous" as Kyle Kasawski showed with the following image.



The red square on the right shows the space that would have been required to power all Germany in 2005 with solar panels, the middle one the 25 countries of the EU and the bigger left square, to power the whole world.

Wind power

On a life cycle basis, GHG emissions associated with manufacturing, installing and maintaining a wind turbine are offset in a period of three to eighteen months on average. Wind power can thus substantively contribute to mitigate climate change. Wind is actually the fastest growing source of new electricity generation. Worldwide wind power production was 4 800 MW in 1995. Eleven years later, it had reached 74 000 MW. The Global Wind Energy Council published in 2005 a Global Wind Energy Outlook proposing three scenarios based on detailed annual wind energy production growth forecasts. The most optimistic scenario assumed that worldwide wind energy production would reach 1.1 million MW by 2020, representing about 13% of global energy production. Daniel Kammen enthusiastically pointed out that the actual numbers for 2006, 2007 and 2008 will all exceed what was assumed in this scenario. If this scenario is actually fulfilled it will

represent the mitigation of 1.6 billion tons of GHG emissions annually by 2020.

Hydro power

Hydro power produces only a small quantity of GHG emissions compared to coal, oil or natural gas power plants. Water reservoirs were often accused in the past of releasing vast amount of GHG emissions. According to Claude Demers this belief is not well-informed since after a period of about 10 years water reservoirs generally have emissions rates similar to those from natural lakes in the same region. Moreover, they have the important advantage of a long-term energy storage capacity. This capacity allows for greater flexibility in grid integration of other energy sources. Since water is unevenly distributed across the globe, hydroelectricity can only be one part of the solution, catered to specific regional needs. In North America, for instance, the current integration of the electricity market will increase the overall network efficiency and allow for cleaner energy (such as hydro power from Quebec) to replace higher GHG emitting energy (such as coal-based power from the US) on the regional grid.

The role of policy

Mass deployment of renewable energy still faces numerous challenges. All panellists highlighted some technological hurdles to be overcome, from the availability and flexibility of transmission grids to high production costs. But most importantly, panellists unambiguously agreed on the need for aggressive policy measures.

Public policy and mandated targets would significantly help the creation or expansion of clean energy markets, while creating the necessary incentives for essential R&D investments. Policy could also contribute to diversifying the array of clean energy options, increasing national demand and supply certainty. Finally, the setting of a price on carbon is considered an important step in ensuring the long-term viability of the industry. According to Kyle Kasawski, the single most important action any government can take to meet the 2050 targets is to develop a national market for renewable energy.

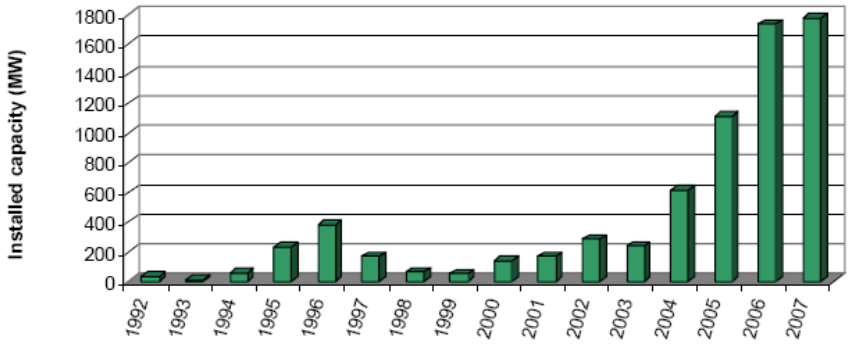
A good example is the Renewable Energy Resources Act (Erneuerbare-Energien-Gesetz, EEG) issued in February 2000 in Germany. The core element of the legislation is an obligation for grid operators to give priority to electricity from renewable energy sources (wind, solar, biomass and hydro), and to pay for it according to fixed premium prices called Feed-In Tariffs (FIT). The EEG Act was based on a *shared burden principle*; households assumed a small increased in their utility bill (about 2$), while

renewable energy was imposed on the market without any state subsidies. This act contributed to the creation of a real demand, ensuring the creation of sufficient incentives to mobilize investors. By 2006, 12 % of total German electricity consumption was supplied from renewable resources resulting in a reduction of over 100 million tons in CO_2 emissions.

Another example is how Spain quickly became a wind energy leader. In 2000, the country was producing a mere 1 000 MW of wind energy when the government set the ambitious national target of reaching 13 000 MW by 2011. Initially criticized as an unachievable, the target was met as soon as 2007 and the country now aims to produce 20 000 MW by 2011. Both examples have proved that as policy shifts, entrepreneurs adapt to the new rules and technologies follow.

Finally, Mahesh Vipradas depicted the situation in India where important energy deficits are projected while more than a hundred thousand villages are still not connected to the national electricity grid. In such a situation, the flexibility of renewable energy offers an important benefit. Indian interest for renewable energy started in the late 80's with capital subsidy measures, then in the early 90's fiscal incentives as well as controlled prices were put in place (5.6 cents/unit with 5% annual escalation). Over the years, a complete legislative and regulatory framework was created addressing issues of connectivity with the grid, (power purchase) tariffs, etc. India is now the fourth producer of wind power in the world with 7 000 MW of installed power by September 2007. Wind potential is evaluated at more than 65 000 MW. All renewable energy sources combined, India has 10 000 MW of installed power, more than its nuclear based capacities. India is an example of how, with good policies, renewable energy can work.[15]

Wind power growth per year in India



[15] The following image was taken from Mahesh Vipradas' presentation.

Conclusion

In conclusion, the advantages of wind energy presented by Kammen also apply to other renewable energy sources. They have significant environmental as well as economic benefits and offer real win-win opportunities. They contribute to CO_2 mitigation while creating major industrial development opportunities. Some of them, especially solar and wind energy, create real economic benefits for rural communities. And their deployment receives a strong and broad public support. Most importantly, these benefits can be harvested within the 2020 timeframe.

Parallel Session 2B
Transportation Efficiency

Chair:
Robert Gilbert
Consultant on Urban Issues

Experts:
Huiming Gong
Program Officer, China Sustainable Energy Program
The Energy Foundation

Drew Kodjak
Executive Director,
International Council on Clean Transportation

Reinhard Schulte-Braucks
Head, Automotive Industry Unit, Directorate General for Enterprise
European Commission

Bryon Stremler
Manager, Government and Regulatory Affairs
Toyota Canada

With the number of motor vehicles worldwide projected to top 1 billion by 2025, improved vehicle efficiency is key to raising air quality, strengthening energy security, and reducing greenhouse gas emissions. As automakers introduce hybrid vehicles and explore other new technologies, governments are debating how best to drive quick and dramatic improvements in transportation efficiency.

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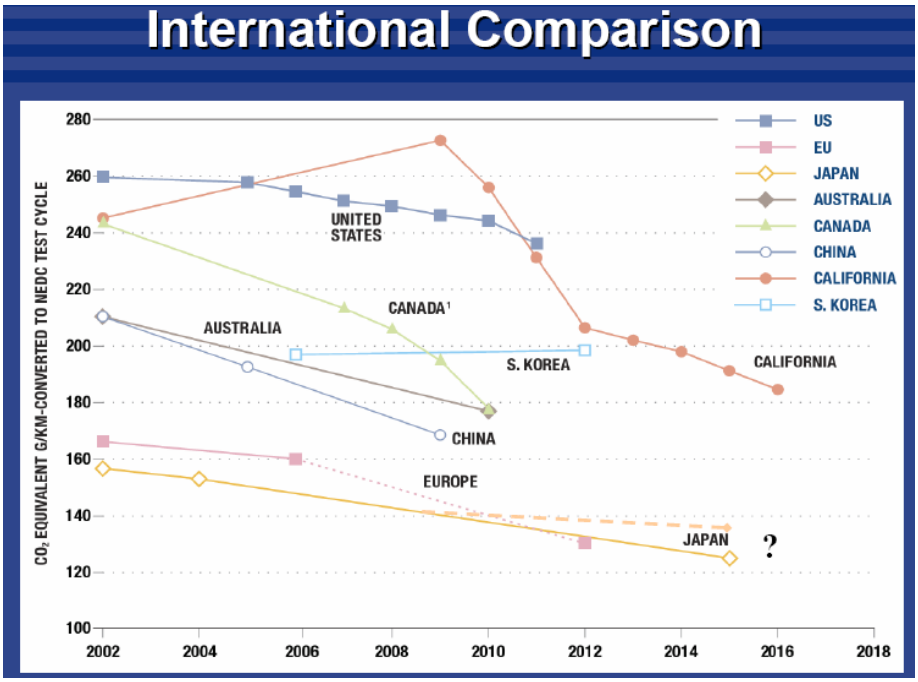
Current trends in transportation efficiency

Drew Kodjak presented the current trends for fuel economy standards on passenger vehicles in different countries. The largest auto markets in the world regulate fuel economy or GHG emissions from passenger vehicles.[16] Most notably, Europe and Japan now present the most stringent passenger vehicle GHG and fuel economy standards. Japan's standards will lead to the lowest fleet average GHG emissions in the world with an objective of 125 g CO_2-eq/km by 2015. This, except if a new approach, now being discussed in Europe, was to reduce the actual standard of 140 g CO_2-eq/km (already one of the lowest in the world) to 120 g CO_2-eq/km by 2012.

On the other hand, shift to heavier and more powerful vehicles in South Korea are predicted to lead to a slight decline in fuel economy in the next few years in spite of fuel and GHG regulations. In the US, due to the same trend, fuel economy dropped by 7% since 1987. According to Kodjak, the U.S. continues to lag behind other nations, although the state of California stands out with very aggressive GHG emissions regulations and vehicle efficiency standards.[17]

[16] Japan, the EU, the US, California, Canada, China, Australia, South Korea and Taiwan. Only a few OECD countries do not have standards (Iceland, Mexico, Norway, Switzerland and Turkey)
[17] The following image was taken from Reinhard Schulte-Braucks' presentation.



Huiming Gong exposed in greater details the major challenges that China faces as its economy grows at an unprecedented rate. As the GDP per capita increases, so do the demand for passenger cars and the GHG emissions into the atmosphere. Yet, energy intensity targets set for 2010 are to increase overall vehicle energy efficiency by 20%, of which half will come from increases in fuel efficiency. This target might be reached using parallel solutions such as fuel efficiency technologies, hybrids, clean diesel vehicles and other viable technological and policy solutions. In 2004, the Chinese government adopted strict energy efficiency standards for passenger vehicles. However, to this day no fuel economy standard has been agreed upon for agricultural vehicles, motorcycles, and heavy weight vehicles. A fuel economy standard system covering all vehicle types is therefore needed. Faced with traffic jams and subsequent problems in its many highly populated areas, China has also decided to implement a rapid bus transit system. The latter represents relatively little costs and has proven to be a very efficient mode of transportation in several Chinese cities.

Still, challenges remain in both developed and developing countries. In Europe, the initial stakeholder reaction to stricter fuel economy regulations was generally supportive. However, Reinhard Schulte-Braucks noted that the general trend for companies was to propose alternative, less ambitious targets and more steeply "sloped" fuel efficiency regulations as a function of car weight. On the other side of the spectrum, environmental NGOs

stressed the need for a "flat" line of fuel efficiency regulations, regardless of the weight of the car, and called for more stringent legislation.

Lastly, policy makers and car producers alike face many challenges when tackling vehicle fuel economy and reductions in GHG emissions. Notably, the current, global market trend towards heavier and more powerful vehicles will reduce overall fuel efficiency and economy. Also, an increased market for diesel may, contrary to the common belief, exacerbate air pollution problems due to less stringent regulations on diesel powered vehicles. Kodjak also stressed the necessity of adjusting regulation stringency to diminish/eliminate incentives to increase vehicle weights and sizes.

Next generation vehicles

The need to reduce energy consumption and CO_2 emissions will drive advanced technology vehicles, which are the next logical step after transportation efficiency efforts. Three criteria are required to make fuel efficient vehicle projects both environmentally and economically viable, according to Bryon Stremler. A balance must be found between emissions reductions and consumer demands; the product must generate a mass market appeal; and the full life cycle of the technology proposed must be considered. Hybrid cars were shown to pass those three tests of viability. One million hybrids are equal to 3.8 million tons of CO_2 emissions avoided. For plug-in cars, the viability of the product is context-dependent: in countries like France where domestic electricity is generated by nuclear plants, the environmental outcome is very positive. In countries where coal is the major source of power supply, the outcome is less evident. For fuel-cell cars, it is acknowledged that considerable progress must be made in order to make this option a solid alternative to conventional vehicles.

Conclusion

Road transport is the second most important source of GHG emissions. Additionally, those emissions are quickly increasing, due to numerous factors such as heavier vehicles trends or increased wealth in developing countries. There is thus a necessity to address energy efficiency to counterbalance emissions growth worldwide. In fact, most presentations emphasized fuel efficiency rather than any absolute decrease in GHG emissions. Schulte-Braucks stressed the high costs of reducing emissions from road transport relative to other sectors, where cheaper, absolute emissions reductions should be massively targeted. Due to financial constraints, current road transport environmental policies should focus on limiting increases in GHG emissions rather than eliminating or decreasing them.

Parallel Session 2C
Forestry

Chair:
Robert Prolman
Director, International Environmental Affairs
Weyerhaeuser

Experts:
Ana Cristina Barros
Brazil Representative
The Nature Conservancy

Federica Bietta
Deputy Director
Coalition for Rainforest Nations

Werner Kurz
Senior Research Scientist, Global Change and Landscape Ecology
Canadian Forest Services

Robert Nasi
Principal Scientist, *CIFOR* & Head, Research Unit, *CIRAD*

Deforestation is the second largest source of greenhouse gas emissions. Improved forest management can reduce emissions while preserving biodiversity and contributing to sustainable rural economies. New policies and international strategies are needed to support efforts in tropical forest countries and to ensure that the climate benefits are real and sustained.

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Impacts of deforestation on global carbon emissions

Deforestation has multiple causes, generally driven either by international demand for food and wood products or by national needs for energy or economic development (like mining or power-line construction). For many countries such as Brazil and Indonesia, deforestation is the primary source of carbon emissions.

Emission Sources

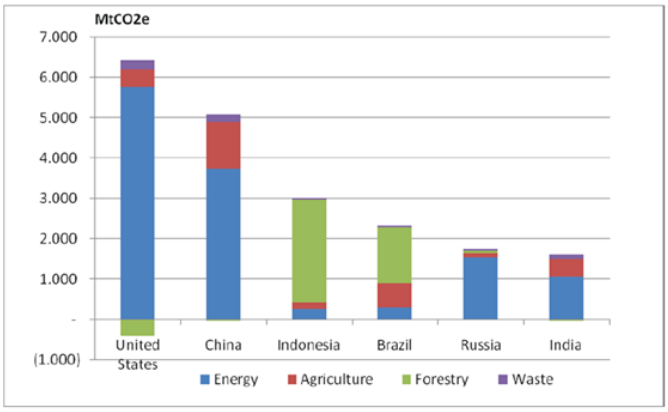


FIGURE 1. THE COMPARISON OF GHG EMISSION

75% of Brazilian emissions come from deforestation and forest fires.[18]

The global (gross) deforestation rate is approximately 12.9 Million hectares annually (Mha/yr), releasing as much as 1.6 Gigatons of carbon every year

[18] The image was taken from Ana Cristina Barros' presentation.

(Gt C/yr).[19] When afforestation measures are taken into account, the net deforestation rate is reduced to 7.3 Mha/yr, yet carbon storage per hectare of afforested stands is initially much lower than per hectare losses from deforestation.

According to Robert Nasi, deforestation is thus responsible for 18 to 25% of GHG annual emissions. The Stern Review[20] even calculated that global emissions from deforestation and land use changes are larger than global emissions from the transportation sector (by over 20%).

Since forecasts over the next 40 years predict a 50% increase in forest products consumption, combined with the need for over 100 Mha of new additional agricultural land, we can expect deforestation to continue to be a major source of carbon emissions if no measures are taken globally. Not to mention that these figures do not take into consideration the possible widespread adoption of biofuels and their repercussions on land use.

"A sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fibre or energy from the forest, will generate the largest sustained mitigation benefit."

- IPCC AR4

Forest sector carbon reduction potential

Based on the calculation of the IPCC, forests have a mitigation potential of 1.3 to 4.2 Gt CO_2-eq/yr by 2030. 65% of the total mitigation potential is located in the tropics and about 50% of the total could be achieved by reducing emissions from deforestation.[21] If we were able to reduce deforestation by 50% by 2050 and maintain this level to 2100, we would avoid the direct release of 50 Gt of carbon. [22]

Werner Kurz pointed out that forests are one of the few biological sinks that we can manipulate through our management choices. In addition, forest-related mitigation options can be designed and implemented to be compatible with adaptation, and can have substantial co-benefits in terms of employment, biodiversity, soil and water conservation, renewable energy supply and poverty alleviation.

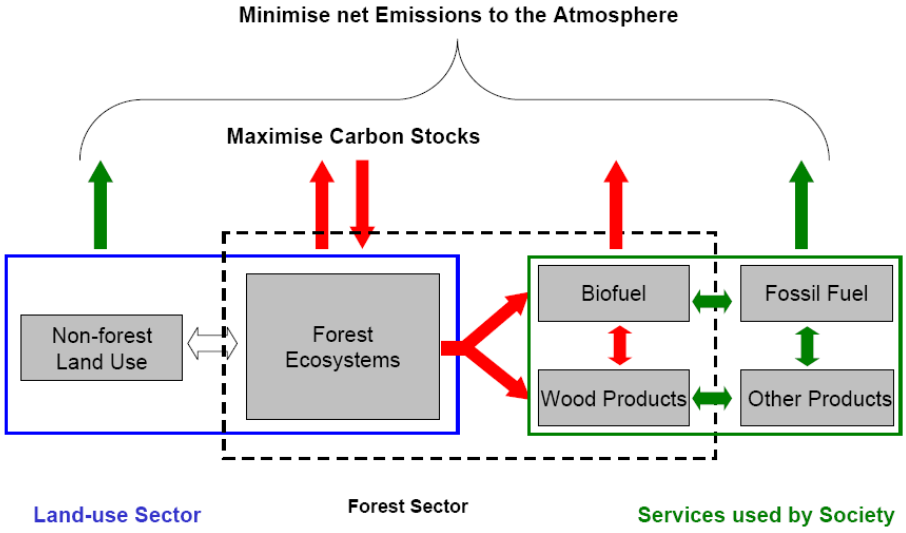
[19] Food and Agriculture Organisation. 2006; Nabuurs et al. 2007; IPCC AR4. 2007; Gullison et al. 2007.
[20] Stern et al. 2006. *Stern Review Report on the Economics of Climate Change.*
[21] Nabuurs et al. 2007; IPCC AR4. 2007.
[22] Gullison et al. 2007.

Elements of a forest sector mitigation strategy

Multiple technologies and techniques that are readily available, operational and cost-efficient can be applied to the forestry industry. The most important ones are forest management activities and afforestation activities.

Forest Management Activities

A multitude of forest management activities can contribute to reducing emissions and increasing carbon storage in the forest biomass, litter and soils. Kurz described how the carbon density can be increased either at the stand-level (through silviculture, harvest systems with partial cover, avoided slashburning, reduced regeneration delays, species selection) or at the landscape-level (through longer rotations, conservation areas, protection against fire and insects, etc.). [23]



Source: Nabuurs et al. 2007, IPCC AR4

Moreover, activities and incentives to limit deforestation are essential. Cristina Barros presented a Brazilian project implemented by the Nature Conservancy that uses green labelling to monitor as well as to enhance legal compliance of land use practices by major agriculture producer. Through this project, the Nature Conservancy encourages governments to create flexible frameworks aimed at stopping deforestation by providing financial incentives for those who engage in forest emissions reductions. The project has generated numerous co-benefits such as technology innovation, conservation and restoration, capacity building, consensus building and

[23] The following image was taken from Werner Kurz's presentation.

private sector engagement, as well as improvements in public bureaucracy. Cristina Barros stressed that such projects can both contribute to global efforts to address climate change and provide developing countries with resources needed to foster sustainable development.

Afforestation Activities

As Kurz mentioned, while several million hectares of land are potentially available for afforestation, costs and competition with agricultural land use contribute to regional constraints. Robert Nasi added that in most tropical countries it is difficult to secure land for plantations due to land tenure issues, low efficiency of the bureaucratic administration, poor governance and ill-functioning justice institutions.

Moreover, little incentives exist internationally that promote afforestation or support capacity building in sustainable forest management practices. Afforestation projects could be carried out within the framework of the CDM, a mechanism that promotes investments by developed countries, aimed at reducing carbon emissions in developing countries in exchange for carbon credits transferable to the investing countries. However, as of yet, only one afforestation project has been accepted under the CDM.

Numerous obstacles prevent these projects from becoming viable within the CDM framework, including questions of additionality (the need to demonstrate that the project would not have been undertaken without the incentive of carbon credits), transaction costs, and the fact that the credits created are only temporary.

The need for a new international approach

Because of the difficulties created by the CDM's specific constraints, a new instrument as been proposed by some developing countries. Its specific goal would be to promote afforestation and good forest management practices; the Reduction of Emissions from Deforestation and Degradation (REDD) mechanism, which would offer financial incentives to countries that are successful in reducing their deforestation rates.

There are still major difficulties to overcome and questions to answer before the creation of this instrument: Should it be integrated into the post-Kyoto agreement or should it be an independent instrument? How to choose and set up baselines while preventing the creation of "hot air" or the reduction of carbon credit prices? How to take into account degradation or how to evaluate government policy while most factors influencing deforestation rates (such as cash crop commodities price changes, currency exchange rates, etc.) are beyond the reach of governments?

Moreover, Federica Bietta highlighted the need to take into account the specific circumstances of different countries when designing the REDD. The mechanism should also include countries like China that already do afforestation and reforestation, or India and Sri Lanka that have effective measures to conserve their forest while providing incentives for countries like Brazil or Indonesia where the deforestation rates are still high.

In any case, Nasi believes that the issue should be de-coupled from the Kyoto Protocol and that financial incentives instead of carbon credits should be offered through an international fund against deforestation.

Conclusion

The forest sector alone cannot solve the problem of climate change. Yet, sustainably managed forest can contribute to mitigation efforts since deforestation represents up to 20% of annual GHG emissions today. Moreover, multiple co-benefits can derive from well-managed forests such as the creation of new revenue streams that can be catalyzed towards poverty alleviation, the preservation of ecosystem biodiversity and soils and water quality.

Parallel Session 3A
Nuclear Energy

Chair:
Elizabeth Dowdeswell
Special Advisor to the Board of Directors
Nuclear Waste Management Organization (NWMO)

Experts:
Alain Bucaille
Senior Vice-President, Research and Innovation
AREVA Group

Thomas B. Cochran
Director, Nuclear Program
Natural Resources Defence Council

Ernest J. Moniz
Director, Laboratory for Energy and the Environment
Massachusetts Institute of Technology

Climate change is leading to renewed interest in nuclear energy, a proven source of zero-carbon electricity. While some countries plan major increases in nuclear power, others remain strongly opposed. Nuclear power's contribution to meeting future energy needs and addressing climate change will depend on critical issues including cost, safety, waste disposal, and the risk of nuclear proliferation.

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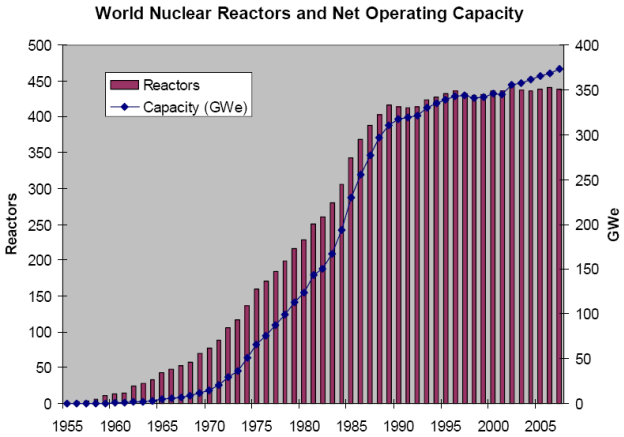
Will nuclear energy be part of the solution?

The Chair, Elizabeth Dowdeswell, opened the session by asking whether climate change would spark a nuclear renaissance. She noted that it is only recently that nuclear energy has been added to the agendas of climate change or environmental conferences. The three speakers shared their views on the issue from the academic, practitioner and NGO perspective.

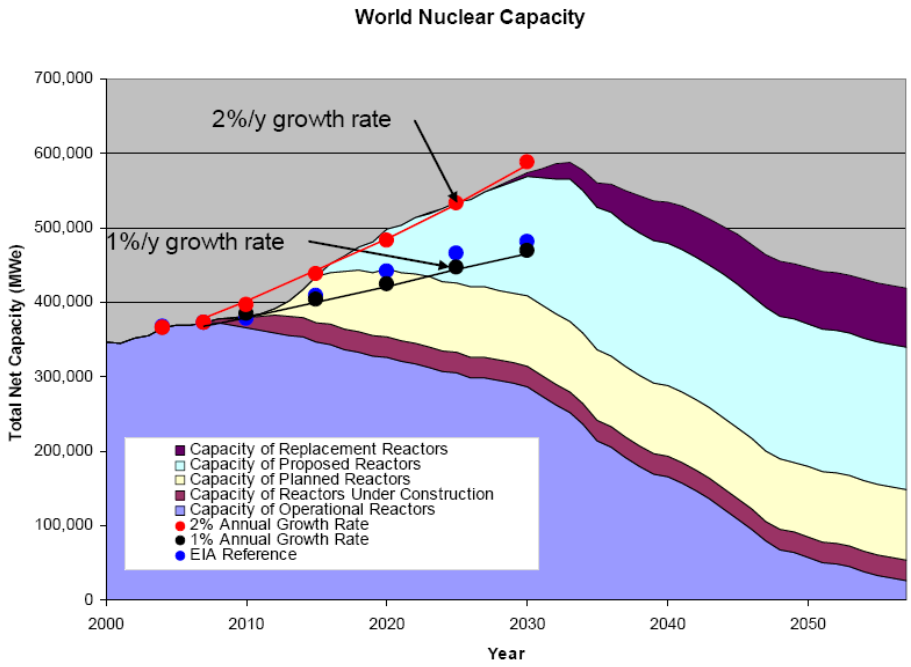
The need of a broad deployment

Alain Bucaille noted that many countries and oil companies are now considering nuclear energy as an option for energy production. Ernest J. Moniz submitted that for nuclear energy to make a meaningful contribution to climate mitigation, one would need a terawatt deployment: roughly a tripling of today's global capacity. To meet such a global target would likely include a tripling of capacity in the US as well. [24]



[24] The two following images were taken from Thomas Cochran's presentation.

Thomas B. Cochran opined: for the industry to represent a potential reduction of one Gigaton of carbon per year (GtC/yr) (equivalent to one wedge in the Pacala and Sokolow theory), a net addition of 700 GW to the current 375 GW of nuclear capacity would be necessary over the next 50 years. He then reviewed likely growth projections for the nuclear industry, concluding that while the industry is likely to grow, he does not believe it will reach the terawatt level.



Risks and challenges of nuclear energy

Nuclear power is the only existing energy technology that requires an international safeguards regime to prevent countries from making nuclear weapons; for which the government generally has to assume the liability for catastrophic accidents; and of which the waste is so dangerous that the government as to assume responsibility for disposal. These important risks need to be taken into consideration. Safety, waste and proliferation risks are generally the key issues with respect to the expansion of nuclear energy.

Bucaille emphasized the need for well-trained and independent safety authorities, especially in countries that are building their first plants. Then, Cochran pointed out that most expansion is projected to occur primarily in countries that currently have significant weaknesses in legal structure (rule of law); construction practice; operating, safety, and security cultures; and regulatory oversight. The safety culture of the plant should be taken into consideration as much as the safety in the design of the plant.

Waste must also be addressed, either through reprocessing or other recycling options (such as using fast-breeder technology). Both Cochran and Moniz believe that spent fuel management is so hazardous that government must take responsibility for it. Finally, large scale deployment of small-scale reactors should be approached with caution as there are proliferation risks involved. There are security concerns involved with having 4 000 nuclear plants around the globe and the current non-proliferation regime has many weaknesses.

Public acceptance

Cochran noted that public acceptance varies from country to country and expressed dismay at the changes in the licensing regulations in the US that essentially removed any mechanism for public participation. Bucaille, on the other hand, noted that AREVA is recruiting one thousand engineers per year and asked why the company would be so popular if the technology was not accepted. Moniz expressed some concern that lack of qualified personnel may become an issue. He stressed the need for challenging research projects to attract and retain students in the field.

Creating an enabling environment for a nuclear renaissance

Cochran questioned whether new nuclear capacity can really contribute to climate mitigation, whether developers will get a social license to build the plants, the availability of the needed human resources, and the advantages of pebble bed reactors.

To create a better enabling environment for a nuclear renaissance: a price on carbon should be established to help drive technological development and first mover initiatives should be supported to overcome cost limitations; development of the spent fuel storage site at Yucca Mountain in the US should not be abandoned; and nuclear research and development programmes should be expanded, according to Moniz. In fact, all panelists agreed that a price on carbon needs to be established.

Bucaille pointed out that if we had started to build the 200 plants we need to meet the targets under the Kyoto Protocol 15 years ago, nuclear would then have made a significant contribution. Now we must consider what kind of contribution we would like it to make in the future. Cochran noted that nuclear is one of the more expensive and slow mitigation options. According to him, nuclear will make a contribution, but not a significant one. He advocated letting the market choose the technology winners (after the price on carbon is set).

Conclusion

Worldwide we can observe a revived interest for nuclear power. Yet, all panelists agreed that if nuclear power should be part of the global fight against climate change, its inherent risks will be source of important challenges. In any case, nuclear, renewables and energy savings cannot be held up against each other; all solutions should be pursued at the same time.

Parallel Session 3B
Urban Planning and Transportation

Chair:
Johanne Gélinas
Partner, Enterprise Risks
Samson Bélair / Deloitte & Touche

Experts:
Don Chen
Founder and Executive Director
Smart Growth America

Paul Lewis
Professor, *University of Montreal* & Director, *Observatoire SITQ, Université de Montréal*

Sanjivi Sundar
Distinguished Fellow and Professor
The Energy and Resources Institute

Steve Winkelman
Manager, Transportation Program
Center for Clean Air Policy

With rapid urbanization, integrated planning and innovative "smart growth" strategies[25] can help ease traffic congestion, reduce air and water pollution, and make cities more liveable and sustainable. At the same time, these local efforts can make a strong contribution to meeting the global challenge of climate change.

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Transportation and urban planning deeply influence one another. On the one hand, urban designs impact travel demand. Sprawling, low-density suburbs increase reliance on personal vehicles which in turn leads to more traffic and CO_2 emissions. On the other hand, the availability of transport commodities guides future urban development patterns and location. Both therefore need to be taken into consideration together: a car lasts for 15 years, but the new street grid that it requires last for a century and the way cities are build today will affect how people will live for hundreds of years to come. Urban planning should be a dynamic process which not only accommodates the current needs of the population but also guides future growth on a sustainable basis.

Transportation and climate change

CO_2 emissions from road transport are the second most important source of CO_2 worldwide and are growing quickly. Johanne Gélinas mentioned that in Canada and Quebec, road emissions amount to 25 and 30% of total

[25] "*Smart Growth* (also called *New Community Design*) is a general term for policies that integrate transportation and land use decisions, for example by encouraging more compact, mixed-use development within existing urban areas, and discouraging dispersed, automobile dependent development at the urban fringe. Smart Growth can help create more accessible land use patterns, improve transport options, create more liveable communities, reduce public service costs and achieve other land use objectives. Smart Growth is an alternative to urban sprawl." TDM Encyclopedia, on line: <http://www.vtpi.org/tdm/tdm38.htm>.

emissions, respectively, with similar figures worldwide, while Sanjivi Sundar and Don Chen mentioned the significant growth in the numbers of cars in India and China.

Steve Winkelman detailed how the amount of GHG emissions released by the transport sector is influenced by three dimensions: vehicles and their fuel economy (miles per gallon; mpg); fuels used to power the engine, which should be considered in terms of life-cycle GHG impacts, and travel demand which is measured by vehicle miles traveled (VMT) and is too often ignored. All three dimensions offer opportunities of efficiency improvement. This session specifically focused on the third dimension: how can urban planning reduce travel demand?

Travel demand in 2050

In the US, a 60% increased in VMT is expected over the next 25 years. This increase can be partly explained by population growth, but the primary contributing factors are sprawling development patterns intensified by limited transport choices. In the same timeframe, transport-related CO_2 emissions are projected to grow by 40%, reaching 75% above the 1990 level in 2030.

Winkelman noted that fuel efficiency measures will not be sufficient to reach significant reductions by 2030. If both the 25mpg efficiency standard recently adopted by the US Senate and the California fuel standard (a 10% reduction in the carbon intensity of transportation fuels) were applied nationally, they would only reduce projected CO_2 emissions to 40% above 1990 levels in 2030. If both legislations were strengthened (45mpg and a 15% reduction), projected emissions would still be 25% above 1990 levels in 2030. Since 60 to 80% reduction below 1990 level are necessary to keep global warming within the scope of 2-3°C, these numbers clearly illustrate the necessity to look at all three dimensions of the transportation issue.

In the case of India, presented by Sanjivi Sundar, 28% of the population already lives in urban areas, a number that is projected to reach 33% in 2025, and over 50% by 2050. There are presently 35 cities with over one million inhabitants in India. By 2025, 60 to 70 cities are expected to reach this number. A majority of these cities are and will be affected by sprawling suburbs with increasing travel demand and growing reliance on personal vehicles. In 2000, there were approximately 60 million cars in India. Projections based on a 6% annual GDP growth estimate that this number will jump to 537 million in 2030 (671 million based on an 8% GDP growth scenario). In both situations, increases in fuels demand and CO_2 emissions are reaching such a proportion that they raise national security concerns linked to both energy and climate change.

How can urban planning and land use contribute to CO_2 reduction?

Steve Winkelman and Don Chen demonstrated that about 60% of new urban development could be made more compact by 2030, reducing VMT per 20% to 40%, which would represent a 12% to 18% VMT reduction at the overall metropolitan level. In 2030, these reductions in VMT would prevent 85 million metric tons of CO_2 emissions from going into the air and would be equivalent to 24 billion USD in fuel cost savings. Moreover, it is estimated that these numbers could double if smart growth strategies were combined to road pricing, parking policies, increased transit opportunities, speed limits and drivers training, etc.

These potential changes are supported by emerging consumer demand for greener housing and transportation as well as changes in demographic patterns. Quoting a Robert Charles Lesser & Co study, Don Chen noted that consistently one third of study respondents preferred new urbanism (compact development) communities and housing projects than conventional patterns.[26] In addition, the population is getting older and there are fewer families with children (only a third of the population is expected to be living in a family with children by 2025, a number that will decrease to 25% by 2050). This will influence the type of housing that will be needed. Finally, there is a growing demand for transit-oriented development (TOD) and residential areas accessible by train or rapid bus systems. Public opinion is changing as well; a majority of Americans believe public transportation and smarter development will do more to cure traffic than building new roads. They also embrace transit and walkable communities as solutions to climate change. Behaviours and demand are changing. Since half of what will be the built environment in 2030 does not even yet exist, it leaves room for important opportunities for changes.

Policies to be put in place

Numerous actions can be put in practice to support sustainable urbanization. Don Chen suggested first of all that state and local climate action plans should take transportation and smart growth into closer consideration. Advanced planning strategies must also be elaborated at a regional scale. Investment in transportation and direct funding for metropolitan areas is necessary, especially since the majority of Americans live in cities. Finally, perverse incentives need to be eliminated to move away from car-oriented transit development.

[26] Robert, Charles Lesser & Co. 2007. *The Market for Smart Growth.*

Paul Lewis argued that taxes (on roads, vehicles and parking) are the most interesting approach in the short term to manage travel demand. He also stressed that the development of public transport should focus on competitiveness in terms of destination, cost, comfort and speed compared to the automobile.

Moreover capacity building, technical know-how, financial assistance and green technologies will be of great importance for developing countries. More so as numerous mitigation options in the transport sector may be counteracted by growth, mentioned Sundar. Yet, Don Chen estimates that municipal administrations are still lacking those tools in developed countries as well. Finally, all experts agreed that it was essential to engage citizens, not only as clients of transport commodities but as people involved in shaping the character of their city for the future.

Conclusion

If we do not design new approaches to transportation and urban planning, we will continue building in a very sprawling manner. As a result we will lock in decades if not centuries of travel behaviour. On the other hand, changes in urban and transportation planning could lead to the creation of more vivid and dynamic communities, diminished reliance on personal vehicles, lower traffic and reduced CO_2 emissions.

As a last thought, Don Chen pointed out that from 1967 to 2006 the US population grew by 50%, while per capita VMT grew by 132%. He then asked: "Do we have 132% more jobs? A 132% more efficient economy? Or have we just increased the transaction cost of driving in order to get the same out of our lives?"

Parallel Session 3C
Adaptation

Chair:
André Musy
Executive Director
OURANOS Consortium

Experts:
Gary Guzy
Senior Vice-President
Marsh USA Inc.

Donald Lemmen
Science Manager, Climate Change Impacts and Adaptation Division
Natural Resources Canada

Kenrick Leslie
Director
Caribbean Community Climate Change Centre

Youba Sokona
Executive Secretary
Sahara and Sahel Observatory

With the early impacts of climate change already being felt, adaptation is a pressing challenge for all nations. Drought, flooding, extreme weather and other climate impacts are projected to fall most heavily on those countries least responsible for climate change and least able to cope. An equitable climate solution must include stronger international support for adaptation in poor and vulnerable countries.

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The need for broad and diverse adaptation measures

Based on the findings of the second Working Group of the IPCC, Donald Lemmen explained how, no matter what mitigation measures are put in place now, the global temperatures of the Earth will still rise in the coming decades. The simple inertia of the climate system would result in a 0.6°C increase even if emissions were to stabilize at their 2000 level. Non mitigation scenarios predict a temperature rise ranging from 1.8 to 4.0°C by 2100. Moreover, all continents and most oceans already show evidence of being affected by climate change. Consequently, adaptation measures will be essential to cope with the unavoidable impacts of climate change on natural and human systems.

Multiple adaptation measures can be put in place. Youba Sokona divided them into three different types: reactive measures, carried once the climate has already changed; no regrets anticipatory measures, implemented before the impacts are felt and benefitting other social development goals and finally, low regrets anticipatory measures, which still have a positive costs-benefits ratio.

Varying country vulnerability and adaptive capacities

Adaptation measures are necessary for poor and rich countries alike since they all have vulnerable sectors and populations. According to Lemmen, Canada's adaptation needs and adaptive capacity are high, but unevenly distributed: rural and remote communities are more affected by climate change than urban areas for example. Furthermore, the country is still

vulnerable to extreme weather events such as ice storms or increase forest fires.

On the one hand, each country's vulnerability depends on multiple geographical, climatic and environmental factors: low lying coastal regions, endangered ecosystems, frequency of drought or food security issues, etc. On the other hand, each country's adaptive capacity is intimately connected to its social and economic development. Therefore, some countries and regions will be more severely affected by climate change than others. Among them, the Small Island Developing States (SIDS), such as those of the Caribbean region, and Africa, especially sub-Saharan states, are among the most vulnerable to the adverse impacts of climate change.

In this respect, Kenrick Leslie discussed in greater detail the challenges faced by the Caribbean region, for instance: significant coral bleaching, higher energy consumption and water demand, biodiversity losses and land degradation as well as extreme rainfall events and stronger storms due to increasing temperatures both on land and in the sea. Leslie also discussed some particular areas that are and will be particularly affected by climate change, such as agriculture, tourism and fishing. These impacts will be especially significant as they are low laying coastal states, have vulnerable ecosystems, but also because their adaptive capacity is intimately connected to their social and economic development.

Adaptation: "Initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects."

- IPCC (2007)

Youba Sokona then discussed the case of the Sahel, where a wide variety of coping strategies have long been exploited such as environmental evaluation, monitoring and early warning methods. He emphasized the need for continuous and reliable data to support the successful implementation of adaptation strategies. He also noted that adaptation efforts need to be integrated within development efforts, as the two are complementary and mutually reinforcing strategies. Finally, it is worth noting that the processes used so far in the Sahel region to design adaptation strategies have deliberately been engaging stakeholders in order to address their specific economical, political and social realities.

What is the best approach to adaptation?

A consensus exists that adaptation and mitigation measures are complementary and mutually reinforcing strategies. However, methodologies are still poorly developed and the barriers, limits and costs of adaptation are not fully understood. More research is needed while

knowledge and practical experiences must be shared across countries and regions to ensure the diffusion of best practices.

Furthermore, climate change concerns and adaptation issues need to be mainstreamed into existing planning processes. Adaptation measures should also be linked with development goals, argued Sokona, even more since, as Lemmen pointed out, development pathways do more to determine future vulnerabilities than climate change itself.

According to Lemmen, multi-level participation including governments and the private sector is essential. He argued that risk management methods are an effective approach to adaptation, an opinion shared by the insurance industry according to Gary Guzy. Guzy explained that insurance companies are a logical sector to focus adaptation efforts since they have core competencies in understanding and managing risk and are constantly dealing with extreme events such as storms, wildfires, drought, heat waves, etc. The industry's strategy is based on limiting risk through better preparedness (oversight and evaluation of mitigation and adaptation strategies by insurance companies), enhanced resilience (micro-insurance and public-private partnerships) and mandated emissions reductions advocacy. New insurance opportunities around carbon credits for instance or green buildings investment are also considered as potential mitigating tools.

Finally and most importantly, increased international support is required, particularly in countries with low capacity, to implement the Nairobi Work Program on impacts, vulnerability and adaptation to climate change. International support is essential to help affected countries build adequate institutional infrastructure, acquire relevant technical, scientific and informative capacities, develop multidisciplinary approaches and raise public awareness.

Even though adaptation is expected to be a major element of any future international climate change regime, Leslie argued that there should be immediate support for the implementation of no regrets adaptation options as recommended in the Stern Report.

Adaptation means not clinging to fixed methods, but changing appropriately according to events, acting as is suitable

- Zhang Yu (Sung Dynasty 960-1278)

Conclusion

In conclusion, André Musy stressed that adaptation solutions and strategies need to cater to specific local or regional vulnerabilities which are difficult to evaluate, especially on the long-term. This is why immediate actions are necessary in order to increase countries and local adaptive capacity and ability to cope with the coming climate change.

Plenary Session 1
Climate Policy: North American Action

Chair:
David McLaughlin
President and CEO
National Round Table on the Environment and the Economy (NRTEE)

Experts:
Michael Goo
Legislative Director, Climate Center
Natural Resources Defence Council

David Van't Hof
Sustainability Advisor
Office of Governor Ted Kulongoski, State of Oregon

Israel Laguna Monroy
Underdirector, Climate Change Program
Mexican National Institute of Ecology

The global climate change challenge requires determined national and regional leadership and vigorous action. Robust national and regional policies will, in large part, define global outcomes. Meanwhile, national governments are confronted with the challenge of striking a delicate balance of growing economies and meeting their energy needs while achieving substantial GHG emissions reductions. Nevertheless, many governments are already setting longer-term goals and taking action to achieve greater reductions over the coming decades. This plenary session examined existing and potential Canadian, Mexican, US and North American policies and actions towards achieving a favourable global sum of national and regional parts.

To access speakers' presentations, please click HERE.

Actions in the United States

According to Michael Goo, things are slowly changing in the US. Although President Bush is still not ready to accept mandatory caps on emissions, following the IPCC report, he asserted he was "ready to move forward." Meanwhile, climate change is getting increased attention from the media, becoming front page material for numerous newspapers and magazines. An important mobilization of civil society can also be observed, with initiatives such as the USCAP (United States Climate Action Partnership) which brings together businesses and environmental NGOs in calling for strong federal regulations and mandatory emissions reductions. Finally, the Supreme Court ruled that CO_2 is a pollutant, putting pressure on the Environmental Protection Agency (EPA) for its refusal to take action under the Clean Air Act and making federal regulation "inevitable" in the mid-term.

Moreover, as mentioned by David Van't Hof, numerous States and cities have decided to lead the way and not wait for the federal government to act. For instance, the governors of Oregon, Washington and California agreed to collaborate on climate change policies (clean cars, appliance efficiency standards, truck stop electrification, etc.) through the West Coast Governor's Global Warming Initiative. In addition, Oregon has developed a load-based cap-and-trade program and decided that the state needs to lead

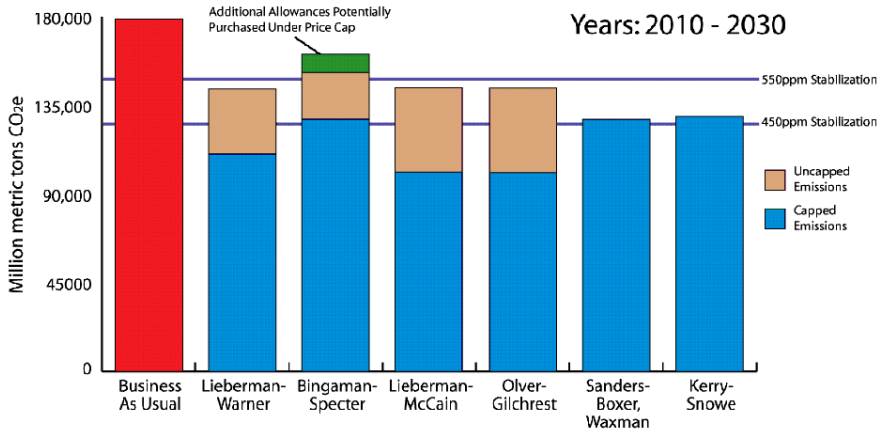
by example, therefore establishing different procurement rules for the government: electricity use will be 100% renewable by 2010, the state fleet is being greened, etc. Moreover, efforts are underway to calculate the state footprint as a basis to drive emissions reductions, and tax incentives for clean energy projects are being expanded. Other states are following similar paths across the US.

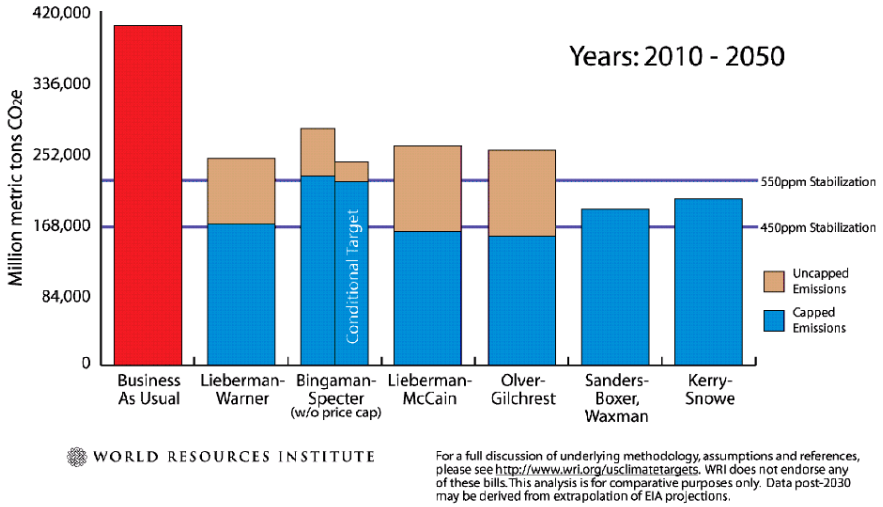
Finally, various legislative proposals are in the works. Michael Goo presented three of them:

- The *Jeffords/Boxer/Sanders Bill,* which proposes 80% reduction by 2050.
- The *Bingaman/Spector Bill*, a bi-partisan bill, which includes a safety-valve if allowances exceed $12/ton.
- The *Warner/Leiberman Bill*, again a bi-partisan bill, which proposes 70% reduction by 2050 and 30% reduction by 2020. It only covers 75% of US emissions, but attracts moderates from both sides.

Then, Goo briefly discussed the comparison, made by the World Resources Institute, of the options that are presently in the House of Congress. In the following graph, the red stripe represents business as usual emissions, the blue stripes indicates that amount that would be produced under each specific bill.

Comparison of Cumulative Emissions Budgets under Legislative Climate Change Targets in the 110th Congress
September 17, 2007





Actions in Canada

Canada's current climate change policy aims at reducing GHG emissions by 20% below 2006 levels by 2020 and by 60-70% by 2050. So far, the government has announced intensity reduction targets that will eventually lead to absolute reductions. In addition, climate change and energy regulations as well as action plans have been enacted at the provincial level.

David McLaughlin briefly introduced how NRTEE plays an important role in informing Canadian policy on the ways to achieve these goals. The NRTEE is an independent federal policy advisor since 1988. Recently, it was asked by the government to provide advice on targets and scenarios for reducing GHG emissions by 65% below current levels by 2050 with a view to also reducing other air pollutants in Canada. The interim report, released in June 2007 explores pathways to deep reductions through Pacala and Socolow's wedges strategy as well as diverse implementation scenarios (fast or slow start, use of carbon tax, cap-and-trade program design, transportation and building regulations, etc.). It discusses the "enabling conditions" to meet these targets and provides recommendations on market-based instruments to price carbon.

Moreover, the NRTEE has been investigating climate change issues happening north of the 60th parallel, focusing on three key areas: disaster management, risk insurance and codes and standards. The NRTEE formed an expert advisory committee composed of federal territorial governments, Aboriginal/Inuit organizations, Northern municipalities as well as numerous experts. It will release a report in June 2008. Global warming has had

profound impacts on the Arctic region which need to be further researched. Adaptation measures also need to be explored.

Actions in Mexico

Israel Laguna Monroy focused on the different Mexican institutions that were created to respond to the climate change challenge and portrayed the Mexican position toward international climate policy. He first presented the National Institute of Ecology (INE); a decentralized body of the Mexican Ministry of the Environment and Natural Resources (SEMARNAT) in charge of coordinating research on environmental issues in order to inform decision-makers. Then he presented the Inter-ministerial Commission on Climate Change (ICCC), established in 2005 to coordinate the actions of the agencies and entities of the federal government. The ICCC regroups ministers of Foreign Affairs, Social Development, Environment and Natural Resources, Energy, Economy and Agriculture among many others.

For the Mexican government, climate change is the most urgent global challenge faced by mankind and a problem of strategic security demanding unprecedented efforts on both mitigation and adaptation. Mexico argues that the international regime should hence be strengthened through agreements that involve major emitter countries and is willing to consider the substitution of the Kyoto Protocol for a more ambitious instrument. However, Mexico firmly believes in the principle of different but common responsibilities, as acknowledged by current instruments, and argues that developed countries (Annex I[27]) should make deeper commitments while developing countries, such as Mexico, progressively increase their participation.

Conclusion

2007 has been a remarkable for climate action. According to Michael Goo, it seems that we are facing two tipping points. A climate tipping point like the melting of around 40% of the Arctic ice cap in the summer of 2007, for instance, is one such sign. And a tipping point in public opinion and political action has been strengthened by the 90% certainty acknowledged by the Working Group I of the IPCC that humans are indeed causing global warming. If climate change is undeniably a global problem, there has been an increasing focus on continental and regional solutions, believed David McLaughlin. As we just saw, initiatives are multiplying worldwide, catered to each countries needs and circumstances.

[27] Countries figuring to the Annex I of the UNFCCC are the industrialized countries that were members of the OECD in 1992, plus countries with economies in transition (the EIT Parties), including the Russian Federation, the Baltic States, and several Central and Eastern European States.

Luncheon Address
Richard Evans, Alcan Inc.

Richard Evans, President and CEO of Alcan Inc., began his address by stressing that we can't afford to ignore climate change, or to "put it on ice", even though some encouraging progress has been made lately. According to him, the global warming issue is a classic case of asymmetric risk; where the risks and costs entailed in moving quickly and decisively are far outweighed by the risks and costs of doing nothing.

Even though the consequences of climate change are still uncertain and difficult to predict, the science has been subject to an increasing consensus while the issue has reached a critical mass in terms of public and political awareness. Opinion leaders and decisions makers around the world are now integrating climate change into their discourse while international events such as the G8 summit, the APEC, UN heads of states gatherings, etc., are focusing on the matter.

Yet, political will and concrete actions are still lacking. The belief that the problem is really a technological issue and that technologies and the free market will bail us out is still widespread. Moreover, the GHG abatement problem is the ultimate "free rider issue" since it puts strong narrow short-term economic interests (which lead to inaction) against much broader collective interests for creating a cleaner, more prosperous future.
Nevertheless, Evans pointed out that the technologies necessary to slow or reverse global GHG emissions trends are readily available or could be developed within a decade at reasonable costs. Besides, the implementation of multiple technologies, such as modified insulation and fuel efficiency for example, has no net cost and could actually provide savings.

In order to address the climate change issue and to cause meaningful and sustained behaviour changes, we thus need to develop a new approach leading to positive, certain and immediate actions. A carrot and stick approach combining trading mechanisms, regulations, taxes and incentives to investment in energy efficiency and conservation is necessary. According to Evans, emissions trading, if well designed, is one of the most efficient tools to achieve lower GHG emissions.

Moreover, large GHG emitters such as India and China have to take a more active stance in the global efforts to reduce GHG emissions. They are more capable economically, technologically and politically than before and they

have to be part of the solution. The Kyoto Protocol was a first and positive step toward global GHG emissions reduction, but we should not await further international binding agreements to start acting. Global incentives need to be put in place, and providing them is not only the role of governments but also of NGOs, international bodies and local and national organizations. The responsibility to fight climate change falls on all of us as citizens.

Plenary Session 2
Strengthening the Multilateral Climate Effort

Chair:
Elliot Diriger
Director, International Strategies
Pew Center on Global Climate Change

Experts:
Kathleen Abdalla
Chief, Division for Sustainable Development
Department of Economic and Social Affairs, United Nations

Thierry Berthoud
Vice-President, International Relations and Governmental Affairs
Alcan Inc.

Jim Greene
Senior Policy Advisor *to the Hon. Joseph R. Biden Jr., US Senate*

David Runnalls
President and CEO
International Institute for Sustainable Development (IISD)

Climate change is a global challenge and thus requires a global response. An equitable and effective multilateral framework can ensure that all the world's major economies contribute their fair share to the global climate effort. With the Kyoto Protocol commitments set to expire in 2012, governments and stakeholders are now debating how to strengthen the international climate framework for the years beyond. This plenary session explored a range of views from government, business, and NGO leaders on how best to advance the global climate effort.

To access speakers' presentations, please click HERE.

The climate policy landscape within the UN framework

The beginning of the international climate effort can be dated to 1992 with the creation of the UNFCCC which established the objective of stabilizing GHG levels in the atmosphere to "prevent dangerous anthropogenic interference with the climate system." It set voluntary targets for industrialized countries aimed at reducing their emissions back to their 1990 levels by the year 2000. However, shortly after the UNFCCC came into force, that initial target was recognized as inadequate, which led in 1995 to the Berlin mandate: an agreement to open a new round of negotiations with the goal of setting new *binding* targets for industrialized countries.

This led to the creation of the Kyoto Protocol, which is in force today. The Protocol sets emissions reduction targets for 36 countries (Annex I) and extends to 2012. It also creates a market-based architecture allowing for international emissions trading. However, according to Elliott Diringer, the Protocol has shortfalls; altogether, the Annex I countries count only for a third of global emissions and two third of industrialized countries emissions. Assuming that all targets were met, it would result in a 5% average reduction below the 1990 baseline while only reducing business as usual emissions on a global scale by a couple percentage points.

In 2005, during the CoP 11 and CoP-MoP 1 in Montreal, two processes were launched to plan the post-2012 era. The first process, conducted by an open-ended ad hoc working group under the Kyoto Protocol, aims to establish new commitments for countries that already have targets. According to Diringer, it is however very doubtful that this group can produce a new agreement. Annex I Countries are unlikely to take on new binding commitments without the US and major emitting economies joining the international effort.

Recognizing this situation, UNFCCC parties (which include the US) launched a parallel process: the Dialogue on long-tem cooperative action. The Dialogue comprised a series of workshops where parties began to talk and share ideas about possible ways to move forward.

The Dialogue produced interesting conversations on potential building blocks for future action and options for subsequent processes. These blocks have been repeatedly discussed in major climate initiatives such as the *Asia-Pacific Partnership*, the *Meeting of Major Economies*, and others.

Building blocks for future climate policy

Adaptation

Adaptation, according to David Runnalls, is always the weak sister in climate change discussions, yet it is a key element of any climate change response, especially in developing countries, which are the least able to cope with the adverse impacts of global warming. Kathleen Abdalla noted that numerous reports, such as the Stern Review or recent works by the World Bank, suggest that the costs of adaptation will be substantial and far outweigh financial resources required to meeting adaptation needs. She suggested that an adaptation fund and other like mechanisms should be made operational as quickly as possible. Runnalls added that already in 1992, the implicit deal was that developing countries would accept the Northern agenda on climate change in exchange for a number of concessions by the developed world, one of which was an increase in financial assistance. As these promises did not materialize, Runnalls suggested that developing countries will be unlikely to get on board any new post-2012 regime unless progress is made on this issue.

Mitigation

Several leaders from developing countries have acknowledged that they too need to take action to limit emissions growth. However, there is still a need to determine what incentives are required to facilitate the active engagement of these countries in a future climate change regime. Although developing countries are in favour of negotiating a post-2012 agreement, they still point out that developed countries should bear the largest

responsibility for mitigation, according to the common but differentiated responsibility principle of the UNFCCC. Hence, it is generally agreed that industrialized countries are required to make much deeper emissions reductions to stabilize the world climate.

All the experts of the panel agreed on the necessity to re-engage the US in the process as well. Jim Green presented briefly how the constitutional structure of the US determines its possibility for reintegrating the international climate regime and how, without clear involvement from emerging economies, it is doubtful that they will be ready to take on binding commitments.

In this context, calls for flexibility are heard. There have been several proposals for PAMs (policy and measures) commitments to be recognized in the post-2012 regime, where developing countries could commit to implementing national policies that would help reduce their emissions, such as renewable energy targets, vehicle economy standards, etc. Developed countries could agree on more stringent Kyoto-like targets. The EU, for instance, wants to continue along Kyoto and wish for a long-term target aiming at 50% reduction by 2050. Reforms of the CDM have been suggested along the same lines, where sectoral policy could be eligible for crediting and where countries could receive credits for implementing programs across a spectrum of activities rather than just on a project basis as it is today.

In order to bring developing countries to the negotiating table, Abdalla argued that both mitigation and adaptation strategies need to be coupled with the implementation of the MDGs. Runnalls agreed that the MDGs be the standard by which many developing countries view future progress on climate. Moreover, Abdalla mentioned that the UNFCCC approaches climate change within the broader framework of sustainable development. During CoP 8, it was acknowledged that climate change is not only an environmental problem but that it has varied social and economic ramifications that need to be taken into consideration, so that all the aspects of the problem are considered in an integrated manner.

Technology

Technology is another key building block of any future agreement. Accelerating deployment is a critical challenge. Abdalla stressed that we don't have the luxury of decades to innovate, deploy and commercialize clean technologies. On the one hand, we need to go into the technologies of tomorrow, but on the other hand we need to focus on overcoming technical, economic and policy barriers to ensure that today's technologies are rapidly deployed. Energy efficiency was repeatedly singled out as one of

the most important near term technology options, requiring sustained policy support.

Thierry Berthoud presented the case of the aluminum industry, one of the most energy intensive in the world. It has been able to drastically increase energy efficiency while reducing perfluorocarbon (PFC) emissions (a potent GHG) per ton of aluminum by 78% from the 1990 baseline. Moreover, the International Aluminum Institute reported a 14% reduction in total direct GHG emissions from the production processes of primary aluminum between 2000 and 2005, despite a 20 percent growth of the industry.

Financing

Finally, the last building blocks of the future climate change regime will be financing. The challenge of climate change is impossible to meet, said Runnalls, without investing massively into adaptation and mitigation measures; action will not be without cost, neither economically nor politically. He also suggested that efforts should be made to align the trade regime along the environment regime to support more sustainable forms of development. The Doha negotiation round at the WTO offers some opportunities in that direction. He believes that negotiations on environmental goods and services are providing an opening for both improving the terms of technology transfers for green technologies as well as facilitating greener investment. However, he noted, such a reorientation of the trade regime will not work if it is perceived by the developing countries as primarily a change to combat climate change. Other venues will be needed such as the adaptation funds and a reform of the CDM to foster growth in green investment.

Conclusion

Runnalls pointed out that 2007 saw the 20th anniversary of the Brundtland Commission. In 1987, the report was already giving a stark analysis of the state of the world, of its diminishing resources, threatened ecosystems and CO_2 emissions increasing rapidly. The Commission reckoned at the time that we had two decades to put this right. Two decades later, not much has been done. However, Runnalls argued that an interesting policy window is now emerging: climate change and environment are the top issues in public opinion in most of the OECD while major developing countries such as India and China have already taken positive actions. These windows don't open so often, so we must take advantage of this favourable political wind in important decision-making countries.

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