

## The Roundtable on Forests, 22-23 September 2006

"I see a world in which the forest is recognized . . . as an essential component in all the great issues that face humankind in this new millennium."

Mike Apsey, *What's All This got to do with the Price of 2X4s?* (2006).

The Global Issues Project (GIP) held its first Roundtable at the University of Toronto in collaboration with the Faculty of Forestry, whose east outer wall facing Huron Street at Willcocks bears a magnificent placard with the word **Conservation** writ large.

Readers may well ask, "Why start with forests?" a good question since climate change ranks high in people's minds today, as well as population, water, food and agriculture, energy, war, AIDS, the vagaries of globalization and widespread criticisms of the world's international financial institutions, namely the World Bank and the International Monetary Fund. We could have picked any one of those topics to start off, and would have been right to do so. But forests presented several important perspectives. Every civilization that lost its forests to overexploitation has failed as a consequence. Today, the tropical rainforests are in a state of decline and a simple extrapolation would project their disappearance within twenty-five years. The pressure on boreal forest to produce more lumber and more pulpwood will be exacerbated by the situation in the tropics, and is greatly driven by the increasing population. There is a tension already between the demand for forest products and what the forests can supply sustainably. The present manner in which the world copes with that tension is to cut too many trees. But that cannot continue.

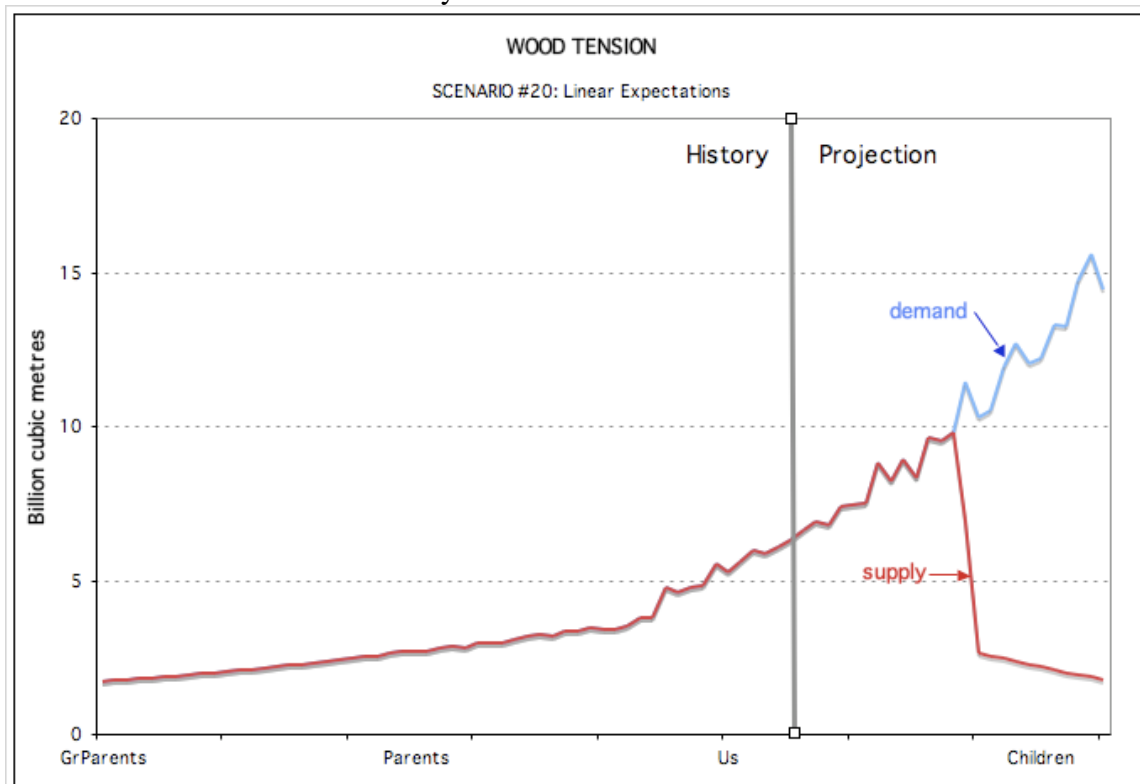


Fig. 1 A typical model projection from past data using so-called linear assumptions. After the break-point at which the supply drops dramatically, about a generation from now, any extrapolation of the demand curve has little meaning, and should be ignored. [Thanks to John McRuer for this figure.]

To attain sustainability the demand must be reduced and the sustainable supply increased. Some increase can be achieved, albeit with some negative consequences, by cultivation of forest plantations, which are much more productive of wood per hectare than natural forests. In the

medium term, if no remedial action is taken, the world's forests will collapse in about thirty years, as can be illustrated using the Global Systems Simulator, an economic computer modeling system. Though the details depend somewhat on the assumptions made, one type of *laissez-faire* scenario leads to the result shown in fig.1. The collapse is so dramatic in this and most similar scenarios, that it surely justifies a Roundtable to explore the conditions of the world's forests in some detail. The sharp drop shown in fig.1 corresponds to the time when the last big tree has been cut, and only small diameter stock remains. This is the point at which, suddenly, the supply can no longer keep up with demand. Hence there is a need to start reducing demand so that the supply-demand tension can eventually be eliminated. The sharp drop in forest products in Fig.1 is a consequence cutting more than the forests can supply sustainably in order to satisfy uncontrolled demand.

Superimposed upon the tension between demand and sustainable supply — a tension that already exists — are other considerations: the relation between forest and water, forest and climate change, forest and energy, forest and food, and biodiversity. The full list is even longer. It has been the intention from the outset that the GIP would look at these interrelationships, not just at the issues in isolation.

### **The Roundtable program**

In his opening welcome the President of the University of Toronto, Professor David Naylor, described the Roundtable as "unique" and stressed its importance. Representing the sponsors of the Roundtable, welcoming remarks were added by Professor Tattersall Smith, Dean, Faculty of Forestry; Professor Paul Hamel, President, Science for Peace; and Dr Adele Buckley, Chairman, Canadian Pugwash Group.

Next followed talks by the first eleven speakers on the first day, interspersed with discussion periods, followed by six speakers the following morning. The titles of the talks and the list of presenters, and the list of other participants will be found at the end of this document.

Next followed two workshops in parallel, one on sustainability within a generation; and one on the GSS modeling.

The concluding session consisted of reports on the two workshops to a plenary session, a lengthy discussion having the objective of reaching some specific recommendations for follow-up after the Roundtable and, to conclude, a final demonstration of the GSS by Robert Hoffman.

### **The presentations**

The GIP Committee gratefully acknowledges the contribution of Peter Nicholls, who attended the first day of the Roundtable and sent in the following summary.

Modeling of the future for forestry as well as other resource industries is needed. Using a modeling program referred to as the Global Systems Simulator\* John McRuer has examined possible futures and plotted the results in terms of generations. The fairly robust models foresee problems for our great-grandchildren (in a world of steep population decline), our grandchildren (energy needs vs. availability), our children (available compared to needed labour; crop yields), and even ourselves in a few years (wood/forestry). So the wood business may be the first to enter crisis because of current extractive overuse of the resource.

In view of the importance of forestry to Canada the a fully satisfactory Canadian forest inventory is a major requirement. National inventories depend upon summing provincial inventories, which are often imprecise and dependent on commercial information sources. Forests are vulnerable both from natural causes (the mountain pine beetle has devastated a large proportion of British Columbia's lodgepole pine trees) and from human exploitation.

Sten Nilsson (Int. Inst. for Applied Systems Analysis, Austria) told us [of the irony] that worldwide mill closures accompany increased wood use owing to industrial efficiency increases. Wood prices have declined. Among many worldwide problems, Russian costs have risen dramatically over the last decade yet there continues to be underinvestment. China with multiple markets is subject to problems of illegal land seizures. India has rapid growth with poor statistics and control. South East Asia may face a 15-year sustainability horizon. Wars have disrupted the industry in Africa. And Latin America has suffered extensive deforestation (*vide* Brazil) due to both logging and agriculture. The importance of Canadian and other boreal forests has declined somewhat but may increase (cf. Boreal Futures below).

Barbara Zimmerman (Kayapo project - Brazil) under the title "Is sustainable logging possible?" showed that sustainable logging in the tropical rainforests is indeed possible, but in practice the need to take into account the secondary consequences of logging (neighbouring trees; canopy; diversity; etc.) augurs strongly against it. Sustainability requires attention to reduction techniques, to silviculture, cutting rotation; cutting intervals (a 40-year cycle is probably a minimum cf. current legal cycles of 20-30 years); max cutting intensity with reduction techniques 8 trees/ha, without 5 trees/ha (current practice often cuts much more than 8/ha). In the Amazon, 90 percent of logging is illegal; investment in sustainability a risky investment in tropics. We need political will; national forest policies; forest services; clear legal title to forests; modern management systems (planned logging intensity/silviculture); absence of war (problematic not only in Africa but also in South America, e.g. Bolivia, Brazil). Brazilian deforestation exceeds 2 million ha/annum; agricultural clearing (soybeans; ranching) is more significant than logging. Native land is often the only barrier to exploitative logging; hence Kayapo vigorously defend their territory (11 million hectares) but they are the only group doing so successfully.

Jim Farrell (Canadian Forest Service) said that 30 percent of the world's land surface and 44 percent of Canada (401.5 million ha or 10 percent world total and 30 percent boreal total) is forest. In Canada 93 percent is public, 8.4 percent protected, with 180 tree species. Forestry is worth \$354 billion worldwide, 1.2 percent global GDP (3 percent in Canada). World losses are 9.4 million ha/annum (0.22 percent of stock) with increasing areas being at fire and pest risk. And boreal forest is an early indicator of climate change (hence link to UN Millennium goals). This presentation led to a lively exchange with former minister Charles Caccia regarding government policies.

Hernandez Diaz (ISIMA\_UJED, Mexico) - On the other side of the US, Mexico produces 8-million m<sup>3</sup> wood/annum from 8 million ha. It is nationally monitored in terms of stocks and flows (cf. McRuer). One potentially positive feature is that 80 percent of Mexican forest is owned by local communities (common land) and only 20 percent is private. But there are problems, in that an entire community has to be persuaded when it comes to the matter of adopting sustainable practices, and such persuasion is not often successful. Mike Apsey had heard a guerrilla claim to be saviours of the forest because loggers were afraid to enter!

Shashi Kant (U of T) emphasized the links between economics and peace with a quote from Joseph Rotblat. There is a disconnection between science and society; but can science provide solutions (the technological fix?). Science is not neutral; and when applied to a problem such as forestry the results will depend upon the desired political ends. Tat Smith (U of T) referred us to the bioenergy tasks set by the International Energy Agency (IEA). Renewable forest bioenergy sources remain unexamined (are they carbon neutral?). He noted that 3 percent of current US energy use is bioenergy (0.24 ekajoules/annum).

Frank Dottori (until recently CEO of forest products firm Tembec), speaking strongly as an enlightened forest industry representative, emphasized the needs for education, for inclusion of the Canadian First Nations in planning, and for independent certification within the industry (through the Forest Stewardship Council). Industrial funds are available for university scholarships — the

industry is thinking about the future. He pointed out some of the economic difficulties — forestry as a high pay industry despite falling prices. Nonetheless the industry — at least in part — is making environmental progress compared to the cowboy era of a couple of decades ago, with zero-effluent mills operating in Northern Ontario. The industry recognises the need to tackle global warming and hence he would favour a carbon tax.

Forest bioproducts were the subject of papers by Mohini Sain, Tat Smith and Helmut Burkhardt. Between 1 and 2 billion m<sup>3</sup> wood has been logged 1961-2005. A price of \$100/ton mixed products gives \$400/ton for paper or \$700/ton for worked wood. A strategy to use all the tree material could cut the immediate cost/value to \$50/ton and such use of all products could increase the added value from 300 percent to 1400 percent. There is now a market for wood product bio-ethanol and wood fibre can be substituted for some plastic in the auto industry. But overall ethanol production (alone) may not be energy-efficient and Burkhardt has calculated that biofuels are very much less efficient ways of converting solar energy than direct methods using solar panels etc. Therefore primary biofuel crops are unlikely to be economic; but secondary production of such material (waste utilisation) may be worthwhile. As a measure of the scale of our problem Burkhardt reminded us that current energy use is 470 ekajoule(EJ)/annum, equivalent to an average power of 15 terawatts (TW) . For 6.5 billion people that means an average of 2.3 kW per person. But Canada uses 14.3 EJ/year (0.46 TW) or 14 kW/head while Niger uses 0.017 EJ/annum or 0.043 kW/head. Leveling cannot entirely be leveling up. And carbon-neutral waste-product biofuels can only provide a very small part of the third world “deficit.”

### **Abstracts of the other papers**

Simon Fobister: Things Must Change

From time immemorial the Ojibway people of Grassy Narrows have learned to manage their lands sustainably, slowly enabling the forest to supply sustenance increasingly to the living creatures within it. The Canadian National Railway line through their lands posed serious problems for the Grassy Narrows people, which they were able to cope with; but clearcutting and the paper industry in Dryden with associated power dams, flooding, and the chemical pollution of rivers produced by the mill caused long-term harm, the loss of commercial fishery and gross reduction of habitat. What must change is the matter of who has to learn from whom. Clearly, in the present search for sustainability in forest practices, First Nations' traditional knowledge and the wisdom of the Elders is of prime value.

Faisal Moola (co-author Devon Page): The Need for Endangered Species Legislation

The Earth's current biodiversity crisis is on a par with earlier mass extinctions. Some 16,000 species are threatened with extinction, including 12 % of birds, 23 % of mammals and 32 % of amphibians. Global warming will likely eliminate a further 15 to 37 % of species by 2050. Among the species thought to be most vulnerable are iconic Canadian wildlife, such as polar bears, muskox and caribou. Though the threats are well known, the consequences of biodiversity loss at such a grand scale are only now being recognized. They include not only major threats to ecosystem integrity, but serious declines in human health and welfare as well. According to the United Nation's 2005 Millennium Ecosystem Assessment (MEA), two-thirds of the benefits people obtain from biodiversity and other elements of nature, so-called ecosystem services, are currently being degraded. A set of key principles for a strong endangered species law is being prepared for application in the province of British Columbia. Such a law would provide the legal means for the effective protection and recovery of at-risk species, and thereby help to fulfil Canada's international and national responsibilities for the conservation of its natural heritage.

John Herity: The Forests and the Trees

Biological diversity in natural forest ecosystems provides resilience, important services and useful products, both for human and planetary needs. We do not know the names, functions or status of most species in our forests, except by inference from their remarkable recent decline in extent. This decline affects planetary services, poverty, disease and susceptibility to disasters. Future scenarios point to continued degradation. We know why and we know how to fix it. We also know that not to do so will be costly in the long run. Reforestation, sustainable non-timber harvesting, local community integrated management for multiple uses are all components of a resolution. We must set targets and move vigorously to implement them if we are to restore sustainability.

Sean Thomas: Forest Feedbacks

In a paper directly relating forests and climate change, Sean Thomas gave a highly technical discussion of forest feedbacks, and concluded that it is essential to enumerate the feedbacks related to the global carbon cycle. Current existing models (incorporating the feedbacks) are poorly constrained by the data. While there appear to be some modest negative feedbacks (meaning that excess carbon dioxide in the atmosphere leads to slightly more carbon dioxide absorption in the forests), strong positive feedbacks are possible, whereby large amounts of carbon can be emitted to the atmosphere in a short time — a frightening possibility.

Josie Hughes: The Mountain Pine Beetle

These creatures are native to pine forests of western North America. British Columbia is currently experiencing the largest mountain pine beetle outbreak yet observed; over 25 percent of mature pine volume has been killed since 1999, and the outbreak is expected to continue for several more years. Two likely reasons for the size of this outbreak are an increase in older (more susceptible) forest, and a series of relatively warm winters. Mountain pine beetles are limited on their northern range by severe cold, and warmer winters are allowing beetles to thrive in new areas. The possibility of further warming has raised concerns that mountain pine beetle might spread east into the jack pine boreal forest. More generally, forest insect pests are biologically well suited to respond quickly and dramatically to small temperature changes, and this outbreak may be one example of a wider effect of changing climate. We know much more about mountain pine beetles than we do about most other forest insects yet, despite a long history of research and practice, we can neither predict where and when outbreaks will occur, nor can we effectively control beetle populations.

### **Workshops and conclusions**

Following the last talk the Roundtable broke up into two workshops for the rest of the morning. One was on the Global Systems Simulator, and the other a broad-ranging discussion on how to achieve sustainability within a generation. The workshops were ably reported to a plenary in the afternoon, after which a general discussion took place.

### **The Global Systems Simulator (GSS)**

The workshop on the GSS was essentially educational. The modeling of global economics offers two choices, that of creating a submodel for each region incorporating transfers between regions, or a global model that integrates the whole, thus eliminating the transfers, since what leaves one region generally is input to one or more others. It turns out that fully detailed modeling region by region becomes extremely complicated at the level of sophistication required in GSS, so that, up until now, only the global, integrated model is available. This has been perfected by Robert Hoffman and colleagues at Whatif? Technologies in Ottawa, and has the advantage of being readily usable. It is easy to change the assumptions, which are all-important in modeling, so as to obtain a rapid response on what these assumptions may imply a decade or two hence.

The GSS uses goods, not money, as its value indicators, and this is most important — economists, please note. Population and labour appear simply in terms of numbers of people. In

traditional economic fashion the GSS plots demand and supply as a function of time. In our current economic system, demand and supply usually match each other fairly closely, except for short times. If the supply exceeds demand, production is cut back. If demand exceeds supply, production is increased. What does GSS tell us about forests and forest products?

In virtually every case of seemingly realistic assumptions, GSS shows a peak in the world population somewhere near the middle of this century, with a steepening decline thereafter, and an agricultural output following a similar curve. In general character, these projections differ only in detail from those of the Club of Rome (1973). What is new, and important for forests is that GSS also projects a sharp drop in the forest product curve, as in fig.1, occurring a decade or two before the projected peak in world population.

We must now distinguish between supply and demand. As stated above, the current economic system, under *laissez-faire*, adjusts supply to demand. The wood supply can be kept up as long as there is a large diameter tree left and someone to cut it down. However, once the mature lumber is gone, the supply simply cannot keep up with demand, and we have an economic catastrophe on our hands. The GSS scenarios invariably project this disaster and furthermore, the sharp drop usually occurs between 20 and 32 years from now, depending on the assumptions.

The remedy for this appalling prospect is to **encourage (or force) the demand to fall below the present level of supply**, which today is, in any case, unsustainable. Today's demand is roughly equal to the supply, but this is being maintained at great risk to the global future. Some of the practices that are unsustainable are: burning of tropical rainforests; illegal cutting of tropical and other forests; bad forestry practices, such as overcutting old growth and clearcutting; poor cutting practices in semi-arid and arid areas.

**The pre-eminent conclusion to be drawn from the Roundtable is the need to begin deliberately reducing the demand for wood products below the current actual supply. Only in this way can the collapse illustrated in fig. 1 be avoided.**

One of the prime purposes of the follow-up to the Roundtable, therefore, is to explore ways of achieving this. The task is likely to be difficult, as it violates the normal way in which our economy works. In this sense, **the growth paradigm in economics is hostile to present needs**. However, growth in total sustainable output of forests is still an acceptable goal, in fact a desirable one, though it must not be sought at the expense of biodiversity. Such growth, most likely, may be achieved by a judicious combination of plantations, protected natural forests and well managed natural forests.

#### **Sustainability within a generation — general recommendations**

The Roundtable came up with a few general recommendations: the need for discourse with the Federal and with Provincial Governments; the need for certification of lumber companies overall (see next section). The Roundtable also asked the follow-up committee to endeavour to get provincial forest inventories created in all provinces of Canada, and to have NRCan integrate these into a National Forest Inventory. [Editor's note: since there already exists a national forest inventory, we shall interpret this request as seeking improvements in the inventory. For the Provinces the same interpretation will be adopted, namely, that improvements are to be aimed for.]

In addition, one participant proposed that the matter of prevention of cutting in the far north of Ontario, beyond the present limit imposed on cutting, be made into a political issue, through a combination of holding a press conference on the subject and demanding an audience with Premier Dalton McGuinty. This was left as a matter for the follow-up committee to deal with.

#### **Certification**

See *The State of Canada's Forests 2005-6*, Natural Resources Canada 2006, p.39.

Three types of certification are available in Canada, through:

the Canadian Standards Association,  
the Sustainable Forest Initiative, and  
the Forest Stewardship Council.

In 2005 half of Canada's forest area was certified under the Canadian Standards Association, but only around 15 percent was certified under the Forest Stewardship Council (FSC). The latter is regarded as the most stringent and forward-looking in its certification standards. The Roundtable recommended strong support for influencing certification under the FSC.

### **Land-use planning**

The Roundtable resolved that the Ontario Government should place an unequivocal moratorium on harvesting trees north of the existing cut line in Ontario's northern boreal forest, and the moratorium should remain in place until such time as the Government, pursuant to public consultations, has adopted a comprehensive official land use plan for the Boreal Forest across Ontario. This conclusion was pursuant to Premier McGuinty's promise to have a broad-scale land-use plan in effect before opening up the northern boreal forest for further development.

### **Further questions and initiatives**

Important matters were inevitably left incompletely discussed or even untouched. The follow-up committee is therefore bearing in mind all of the following.

A. The vital importance of *preventing the destruction of what is left of the tropical rainforests* requires both initiative and imagination. The Government of Canada has consistently supported efforts at the United Nations to achieve an International Convention on Forests. This would be a Treaty binding upon all its signatories, and could add tremendous impetus to efforts to preserve the tropical forests, as well as having significant benefits elsewhere. Canada's most recent aspirations, as expressed at the recent UN Forum on Forests, have by no means been met. New ideas and initiatives are therefore needed.

In parallel, it should be of benefit to envision the combination of conditions, in such places as Indonesia, that might lead eventually to sustainable forestry. Far away though such dreams are, we believe that the envisioning itself is still lacking. Following the philosopher Erasmus, however, it is necessary to envision the future you desire, or else it can never come to pass.

B. The follow-up committee is pursuing the goal of becoming acquainted with the many nongovernmental groups in the domain of *forest sustainability and biodiversity*, with a view to healthy collaboration.

C. There is a reference above to *clearcutting* as a bad (or at best dubious) forestry practice. We suggest that, even if the last word on clearcutting has not been heard, our provincial ministries should generally not be issuing permits to clearcut until such time as there is general agreement that clearcutting is acceptable and upon what conditions it is acceptable. For example, clearcutting might be found to be acceptable in many circumstances within plantations, but not at all in natural forests. The suggested restriction on clearcutting is a matter of following the precautionary principle.

D. Current *forestry practices in the boreal are extremely damaging to bird life*. In 2001, in Ontario alone, 44,000 active birds' nests were destroyed through logging. This might not be a vital consideration if there were no other massive threats to birds. But there are in fact several. One of these is death through crashes into high-rise buildings, another is the proliferation of domestic cats. All these attacks on bird life are related to the burgeoning human population, and all require attention and remedy urgently.

E. *Plantations*. It is known that forest productivity can be raised fivefold through plantations of fast-growing trees. Such proposals are not to be scoffed at, since the more rapid growth provides a carbon sink not otherwise available, which is important for countering climate change. Simultaneously, the plantations reduce the supply-demand wood tension. However, we believe that the entire concept and prospect of plantations needs a carefully detailed and integrated overview, looking into such questions as what are suitable areas for, and suitable limits of extent of such plantations. In particular their overall effect on biodiversity needs to be studied, both within and in the vicinity of plantations, wherever they are developed.

F. We also see a need for *increased research*, though the Roundtable did not identify specific areas. The apparent intractability of the mountain pine beetle infestation would appear to require new avenues of thought and investigation.

G. *Education*. It became clear at various points in the Roundtable that there was much of value in the discussions that could be transmitted to the young and to the public at large with potentially great benefit. Julia Morton-Marr offered to transmit findings on sustainability of this and possibly other roundtables to the wide-ranging network of educators with whom she has developed virtual conferencing. Her networks include peace and sustainability education, holistic tourism education and Phi Delta Kappa. [www.ihtec.org](http://www.ihtec.org) email [ihtec@3web.com](mailto:ihtec@3web.com)

### **Bibliography**

Mike Apsey, *What's All This got to do with the Price of 2X4s?* (University of Calgary Press 2006).

David R. Boyd, *Sustainability within a Generation: a new vision for Canada* (David Suzuki Foundation, 2004)

Donella H. Meadows *et al.* (Club of Rome), *Limits to Growth* (NY: Universe Books 1972, 1974)



## List of Talks

### Speakers on the first day:

- "Models, Dogma etc." John McRuer, Canadian Association of the Club of Rome.
- "Strategies for Forest Conservation: Community and Industry leaders", Tony Iacobelli, Director, Forests and Freshwater Conservation, World Wildlife Fund Canada
- "The World's Forests: a survey", Sten Nilsson, International Institute for Applied Systems Analysis.
- "The Prospects for Sustainable Logging of Natural Forests in the Tropics", Barbara Zimmerman, Director, Kayapo Project, Conservation International, Brazil Program, Washington DC.
- "The role of governments, in both their domestic and international activities, in promoting the objectives of sustainable development, with a particular emphasis on forestry", Jim Farrell, Assistant Deputy Minister, Natural Resources Canada, Ottawa.
- "Factors influencing sustainability of forest resources in Mexico", J.C. Hernandez Diaz, Juarez University of Durango State.
- "Reforestation. Tree planting in arid areas and the effect of climate change" Remarks by J.C. Hernandez Diaz and discussion by participants.
- "Science, economics and sustainable development", Shashi Kant Faculty of Forestry University of Toronto.
- "Realising the potential for sustainable forest bioenergy production systems", Tattersall Smith, Dean Faculty of Forestry, University of Toronto.
- "Forestry, plantations, business and labour", Frank Dottori, CEO, Tembec
- "The forest products industry and the effect of moving toward a conserver society", Mohini Sain, Faculty of Forestry, University of Toronto.
- "Forests and biomass; limits to the use of biomass for making up the liquid fuel deficit." and a second paper, "A program to substitute solar power for cooking with firewood, and its limitations", Helmut Burkhardt, Science for Peace, Canadian Pugwash Group

### Speakers on the second day:

- "Things Must Change: Sustaining the Living Ones in the Ancestral Forests of Grassy Narrows First Nation", Simon Fobister, Chief, [Grand Council, Treaty No.3] Grassy Narrows First Nation
- "Applications of Endangered Species Legislation to protect forest biodiversity in Canada", Faisal Moola, Director of Science, David Suzuki Foundation.
- "The vital importance of biodiversity. Other creatures of the Forest; plant diversity; habitat and extinctions, the value of ecological continuity", John Herity, Director, Canada Office, IUCN — the World Conservation Union.
- "Forest plagues, their origins and their effects. How climate change affects forests and infestations. Can there be healthy remedies?", Prof. Sandy Smith, Faculty of Forestry, University of Toronto.
- "Forest feedbacks: will forest responses mitigate or exacerbate climate change?" Prof. Sean Thomas, Faculty of Forestry, University of Toronto.

"Assessing Broad-Scale Risk of Mountain Pine Beetle Infestations", Josie Hughes, Department of Zoology, University of Toronto, and (*in absentia*) Andrew Fall

**List of participants and observers additional to the speakers**

Mike Apsey, Adele Buckley\*, The Hon. Charles Caccia, Paul Gray, George Heintzman, Martin Hubbes\*\*, Ken MacKay\*, Julia Morton-Marr, Peter Nicholls, Derek Paul\*\*, Don Roberts, Virgilio Rodriguez, Ardavan Shirazirad, Saeedeh Shirazirad, Cameron Smith, Amalia Veneziano, Annemarie Wolff.

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30 November 2006