



House of Commons  
Canada

THE STANDING COMMITTEE ON ENVIRONMENT

**No Time To Lose :  
The Challenge of Global Warming**

Part II of "Our Changing Atmosphere" Series



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"By the time scientists have all the answers to these questions global climate change may have been driven by human society to the point where the answers are largely academic."

October 1990

The Honourable David MacDonald, P.C., M.P.  
Chairperson

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HOUSE OF COMMONS

CHAMBRE DES COMMUNES

Issue No. 58

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Thursday, October 11, 1990

Le jeudi 11 octobre 1990

Chairperson: David MacDonald

Président: David MacDonald

**THE STANDING COMMITTEE ON ENVIRONMENT**

Environment

l'Environnement

RESPECTING

CONCERNANT

In accordance with its mandate under Standing Order 106(2), a study of global warming

Conformément au mandat que lui accorde l'article 106(2) du Règlement, une étude du réchauffement de la planète

INCLUDING

Y COMPRIS

Fourth Report to the House

Quatrième rapport à la Chambre

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*Minutes of Proceedings and Evidence of the Standing Committee on Environment*    *Procès-verbaux et témoignages du Comité permanent de l'Environnement*

## Environment

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Second Session of the Thirty-fourth Parliament,  
1989-90

Deuxième session de la trente-quatrième législature,  
1989-1990

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The Standing Committee on Environment has the honour to present its

### **FOURTH REPORT**

Pursuant to Standing Order 108(2) the Standing Committee on Environment undertook a study on global warming. After hearing evidence, the Committee has agreed to submit an **interim report** prior to the Second World Climate Conference in Geneva, as follows.





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precipitated by the emission of certain gases from the industrial and agricultural activities of humanity. If present trends in the atmospheric accumulation of so-called "greenhouse gases" — principally carbon dioxide, CFCs, methane and nitrous oxide — continue, they will reach the equivalent of twice the pre-industrial level of carbon dioxide within 40 years. How this change will affect global climate is uncertain but the scientific consensus today is that temperatures will rise by an average of 1.5° to 4.5° C, with larger increases at high latitudes and smaller increases in the tropics. This warming would be sufficient to alter rainfall patterns and temperature regimes around the globe and to increase mean sea level, perhaps by a half-metre or more. This is likely to be accompanied by changes in wind patterns, ocean currents, the accumulation of snow and ice in polar regions, the frequency of severe storms, variations in the range of disease-bearing organisms and changes in natural ecosystems such as forests and wetlands. In turn, these changes would affect the habitation patterns and agricultural and industrial activities of the human population. One of the key events that expanded the debate about global warming from the scientific domain into the political arena was the Toronto Conference on "The Changing Atmosphere: Implications for Global Security", held in June 1985.

Given the mounting evidence that human activities are beginning to alter the basic equilibrium processes of the Earth, this Committee in 1987 launched a study of global climate change from a Canadian perspective. We wanted to assess the state of knowledge regarding human-induced change in the Earth's climate, its potential impact on the welfare of Canadian and global society, Canada's role as a precipitator of climate change, and policies which we could recommend to reduce both Canada's emissions of greenhouse gases and those of other countries through our foreign aid and trade policies and the export of appropriate technologies and expertise. Today, having heard almost 40 witnesses on the subject and having received more than 200 public submissions, the Committee presents its principal findings in this interim report. The Committee's detailed analysis and a more lengthy set of recommendations will be presented in a comprehensive final report.

The Committee presents its interim report on the eve of the Second World Climate Conference in Geneva. This meeting is expected to provide the framework within which countries can take national and international initiatives to limit and reduce climate change.



## No Time To Lose The Challenge of Global Warming

The average temperature of the Earth is rising. Many scientists believe that this temperature increase is an early manifestation of a global warming that is being precipitated by the emission of certain gases from the industrial and agricultural activities of humanity. If present trends in the atmospheric accumulation of so-called "greenhouse gases" — principally carbon dioxide, CFCs, methane and nitrous oxide — continue, they will reach the equivalent of twice the pre-industrial level of carbon dioxide within 40 years. How this change will affect global climate is uncertain but the scientific consensus today is that temperatures will rise by an average of 1.5° to 4.5° C, with larger increases at high latitudes and smaller increases in the tropics. This warming would be sufficient to alter rainfall patterns and temperature regimes around the globe and to increase mean sea level, perhaps by a half-metre or more. This is likely to be accompanied by changes in wind patterns, ocean currents, the accumulation of snow and ice in polar regions, the frequency of severe storms, variations in the range of disease-bearing organisms and changes in natural ecosystems such as forests and wetlands. In turn, these changes would affect the habitation patterns and agricultural and industrial activities of the human population. One of the key events that expanded the debate about global warming from the scientific domain into the political arena was the Toronto Conference on "The Changing Atmosphere: Implications for Global Security", held in June 1988.

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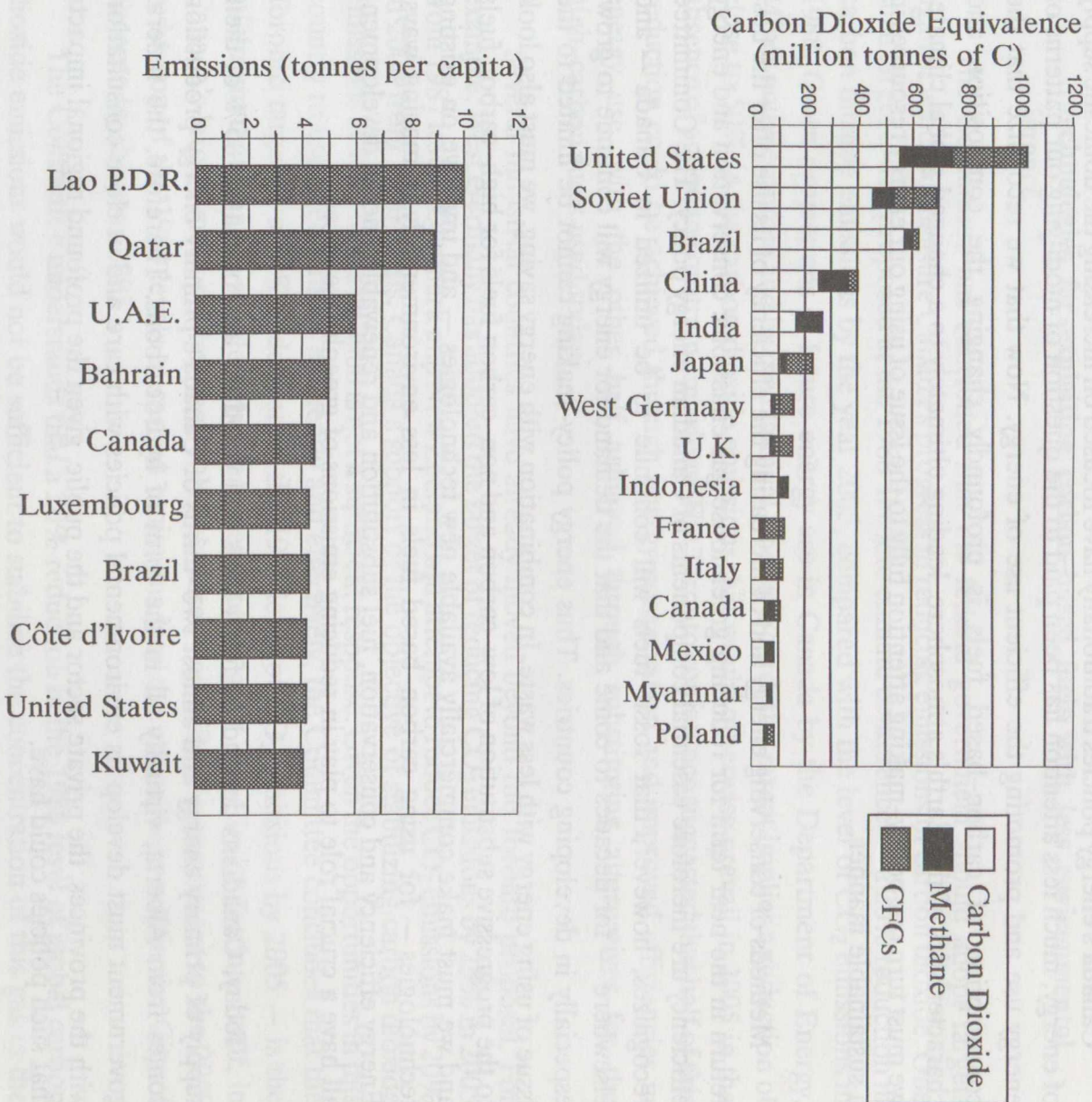
We hope that our views will strengthen Canada's position at this conference, and reinforce the growing international call for action.

The sense of urgency which prompted this Committee to undertake a study of the complex and compelling phenomenon of global climate change has been reinforced in the course of its work. We acknowledge that much remains to be learned about the phenomenon of climate change, the rate at which the activities of human society will propel such change, and the magnitude and distribution of its effects. By the time scientists have all the answers to these questions, however, global climate change may have been driven by human society to the point where the answers are largely academic.

Given the speed with which humanity's energy-using, industrial, forestry and agricultural activities are altering the composition of the atmosphere, and consequently changing its thermal properties, we see no validity in the argument that governments should delay acting until more detailed information on the likely effects of global climate change is gathered. If human society is in fact initiating profound changes in the climatic systems of our planet, then delaying action could lead to devastating effects on many of the Earth's peoples. If the skeptics are correct and climate change is less of a problem than most scientists anticipate, the policies which we are proposing will still return many benefits, both environmental and economic. We have accepted the argument that a precautionary principle must apply in so vital a situation.

The World Resources Institute (WRI) in a 1990 report, *World Resources 1990-91*, ranked the 50 countries of the world with the largest net emissions of greenhouse gases in 1987, using carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and chlorofluorocarbons (CFCs) as the indicators for its "Greenhouse Index", with methane and CFCs expressed as carbon dioxide heating equivalents in metric tons (tonnes) of carbon. According to the WRI estimates, Canada ranked twelfth that year and contributed 2% of total global emissions. While this may not appear to be a substantial share, it is being generated by only 0.5% of the world's population. On a per capita basis, WRI placed Canada fifth at 4.5 tonnes annually per person, exceeded only by four developing countries which either have high rates of deforestation or are Persian Gulf nations consuming energy at a high per capita rate while flaring large quantities of natural gas. Figure 1 shows Canada's ranking both as a total and a per capita emitter of greenhouse gases in 1987.

**Figure 1: Canada's 1987 Ranking as a Total Net Emitter of Greenhouse Gases and as a Per Capita Emitter**



Source: World Resources Institute, *World Resources 1990-91*, Oxford University Press, Toronto, 1990, p. 15 and 17.

The manner in which Canadians use energy is the principal determinant of our country's emissions of greenhouse gases. Although Canadians improved their efficiency of energy use significantly in the 1970s and 1980s, other industrialized countries did as well or better in responding to the oil shocks of this period and we remain one of the most inefficient energy users in the developed world.

Canada's energy policies traditionally have focused on increasing the domestic supply of energy; much less attention has been paid to the question of modifying our patterns of energy use and promoting the efficient use of energy. Now that we recognize that the consumption of carbon-based fuels is profoundly changing the composition and characteristics of the Earth's atmosphere, leading ultimately to a changed global climate, we must turn our policy-making attention fully to the issue of using our energy resources in a sustainable manner.

Methods of conserving energy and of increasing the efficiency of its use offer the best return in the near term for reducing greenhouse gas emissions: conservation and energy efficiency are therefore essential components of Canadian energy policy. The Committee recognizes, however, that fossil fuels will continue to be utilized in Canada — and elsewhere — for decades to come and that the demand for energy will continue to grow, especially in developing countries. Thus energy policy-making cannot be limited to the issue of using energy with less waste. In combination with energy saving, we must also look to the progressive substitution of low-carbon and non-carbon fuels for high-carbon fuels and we must make commercially available new technologies — and improve on existing technologies — for using carbon-based fuels in less environmentally damaging ways. Energy efficiency and conservation, fuel substitution and renewable energy development all have a crucial role to play in reducing emissions of greenhouse gases.

Today, Canadians depend on fossil fuels and wood for approximately 85% of their supply of primary energy and almost two-thirds of Canada's primary energy production comes from Alberta, virtually all in the form of hydrocarbons. Therefore, the federal government must develop its environmental policies with care and in close consultation with the provinces, the private sector and the public, given the profound regional impacts that such policies could have.

1. Given that human-sourced carbon dioxide emissions are the principal contributor to increasing atmospheric levels of greenhouse gases, and given that society's use of energy is the largest factor in this CO<sub>2</sub> generation, the Committee concludes that Canadian energy policy-making must have as its most immediate focus the more efficient and conserving use of energy. Coupled with the more effective use of energy is the need for fuel substitution away from high-carbon fuels and for the commercial availability of technologies for exploiting carbon-based fuels with less environmental impact.

The Committee has concluded that the federal government should adopt targets against which to measure Canada's progress in reducing emissions of carbon dioxide. One such target is that proposed at the 1988 Toronto climate conference — a 20% reduction in carbon dioxide emissions by the year 2005, compared with the level of CO<sub>2</sub> emissions in 1988. Given projections of future energy use in Canada by the Department of Energy, Mines and Resources and by the National Energy Board, this target implies a reduction of close to 50% in the carbon dioxide emissions that would otherwise prevail in 2005 in the absence of action to constrain emissions. The Toronto conference suggested that half of this reduction could be achieved through energy conservation and improved efficiencies in energy use, with the other half achieved through substituting alternatives for the high-carbon fuels used today.

Several industrial countries have already moved beyond the Toronto proposal. For example, West Germany has adopted the target of reducing CO<sub>2</sub> emissions by 25% in 2005 from 1987 levels; Denmark and New Zealand will attempt to reduce CO<sub>2</sub> emissions by 20% in 2000 from 1990 levels. Canada's support of the objective of stabilizing carbon dioxide emissions at 1990 levels by 2000 is not a sufficient response. Given the opportunities in this country to use energy more efficiently and effectively, the Committee concludes that the Toronto target — a 20% reduction in the 1988 level of CO<sub>2</sub> emissions by 2005 — is the minimum that Canada should strive for as an interim goal. The City of Toronto itself, in Canada's largest metropolitan centre, has declared "an official commitment to the 20% reduction of the 1988 levels of carbon emissions into the atmosphere within the City of Toronto by the year 2005".

The Committee understands that a 20% reduction in the 1988 level of global carbon dioxide emissions would not be sufficient to stabilize the concentration of this gas in the atmosphere. Although the manner in which carbon cycles through the atmosphere, the oceans and the biosphere is not well understood, historical observations of the rising atmospheric concentration of CO<sub>2</sub> suggest that roughly half of the carbon released to the atmosphere through human activities remains there. Apparently then, CO<sub>2</sub> emissions

would have to be reduced by more than half to achieve the long-term objective of stabilizing the atmospheric concentration of carbon dioxide, insofar as that concentration is a function of human activity. Given that commercial energy use in developing countries today is often at extremely low levels and that these countries will experience substantial increases in future energy use as part of their efforts to raise levels of economic activity and improve standards of living, it is incumbent on undustrialized countries like Canada to make even greater reductions in CO<sub>2</sub> emissions to offset increases that will occur in most developing countries. Longer-term targets for even lower emissions in Canada are therefore necessary. The May 1990 Bergen Conference report, entitled *Action for a Common Future*, observes that a reduction of 60–80% in current CO<sub>2</sub> emissions is ultimately required. A 50% reduction in CO<sub>2</sub> emissions by the year 2020, compared with the level of 1988 emissions, has been discussed as a second-phase target for Canada; the Committee believes that the federal government should seriously consider adopting this longer-term target.

- 2. The Committee recommends that the Toronto target of a 20% reduction in human-sourced CO<sub>2</sub> emissions by the year 2005, compared to the 1988 level of emissions, be adopted by the federal government as its minimum interim objective in reducing Canadian CO<sub>2</sub> emissions.**
- 3. Among other initiatives, the Committee recommends that Canada adopt the target of reducing the intensity of energy use in the Canadian economy by 2% annually, until our emissions of carbon dioxide are reduced to a level which does not contribute to the further accumulation of CO<sub>2</sub> in the atmosphere.**

Although there is not a strict one-to-one correspondence between the intensity of energy use in Canada and emissions of carbon dioxide, the Committee's research indicates that the relationship is strong. When the other policy elements of fuel substitution and technological improvements in carbon-fuel use are added to this objective of using energy with increasing efficiency in the Canadian economy, the relationship between energy intensity and carbon dioxide emissions could be substantially improved upon.

If Canadians are going to accept far-reaching changes in the patterns of energy use that policies to combat global climate change will require over time, they must be well informed about the need for these changes and the benefits that can accrue from such policies. Communicating information to the public is a vital element of federal policy-making. But public information and education are not ends in themselves. The Committee has noted that public opinion is often well in advance of government policy. A better informed populace can become a strong advocate of new policy and can pressure governments to make changes that they might otherwise be reluctant to carry forward.



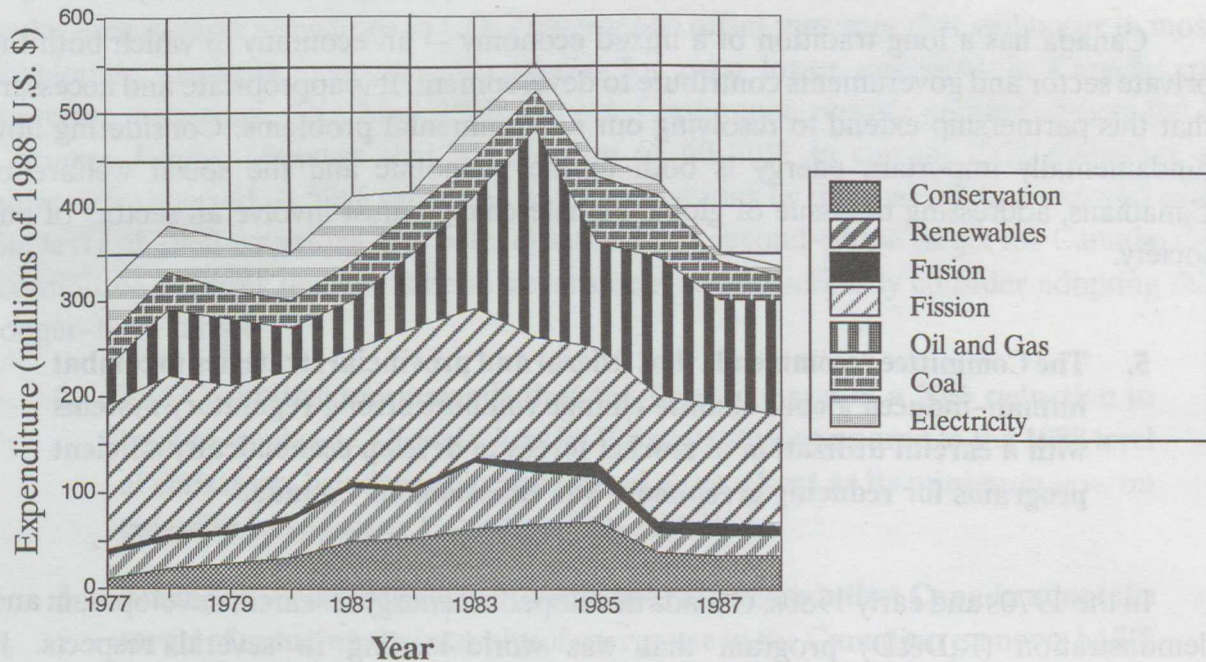
- 4. The Committee recommends that Environment Canada, as the lead agency, coordinate the development by federal departments and agencies of comprehensive public information and advocacy programs directed to individual Canadians, to Canadian business and to other institutions, identifying the role that each can play in reducing greenhouse gas emissions.**

Canada has a long tradition of a mixed economy — an economy in which both the private sector and governments contribute to development. It is appropriate and necessary that this partnership extend to resolving our environmental problems. Considering how fundamentally important energy is both to the economic and the social welfare of Canadians, addressing the issue of global climate change must involve all sectors of our society.

- 5. The Committee recommends that federal and provincial strategies to combat human-induced global climate change combine strong regulatory systems with a careful utilization of market forces to develop economically efficient programs for reducing greenhouse gas emissions in Canada.**

In the 1970s and early 1980s, Canada developed an energy research, development and demonstration (R,D&D) program that was world-leading in several respects. It emphasized energy conserving technologies and alternative forms of energy development, while simultaneously supporting a strong effort in conventional energy R,D&D. The federal government also established public information programs which were acknowledged internationally for their effectiveness and scope. Unfortunately, these programs were not sustained and the non-conventional aspect of the energy R,D&D program has been markedly reduced. The termination in 1986 of the National Research Council's Division of Energy, which had been the lead federal agency for alternative energy R,D&D, set the stage for this decline. Government support for conservation and renewable energy R,D&D in fiscal year 1990-91 is running at a level only about one-third that of the years of peak support in the early 1980s, as reported by the International Energy Agency (IEA). Figure 2 displays government spending in Canada on energy R,D&D by type from 1977 through 1988, measured in constant 1988 U.S. dollars.

**Figure 2: Government Expenditures on Energy R,D&D in Canada by Type, 1977-1988, Measured in Constant 1988 U.S. Dollars**



Note: The category "Electricity" includes electricity conversion and transmission R,D&D, energy storage and energy systems analysis.

Source: Organisation for Economic Co-operation and Development, International Energy Agency, *Energy Policies and Programmes of IEA Countries: 1988 Review*, Paris, 1989, p. 97-105.

The earlier interest in conservation and alternative energy R,D&D was largely prompted by energy supply concerns arising from two international oil shocks. When oil supplies increased in response to high prices and fears of further supply interruptions, the world oil market became glutted, the price of oil plummeted and interest in new energy initiatives waned. In retrospect, this complacency was short-sighted; it stemmed from a failure by policy-makers to take a strategic, long-term and holistic view of the environmental, economic, social and political impacts of global energy development. Today

we especially cannot ignore the environmental implications of using energy; the need to restore a vigorous R,D&D program in energy conservation and alternative energy development is manifest.

**6. The Committee recommends, for the purpose of attaining integrated environmental and economic objectives, that the federal government considerably increase its support for research, development and demonstration directed to:**

- (a) the more efficient and conserving use of energy;**
- (b) fuel substitution leading to reduced greenhouse gas emissions; and**
- (c) technologies for producing and using fossil fuels in less environmentally-damaging ways.**

Although the Committee anticipates that the products of a rejuvenated program of energy R,D&D will have great value for the Canadian environment, there is the broader concern that efficient energy technologies reach countries with the greatest need for them. Populous nations such as China, India, Nigeria and Mexico have a huge latent demand for energy and are growing consumers of fossil fuels. It is essential that these countries receive the technologies needed to use these fuels in the least environmentally damaging manner. Thus technology transfer must be another cornerstone of Canadian energy policy. There should be incentives for Canadian industry to develop the appropriate technologies and there need to be mechanisms for expeditiously transferring these technologies to other countries.

**7. The Committee recommends that the federal government develop policies and programs which encourage Canadian companies to commercialize and export technologies and equipment that are effective in reducing greenhouse gas emissions, particularly to developing countries which are striving to build their domestic economies.**

From time to time, Canada's foreign aid policies have promoted forms of development abroad which have not been soundly based in an environmental sense. The federal government should be more discriminating in its aid programs and trade policies, removing incentives which encourage forms of development or the transfer of technologies and equipment that are not environmentally appropriate.

**8. The Committee recommends that the federal government use environmental considerations as a filter for its foreign aid and trade initiatives, encouraging programs and technologies which convey environmental benefits and ending or modifying those that are environmentally unacceptable.**

In stressing the international element of Canadian policy-making, the Committee accepts the view that environmental problems are ultimately irremediable if we cannot solve the problem of poverty that afflicts so many of the Earth's inhabitants. Much of the global population lives in conditions of hunger, disease, illiteracy and conflict. The developing world as a whole is labouring under a crushing burden of external debt. Until the human condition can be substantially improved, the prospects for successfully addressing global environmental concerns are vanishingly small.

This Committee endorses the conclusions and recommendations contained in the June 1990 report of the House of Commons Standing Committee on External Affairs and International Trade, entitled *Securing Our Global Future: Canada's Stake in the Unfinished Business of Third World Debt*. In particular, we agree with the basic finding of that study: "The primary long-term goal of action on Third World debt must be sustainable human development in the debtor countries."

In its more detailed analysis, the Committee considered strategies for reducing greenhouse gas emissions at the sectoral level in Canada. Although the bulk of this study and the detailed recommendations arising from it will be presented in the comprehensive report to follow, the Committee does want to express several general conclusions at this time.

First, it is apparent that our use of electricity will have a major bearing on Canada's future emissions of greenhouse gases. Electricity accounts for a growing fraction of Canada's end use of energy, a development seen in other industrialized countries as well. This is a function of its versatility in use, its versatility in production and its cleanliness at the point of use (although not necessarily at the point of production). Given the rising importance of electricity in our energy system, and the tremendous variability across Canada in the means by which it is generated, policy-making in this area faces particular challenges.

In keeping with the Committee's philosophy that the principal issue of concern is the manner in which energy is used, it is apparent that Canada's electrical utilities have a major part to play in any strategy to reduce greenhouse gas emissions. Several utilities have taken important steps to modify the demand for electricity within their service areas and to introduce new technologies that improve the process of producing, transmitting and consuming electricity. The Committee applauds these initiatives and encourages other utilities to follow suit.

- 9. The Committee concludes that Canada's electric utilities are a key element in reducing greenhouse gas emissions and urges provincial, territorial and municipal governments to direct utilities to take the lead in developing programs for electricity demand management and for introducing new technologies which improve—in both an energy and an environmental sense—the production, transmission and consumption of electricity.**

Energy use in the transportation sector is another key element in modifying patterns of Canadian energy production and consumption. The Committee supports continuing efforts to increase fuel efficiency in motor vehicles and the intelligent development of mass transit systems. Substantial gains remain to be made in increasing the fuel efficiency of vehicles with internal combustion engines.

- 10. The Committee recommends that fuel efficiency standards be legislated for cars and trucks.**

Beyond improved fuel efficiency and an increased reliance on mass transit, the Committee sees a need to make basic changes in the energy sources for the transportation sector. It is possible, for example, to design production systems for biomass-derived fuel alcohols that are CO<sub>2</sub>-neutral in their impact. When the technology for producing fuel ethanol from forest biomass is commercialized, the Committee visualizes energy plantations being developed in support of the transportation sector. In the longer term, the Committee sees a major role for hydrogen and electricity as transportation fuels. Depending upon the means by which fuel alcohols, hydrogen and electricity are produced, these energy “carriers” could be far smaller net contributors to greenhouse gas emissions than are motor vehicle, aviation, rail and marine transport fuels today. Although the federal government supports a modest program of research, development and demonstration in transportation fuels, the Committee does not consider this effort to be at all commensurate with the magnitude of the challenge and the opportunities involved.

- 11. The Committee recommends that the federal government introduce a major research, development and demonstration program with its objective being the commercial development of transportation fuels and systems that result in the lowest economically and technically feasible emissions of greenhouse gases.**

Forests play an important role in the global-warming equation. As a tree increases in size, it accumulates CO<sub>2</sub> from the atmosphere through photosynthesis, converting it into wood. As long as the tree is alive and growing, it acts as a sink or repository for atmospheric carbon. Deforestation causes an increase in the concentration of CO<sub>2</sub> in the atmosphere, partly through a reduction in overall photosynthetic activity and partly through the release

of carbon stored in the forest biomass. Deforestation may occur as a consequence of commercial harvesting or as a consequence of “natural harvesting”, the destruction of trees by wildfire, insects or disease.

The extensive commercial harvesting of trees and the loss of trees from other causes in the developed countries, Canada included, has not always been followed by adequate replanting of stock. Reforestation of deforested areas has always been essential to maintain a healthy, productive forest for commercial, recreational and ecological reasons. In the context of global warming, reforestation gains an additional importance as a means to sequester more atmospheric carbon dioxide.

The forest is a dynamic, living entity and the carbon stored in wood will eventually be returned to the atmosphere. The most effective and efficient fixation of atmospheric carbon occurs in the early stages of a forest stand, when the trees are growing rapidly. As the stand ages, the rate of carbon release through respiration increases and, eventually, the balance will shift to a net loss of carbon to the atmosphere as the sum of carbon released through respiration and decay exceeds that sequestered by photosynthesis. Ultimately, when the stand reaches advanced age and the trees begin to die, the balance will shift predominantly to carbon release.

The best way, therefore, to maximize carbon sequestration by Canadian forests is through programs designed to develop and maintain vigorously growing forest stands. This can be done by ensuring prompt regeneration of harvested areas, either through planting or by natural means, and reducing the extensive losses of stands to wildfire, insects and disease.

Notwithstanding the importance of vigorously growing forest stands in carbon sequestration, the Committee recognizes that old-growth forests have a unique status in Canada, as elsewhere. Such forests have an enduring value as a locus of genetic diversity and must be protected for their intrinsic cultural and ecological qualities.

Forest land classed as “NSR” is “not satisfactorily (or sufficiently) restocked (or revegetated), productive forest land that has been denuded and has failed partially or completely to regenerate naturally or to be artificially regenerated.” Dr. J.S. Maini of Forestry Canada told the Committee that there are 244 million hectares of inventoried productive forest land in Canada, of which 7%, or 17 million hectares, is classified as NSR.

The principal type of agreement in Canada pertinent to reforestation is the Federal-Provincial Forest Resource Development Agreement (FRDA), jointly administered by the federal and provincial governments. Most of the FRDAs have now expired, including those with Ontario, Saskatchewan, Alberta, Newfoundland and British Columbia. Similar agreements with Quebec and Manitoba have also expired.

New reforestation agreements "... remain in limbo because the federal and British Columbia governments are arguing over changes in a funding formula." (*Financial Post*, 21 August 1990). The Minister of Forestry Canada has been quoted as stating that he wants the British Columbia agreement settled before dealing with Ontario, Quebec and the Prairie Provinces. The Committee notes this impasse with concern, and we make the following recommendation.

**12. Recognizing that Canada's forests are a major reservoir for atmospheric carbon and that the losses of forest stands through commercial harvesting, wildfire, insects and disease have resulted in a rate of harvesting of Canada's commercial forests and wild lands exceeding the rate of restocking, the Committee recommends that:**

- (a) the federal government expedite negotiations with the provinces on federal-provincial agreements for the management of Canada's forests;
- (b) provincial governments be urged to ensure that NSR lands are adequately reforested through replanting programs or through natural regeneration of the forest cover, and in a reasonable period of time;
- (c) the losses to wildfire, insects and disease be reduced wherever possible; and
- (d) future forest resource development agreements be linked to prompt regeneration and protection of all deforested areas, whether harvested commercially or depleted naturally.

Afforestation, in the context of programs to combat global warming, involves the creation of extensive plantation forests for the specific purpose of sequestering atmospheric carbon. It has been estimated that one hectare of plantation forest on a good site in the southern United States or the Pacific Northwest will sequester about 6.24 tons of carbon annually. Using this figure, it has been estimated that 465 million hectares of plantation forests would be needed to trap the 2.9 billion tons of excess carbon produced each year. This area would be about 1.5 times the current total forested area of the United States, or about 15% of the world total of closed forests. By comparison, the most recent estimate of total industrial plantations worldwide is about 92 million hectares.

There are millions of hectares of land in Canada that could be suitable for plantation forestry, including abandoned and unimproved agricultural lands. There are also opportunities for increased tree planting as part of shelterbelt and windbreak programs in both rural and urban areas. In these latter situations, trees can provide insulation in the

winter and shade in the summer, reducing the use of heating fuel and air conditioning in nearby buildings. We believe that the federal government, working cooperatively with provincial and municipal governments, should take the lead in exploring the potential for plantation forestry in Canada, as an interim measure to sequester atmospheric carbon.

- 13. Given that vigorously growing trees are an effective means for extracting CO<sub>2</sub> from the atmosphere, the Committee recommends that the federal government take the lead in establishing federal-provincial-municipal programs to encourage development of tree plantations on otherwise unused lands, dedicated to sequestering atmospheric carbon as an intermediate-term strategy for reducing CO<sub>2</sub> levels in the atmosphere.**

Trees grow more rapidly, and sequester carbon more efficiently, in the world's tropical regions. Therefore, there is a strong argument for promoting reforestation and the planting of forests in developing countries. It is also important to support efforts to reduce deforestation in those developing countries where this has become a problem.

- 14. Given the interconnectedness of the global environment and the necessity of assisting the developing world in protecting our common environmental heritage, the Committee recommends that the federal government, through its own agencies and through Canada's membership in multilateral organizations, advocate programs to reduce deforestation and to encourage reforestation and the planting of forests in developing countries. Support for these activities by the federal government must not reduce current and planned Canadian support for other development assistance programs.**

Strategies to reduce greenhouse gas emissions necessarily cut across the area of responsibility of many government departments, at all levels of government. Whereas policy-making in the past was typically a vertically coordinated activity within a government department, today environmentally oriented policies are seen to extend horizontally across all government activities. We fully support the view of the Brundtland Commission that environmental policies and disciplines should permeate all departments and agencies of government, just as fiscal and economic considerations do.

Governments in general have not yet learned how to develop policy across areas of responsibility and overcome narrowly vested interests; indeed, some governments have yet to acknowledge the need for new approaches to policy-making. The concept of sustainable development depends on our constructing innovative approaches to policy formulation, and the Committee expresses its hope that the Government of Canada will move quickly to entrench environmental considerations in the operations of all federal departments and agencies. The Committee makes the following recommendations regarding the



mechanisms by which this environmental function could be developed across federal government activities.

15. The Committee recommends that the Minister of Environment have the responsibility and authority to develop policies, programs and regulations that span the full range of activities of the federal government, analogous to the Minister of Finance for financial and economic affairs, and that the Environment Minister report to Parliament annually on the environmental impact of all federal activities.
16. The Committee recommends that the Auditor General, working in conjunction with the Departments of Environment and Finance, establish an environmental audit function to assure that all federal departments and agencies have implemented environmental assessment processes, and to monitor the effectiveness of environmental programs. Specifically, the Auditor General should monitor the progress of all federal departments and agencies in setting and attaining targets for greenhouse gas emissions.
17. The Committee recommends that all federal departments and agencies, as part of their budget submissions, report on the direct and indirect impacts of their operations on global warming, and set annual targets for reductions in greenhouse gas emissions.



## LIST OF RECOMMENDATIONS

1. Given that human-sourced carbon dioxide emissions are the principal contributor to increasing atmospheric levels of greenhouse gases, and given that society's use of energy is the largest factor in this CO<sub>2</sub> generation, the Committee concludes that Canadian energy policy-making must have as its most immediate focus the more efficient and conserving use of energy. Coupled with the more effective use of energy is the need for fuel substitution away from high-carbon fuels and for the commercial availability of technologies for exploiting carbon-based fuels with less environmental impact.
2. The Committee recommends that the Toronto target of a 20% reduction in human-sourced CO<sub>2</sub> emissions by the year 2005, compared to the 1988 level of emissions, be adopted by the federal government as its minimum interim objective in reducing Canadian CO<sub>2</sub> emissions.
3. Among other initiatives, the Committee recommends that Canada adopt the target of reducing the intensity of energy use in the Canadian economy by 2% annually, until our emissions of carbon dioxide are reduced to a level which does not contribute to the further accumulation of CO<sub>2</sub> in the atmosphere.
4. The Committee recommends that Environment Canada, as the lead agency, coordinate the development by federal departments and agencies of comprehensive public information and advocacy programs directed to individual Canadians, to Canadian business and to other institutions, identifying the role that each can play in reducing greenhouse gas emissions.
5. The Committee recommends that federal and provincial strategies to combat human-induced global climate change combine strong regulatory systems with a careful utilization of market forces to develop economically efficient programs for reducing greenhouse gas emissions in Canada.
6. The Committee recommends, for the purpose of attaining integrated environmental and economic objectives, that the federal government considerably increase its support for research, development and demonstration directed to:
  - (a) the more efficient and conserving use of energy;
  - (b) fuel substitution leading to reduced greenhouse gas emissions; and

(c) technologies for producing and using fossil fuels in less environmentally-damaging ways.

7. The Committee recommends that the federal government develop policies and programs which encourage Canadian companies to commercialize and export technologies and equipment that are effective in reducing greenhouse gas emissions, particularly to developing countries which are striving to build their domestic economies.
8. The Committee recommends that the federal government use environmental considerations as a filter for its foreign aid and trade initiatives, encouraging programs and technologies which convey environmental benefits and ending or modifying those that are environmentally unacceptable.
9. The Committee concludes that Canada's electric utilities are a key element in reducing greenhouse gas emissions and urges provincial, territorial and municipal governments to direct utilities to take the lead in developing programs for electricity demand management and for introducing new technologies which improve—in both an energy and an environmental sense—the production, transmission and consumption of electricity.
10. The Committee recommends that fuel efficiency standards be legislated for cars and trucks.
11. The Committee recommends that the federal government introduce a major research, development and demonstration program with its objective being the commercial development of transportation fuels and systems that result in the lowest economically and technically feasible emissions of greenhouse gases.
12. Recognizing that Canada's forests are a major reservoir for atmospheric carbon and that the losses of forest stands through commercial harvesting, wildfire, insects and disease have resulted in a rate of harvesting of Canada's commercial forests and wild lands exceeding the rate of restocking, the Committee recommends that:
  - (a) the federal government expedite negotiations with the provinces on federal-provincial agreements for the management of Canada's forests;
  - (b) provincial governments be urged to ensure that NSR lands are adequately reforested through replanting programs or through natural regeneration of the forest cover, and in a reasonable period of time;

- (c) the losses to wildfire, insects and disease be reduced wherever possible; and
  - (d) future forest resource development agreements be linked to prompt regeneration and protection of all deforested areas, whether harvested commercially or depleted naturally.
13. Given that vigorously growing trees are an effective means for extracting CO<sub>2</sub> from the atmosphere, the Committee recommends that the federal government take the lead in establishing federal-provincial-municipal programs to encourage development of tree plantations on otherwise unused lands, dedicated to sequestering atmospheric carbon as an intermediate-term strategy for reducing CO<sub>2</sub> levels in the atmosphere.
  14. Given the interconnectedness of the global environment and the necessity of assisting the developing world in protecting our common environmental heritage, the Committee recommends that the federal government, through its own agencies and through Canada's membership in multilateral organizations, advocate programs to reduce deforestation and to encourage reforestation and the planting of forests in developing countries. Support for these activities by the federal government must not reduce current and planned Canadian support for other development assistance programs.
  15. The Committee recommends that the Minister of Environment have the responsibility and authority to develop policies, programs and regulations that span the full range of activities of the federal government, analogous to the Minister of Finance for financial and economic affairs, and that the Environment Minister report to Parliament annually on the environmental impact of all federal activities.
  16. The Committee recommends that the Auditor General, working in conjunction with the Departments of Environment and Finance, establish an environmental audit function to assure that all federal departments and agencies have implemented environmental assessment processes, and to monitor the effectiveness of environmental programs. Specifically, the Auditor General should monitor the progress of all federal departments and agencies in setting and attaining targets for greenhouse gas emissions.
  17. The Committee recommends that all federal departments and agencies, as part of their budget submissions, report on the direct and indirect impacts of their operations on global warming, and set annual targets for reductions in greenhouse gas emissions.



## APPENDIX A

### LIST OF WITNESSES

	ISSUE	DATE
W.T. Hancox, Vice-President, Technology and Planning; R.V. Osborne, Director, Health Sciences, <i>Atomic Energy of Canada.</i>	35	March 27, 1990
Erik Haites, Principal, <i>Barakat and Chamberlin.</i>	22	November 23, 1989
James Bruce, Environmental Consultant.	30	January 25, 1990
Michael McNeil, President; David Leonhardt, Manager, Public Affairs, <i>Canadian Automobile Association.</i>	38	April 5, 1990
Ian C. MacNabb, President; Pierre E. Dumouchel, Manager, Technology Transfer and Development, Union Gas Limited; Robert Cumming, Manager, Natural Gas Vehicle Development, <i>Canadian Gas Association.</i>	38	April 5, 1990
Danielle Wetherup, Vice-President, Professional Services Branch; André Levasseur, Senior Policy Advisor, Policy Branch; Gilles Lamoureux, Special Advisor, Environment, Professional Services Branch, <i>Canadian International Development Agency.</i>	39	April 10, 1990
I.R. Smyth, President; Peter Dickey, Manager, Safety and Environmental Affairs, Shell Canada Limited; P. Douglas Bruchet, Director, Safety, Health and Environment, <i>Canadian Petroleum Association.</i>	35	March 27, 1990
Jim Johnson, President; Terry Daynard, Executive Vice-President, <i>Canadian Renewable Fuels Association.</i>	27	December 12, 1989

Arthur C. Eggleton, Mayor; Glen Gormick, Transportation Consultant, <i>City of Toronto.</i>	49	May 23, 1990
Gary Livingstone, Chairman of the Board; Dick Marshall, President; John Railton, Director, Research and Development, <i>Coal Association of Canada.</i>	28	December 14, 1989
Dr. Arthur Olson, Assistant Deputy Minister, Research Branch; Dr. Laure Benzing-Purdie, Research Coordinator (Environment), Research Branch; George Pearson, Director, Ottawa Affairs, Prairie Farm Rehabilitation Administration (PFRA); Dr. Valerie Stevens, Research Coordinator, (Animals) Research Branch; Cathie Lesslie-Jeffery, Senior Advisor, Policy/Communications Research Branch, <i>Department of Agriculture.</i>	47	May 15, 1990
M. D. Everell, Assistant Deputy Minister, Mineral and Energy Technology Sector; Ken Babcock, Assistant Deputy Minister, Geological Survey of Canada Sector, <i>Department of Energy, Mines and Resources.</i>	26	December 11, 1989
David Reeve, Director, Energy Research Laboratories; A.C. Skip Hayden, Head, Energy Conservation; George K. Lee, Senior Scientist, <i>Canada Centre for Mineral and Energy Technology (CANMET), Department of Energy, Mines and Resources.</i>	28	December 14, 1989
George Anderson, Assistant Deputy Minister, Economic Development Policy Branch; Ron Edwards, Director, Energy and Resource Policy Division; David Holland, Director, Business and Resource Tax Analysis Division, Tax Policy and Legislation Branch; Brian Willis, Assistant Director, Sales and Excise Tax Division, Tax Policy and Legislation Branch; Glen Hodgson, Chief, International Development Finance Division, International Trade and Finance Branch, <i>Department of Finance.</i>	42	May 1, 1990



<p>Bill Barley, General Manager, Fluorocarbon Products; J. A. Walsh, Vice-President, Government Affairs; G. Mouton, Marketing Manager, Fluorocarbon Products, <i>Du Pont Canada.</i></p>	29	January 23, 1990
<p>A.K. Stuart, Chairman, <i>Electrolyser Corporation Ltd.</i></p>	37	April 3, 1990
<p>Robert Slater, Assistant Deputy Minister, Policy, <i>Environment Canada.</i></p>	18	October 26, 1989
<p>Elizabeth Dowdeswell, Assistant Deputy Minister, Atmospheric Environment Service; Kirk Dawson, Director General, Canadian Climate Centre; Henry Hengeveld, Advisor, Carbon Dioxide Related Matters, Canadian Climate Centre; Peter Higgins, Director General, Environmental Protection, Conservation and Protection, <i>Environment Canada.</i></p>	19	October 31, 1989
<p>Len Good, Deputy Minister; Kirk Dawson, Director General, Canadian Climate Centre; Robert Slater, Assistant Deputy Minister, Policy; Peter Higgins, Director General, Environmental Protection; Elizabeth Dowdeswell, Assistant Deputy Minister, Atmospheric Environment, <i>Environment Canada.</i></p>	41	April 26, 1990
<p>G.V. Buxton, Chief, Chemical Controls Division, Commercial Chemicals Branch; A. Stelzig, Acting Chief, Chemical Industries Division, Industrial Programs Branch, <i>Environment Canada.</i></p>	49	May 23, 1990

R.L. Richardson, President; Rolfe Cooke, General Manager, Corporate Coordination and Evaluation Division, <i>Export Development Corporation.</i>	46	May 10, 1990
Richard Gilbert, Metropolitan Councillor, Toronto; George Brown, Alderman, Ottawa; Denis Goulet, Alderman, Laval, <i>Federation of Canadian Municipalities.</i>	41	April 26, 1990
Jag S. Maini, Assistant Deputy Minister, Policy; John Forster, Director, Forestry Development, <i>Forestry Canada.</i>	22	November 21, 1989
Kai Millyard, Policy Director; Phillip Jessup, Energy Policy Advisor, <i>Friends of the Earth.</i>	24	December 5, 1989
James J. Frelk, Executive Director; Frederick Seitz, President Emeritus, Rockefeller University, <i>George C. Marshall Institute (Washington, D.C.).</i>	43	May 3, 1990
Rolf Annerberg, Under-Secretary of State for Ministry of Industry, <i>Government of Sweden.</i>	44	May 7, 1990
Bob McLeod, Assistant Deputy Minister, Department of Renewable Resources, <i>Government of the Northwest Territories.</i>	42	May 1, 1990
John Lawson, Director, Federal Relations, <i>Government of Yukon.</i>	42	May 1, 1990
Stephen Hazell, Chairman, <i>Greenprint for Canada Committee.</i>	24	December 5, 1989
Warren Heeley, President; Garry Stroud, Secretary-Treasurer and President, Copeland Refrigeration of Canada Limited, <i>Heating, Refrigerating and Air Conditioning Institute of Canada.</i>	34	March 8, 1990

Esmat Macramalla, President; George Ferris, Vice-President, Research and Development, <i>Incendrex International Inc.</i>	32	February 20, 1990
David Runnalls, Associate Director, Environment and Sustainable Development Program, <i>Institute for Research on Public Policy.</i>	19	October 31, 1989
David Brooks, Director, Environmental Affairs, <i>International Development Research Centre.</i>	23	November 28, 1989
Ivan L. Head, President; Geoffrey Hawtin, Director, Agriculture, Food and Nutrition Sciences Division; Anne Whyte, Director, Social Sciences Division, <i>International Development Research Centre.</i>	39	April 10, 1990
Robert Skinner, Director, Long-Term Co-operation and Policy Analysis, <i>International Energy Agency OECD</i>	51	June 7, 1990
Brian Foody, President, <i>Iogen Corporation.</i>	27	December 12, 1989
The Honourable Jake Epp, <i>Minister of Energy, Mines and Resources.</i>	26	December 11, 1989
The Honourable Lucien Bouchard, <i>Minister of the Environment.</i>	18	October 26, 1989
Marc Nantais, Executive Director, Committees; J.E. Elliott, Director of Engineering, Chrysler Canada Limited, <i>Motor Vehicle Manufacturers' Association.</i>	27	December 12, 1989
Darrell Bishop, Senior Director, Planning and Environment; Leo Burns, Senior Technical Specialist, Meteorology and Air Quality; Heather Connors-Dunphy, Manager, Energy Conservation and Customer Service, <i>New Brunswick Power.</i>	36	March 29, 1990

Carole Burnham, Director, Environment Division; June Bassu-Roy, Supervising Planner, System Planning Division; Gerry Crown, Section Head, Government Relations, <i>Ontario Hydro.</i>	25	December 7, 1989
Jeff Passmore, <i>Passmore Associates International.</i>	23	November 28, 1989
Amory Lovins, Director of Research. <i>Rocky Mountain Institute.</i>	38	April 5, 1990
Bert Metz, Counsellor for Health and Environment; Mieke Bos, Third Secretary, <i>Royal Netherlands Embassy.</i>	29	January 23, 1990
Bob Lawrence, Senior Vice-President, Operations; Tony Harras, Vice-President, Planning, <i>SaskPower.</i>	30	January 25, 1990
Raye E. Thomas, President; Peter L. Allen, Vice-President; Douglas P. Lorriman, Director, <i>Solar Energy Society of Canada Inc.</i>	25	December 7, 1989
Patrick Foody, President, <i>Techtrol Inc.</i>	27	December 12, 1989
Ralph Torrie, <i>Torrie, Smith and Associates.</i>	23	November 28, 1989
Ken F. McCready, President and Chief Executive Officer; Edward J. Barry, Vice-President, Research; Jim Leslie, Senior Vice-President, Corporate Services, <i>TransAlta Utilities Corporation.</i>	28	December 14, 1989
Chris Holloway, National Director; David Jeanes, National Treasurer, <i>Transport 2000.</i>	36	March 29, 1990

William E. Rees, Associate Professor, Planning and Resource Ecology, School of Community and Regional Planning, <i>University of British Columbia.</i>	43	May 3, 1990
David Scott, Professor of Mechanical Engineering and Integrated Energy Systems, <i>University of Victoria.</i>	25	December 7, 1989
John Robinson, Professor, Department of Environment and Resource Studies, <i>University of Waterloo.</i>	24	December 5, 1989
Christopher Flavin, Vice-President and Senior Researcher, <i>Worldwatch Institute (Washington).</i>	31	February 1, 1990

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*Fisheries and Oceans Canada.*

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*Greenpeace.*

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Harvey J. Levy  
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Claude Lagar  
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David Lewis  
Crescent Valley, British Columbia.

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Chesapeake, British Columbia.

Fred G. Marsh  
Castlegar, British Columbia.

Geoffrey May  
Cape Breton Island, Nova Scotia.

Robert A. McCarroll  
Willowdale, Ontario.

Carolyn McLean  
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David Mondor  
Kirkland, Quebec.

Andrew B. Noyes  
San Francisco, California.

C.R. Nixon  
Ottawa, Ontario.

Christopher O'Brien  
Yellowknife, Northwest Territories.

Dirck H. Pichler  
Vancouver, British Columbia.



## REQUEST FOR GOVERNMENT RESPONSE

Your Committee requests that the Government table a comprehensive response to this Report within 150 days of its tabling, in accordance with the provisions of Standing Order 109.

A copy of the relevant Minutes of Proceedings and Evidence of the Standing Committee on Environment (*Issues Nos. 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 37, 38, 39, 41, 42, 43, 44, 46, 47, 49, 50, 51, 52, 53, 54, 55, 56, 57 and 58, which includes this Report*) is tabled.

Respectfully submitted

DAVID MacDONALD

Chairperson