

I. Introduction

Two of the most urgent global environmental challenges in human history gained prominence in the closing decades of the twentieth century--depletion of the stratospheric ozone layer and climate change. As Environment Canada points out, "for the first time in the history of the planet, human beings have precipitated a major geophysical disturbance on a global scale."¹ The potential ramifications of ozone depletion and climate change are nothing short of catastrophic, from environmental, economic, health, cultural and social perspectives.

As a wealthy industrialized nation, Canada's contribution to these two planetary problems has been disproportionately large relative to our small population. Moreover, our northern location, for complex scientific reasons, makes us particularly vulnerable to the impacts of both ozone depletion and climate change. Canada's northern people, wildlife and ecosystems are already suffering significant harm.

Yet Canada's reaction to these two environmental problems, despite their similarities, has been dramatically different. On the issue of ozone depletion, Canada is a world leader. We played a vital role in global negotiations culminating in the *Montreal Protocol on Substances that Deplete the Ozone Layer*. Canadian governments, both federal and provincial, passed strong and effective laws that ensured we met our international commitments. Canadian consumption of ozone-depleting chemicals has fallen an impressive 95% since 1987.

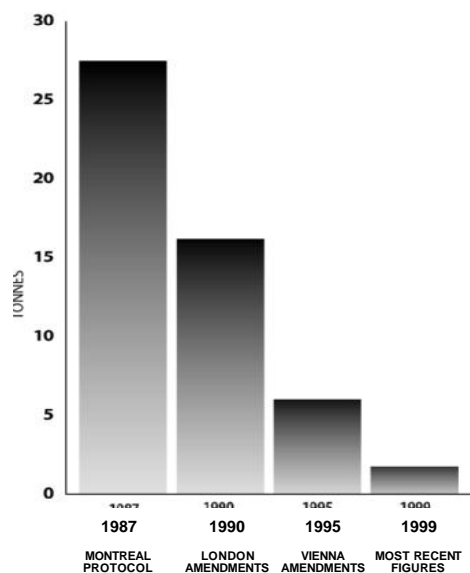
In contrast, with respect to climate change, Canada is more of a laggard than a leader. For years Canadian representatives undermined international negotiations intended to create a legally binding framework for greenhouse gas reductions. Despite signing agreements like the *United Nations Framework Convention on Climate Change* and the *Kyoto Protocol*, the federal government has taken few concrete actions to reduce greenhouse gas emissions. Large industrial polluters, lobbying organizations like the Business Council on National Issues and provincial governments have vigorously opposed meaningful actions to address climate change. Instead of passing effective laws and regulations, Canada's federal and provincial governments have relied almost entirely on unenforceable and ineffective voluntary initiatives. As a result, Canada is violating the spirit of our obligations under these environmental treaties. As of 2001, Canadian greenhouse gas emissions are 15% *above* 1990 levels while our commitment under the *Kyoto Protocol* requires emissions to be six percent *below* 1990 levels by 2008-2012.

The contradiction between Canada's responses to ozone depletion and climate change is remarkable. Why is Canada at the forefront of global efforts to protect the ozone layer while showing little, if any, international leadership in defusing the threat posed by climate change? Why is Canada's domestic strategy for tackling ozone-depleting chemicals fully developed and implemented, while our approach to climate change continues to be up in the air? This report examines the details of Canada's record on these two global problems in an attempt to answer these vexing questions.

First we take an in-depth look at ozone depletion, summarizing the science, the health and environmental impacts, identifying the causes of the problem, highlighting the international negotiations and detailing Canada's response. We analyze the effectiveness of laws and policies introduced by both federal and provincial governments. The results of Canadian efforts are documented, costs and benefits assessed, and some lessons drawn from the hurdles overcome in addressing ozone depletion.

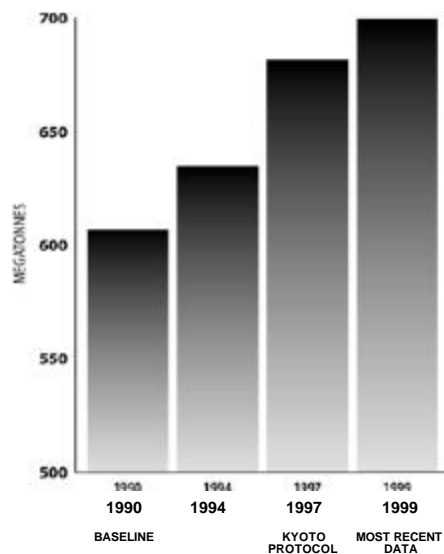
Then we conduct a similar analysis of climate change, including the science, impacts, causes and evolution of international negotiations. The response of the federal, provincial, and territorial governments is critically examined, and the results of these efforts assessed.

Finally, we compare the factors influencing Canada's divergent responses to ozone depletion and climate change. This comparison illustrates the reasons why Canada's approach to dealing with ozone depletion has been superior to its efforts to address climate change. Canada's success in eliminating the use of ozone-depleting substances suggests that the obstacles to reducing greenhouse gas emissions are in no way insurmountable. By adopting laws, standards and policies similar to those used in overcoming ozone depletion, Canada can begin to reduce greenhouse gas emissions and protect the planet's climate. It is not too late to salvage our international reputation for environmental leadership, but time is running out. Canada needs to move forward quickly by ratifying the *Kyoto Protocol* and implementing effective solutions.



Canadian Ozone-Depleting Substance Consumption

SOURCE: Environment Canada, "National Action Plan For the Environmental Control of Ozone-Depleting Substances and Their Halocarbon Alternatives"



Canada's greenhouse gas emissions

SOURCE: Environment Canada, July 11, 2001

II. Progress in the Air: Canada's Role in Halting Ozone Depletion

"The 'boundless' blue sky which gives us breath and protects us is but an infinitesimally thin film. How dangerous it is to threaten even the smallest part of this gossamer covering, this conserver of life."

Vladimir Shatalov, cosmonaut²

Ozone depletion is a global atmospheric environmental challenge that rose to prominence in the late 20th century. The world's swift response to this unprecedented challenge is a powerful yet largely unrecognized reason for environmental optimism. Scientists discovered the problem, the public became concerned, politicians negotiated an international agreement and the treaty was repeatedly strengthened. Nations, both rich and poor, took concrete steps to address the problem. While ozone depletion is not yet behind us, the requisite legal tools are in place to insure that the problem will be solved. Canada's prominent role in advocating, negotiating and implementing effective steps to protect the ozone layer merits careful examination as a successful model of environmental problem-solving.

The Science of Ozone Depletion

The stratospheric ozone layer is like a protective shield, a natural sunscreen for the planet. It blocks out most of the harmful form of ultraviolet radiation, known as UV-B, emanating from the sun. According to Environment Canada, "life on Earth would be impossible without it."³ Although ozone occurs throughout the atmosphere, it is concentrated in the stratosphere, 18 to 35 km above the earth's surface. The thickness of the ozone layer varies seasonally and geographically, but historically the amount of ozone was in a dynamic balance as the ozone naturally produced in the stratosphere offset the amount destroyed by natural causes.⁴

Ozone depletion refers to the destruction of the ozone layer by human-made chemicals such as chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), halons, carbon tetrachloride, methyl chloroform and methyl bromide. These chemicals are used, or were used, in refrigeration and air conditioning equipment, aerosol sprays, fire extinguishers, foamed plastics, industrial processes and pesticides. Chemical reactions involving the bromine and chlorine molecules in these substances destroy ozone. Because of their unique chemical properties, a single molecule of chlorine or bromine is capable of destroying hundreds of thousands of ozone molecules.⁵ Although there are natural sources of chlorine and bromine (e.g. volcanic eruptions), studies by the World Meteorological Organization indicate that 82% of the chlorine entering the stratosphere in recent years is from human activities.⁶ Chlorine levels in the atmosphere are now six times historic levels.⁷

Because of a number of meteorological factors, ozone depletion is greatest during spring in the Antarctic and Arctic regions, where thinning has reduced the ozone layer by up to 80% and 45% respectively in recent years. Overall, the ozone layer has thinned by approximately 5% over mid-latitude regions and 11% in polar regions.⁸

Scientists have now confirmed that ozone depletion results in higher levels of UV-B radiation reaching the Earth's surface. According to Environment Canada, "measurements show that globally averaged ground-level UV-B radiation rose 10% from 1986 to 1996."⁹ The current increases in UV-B radiation range from 4% in the Northern Hemisphere mid-latitudes in the summer/fall; 7% in the Northern Hemisphere mid-latitudes in the winter/spring; 6% in the Southern Hemisphere mid-latitudes year-round; 130% in the Antarctic in the spring; and 22% in the Arctic in the spring.¹⁰

The Health and Environmental Effects of Ozone Depletion

Higher levels of UV-B radiation could wreak extensive damage on both the environment and human health.¹¹ Potential health impacts arising from increased exposure to UV-B radiation include sunburn, skin cancer, eye cataracts and reduced efficiency of the human immune system. A medical study found "alarming increases" in skin cancer between 1973 and 1987.¹² According to the World Health Organization (WHO), there are two million non-melanoma skin cancers and 200,000 malignant melanomas globally each year. WHO predicts that a 10% decrease in stratospheric ozone would cause an additional 300,000 non-melanoma and 4,500 melanoma skin cancers annually. Eye cataracts make 12-15 million people blind annually, worldwide. WHO estimates that each one percent decrease in stratospheric ozone will increase cataracts by 0.5 percent.¹³ In other words, an additional 600,000 to 750,000 people will suffer from cataracts annually for every one-percent decline in the ozone layer.

There is extensive evidence about the environmental impacts caused by ozone depletion. Environmental damage is inflicted on aquatic ecosystems, particularly phytoplankton and zooplankton. These tiny plants and animals, living in the surface layers of lakes and oceans, are the foundation of many vital food chains. Other aquatic organisms that are particularly sensitive to UV-B include sea urchins, corals, amphibians, macroalgae and seagrasses. Studies show that increased exposure to UV-B radiation has adverse impacts on plant growth, photosynthesis and disease resistance, resulting in reduced crop yields.¹⁴ The environmental effects of UV-B radiation also interact with other stresses including climate change and pollution to produce cumulative impacts on living organisms.¹⁵

Because of our northern location, Canada is one of the countries most at risk from ozone depletion. Between 1969 and 1992 there was a threefold increase in melanoma cancer rates in Canada, partially caused by ozone depletion.¹⁶ In 1997, according to the federal Auditor General, 61,000 Canadians developed skin cancer, of whom 3,200 will be afflicted with malignant melanoma, resulting in 660 deaths.¹⁷ Canada's Arctic ecosystems, already the canaries in the coal mine in terms of suffering the early impacts of climate change, will be particularly vulnerable to ozone depletion. According to the

World Meteorological Organization, "Polar marine ecosystems, where ozone related UV-B increases are the greatest, are expected to be the oceanic ecosystems most influenced by ozone depletion."¹⁸

Ozone Depleting Substances

CFCs, the main ozone-depleting substances, were synthesized decades ago and for many years were believed to be safe, stable, non-toxic, non-flammable and inexpensive--almost "miracle chemicals"--with many uses including spray propellants, refrigerants, foam-blowing agents, solvents and cleaning fluids.¹⁹ By the 1970s, Canadians were unwittingly dependent on CFCs at home, at work, and in their vehicles as CFCs were used to cool cars and offices, package food, and manufacture computer and electronic equipment.

In 1974, two scientists, Sherwood Rowland and Mario Molina, released a groundbreaking and controversial study suggesting that chlorine from decomposing CFCs could lead to the depletion of stratospheric ozone.²⁰ The study was met with widespread skepticism, particularly from industries that used or manufactured CFCs. However, during the late 1970s and 1980s scientific evidence accumulated to support Rowland and Molina's assertion that this group of chemicals, previously thought of as miraculously safe, cheap, and useful, was in fact eroding the stratospheric ozone layer and endangering life on earth.

As a result of these concerns, Canada was one of the first countries, along with Sweden, Norway and the United States, to ban the use of CFCs as propellants in a range of consumer items (e.g. hair spray, anti-perspirants and deodorants) in the late 1970s.²¹ This early action propelled Canada into the role of an international leader on ozone depletion and lent moral suasion to our efforts to persuade other nations to follow our lead.

Amidst growing public concern, international negotiations resulted in the 1985 *Vienna Convention on the Protection of the Ozone Layer*, a preliminary agreement to monitor scientific developments, cooperate in research and meet again in two years.²² Canada was the first nation to ratify the *Vienna Convention*, but the agreement contained no provisions requiring the reduction or elimination of ozone-depleting substances.²³ Shortly thereafter, scientists made the dramatic discovery that the springtime ozone layer over Antarctica had decreased by up to 50% since the late 1970s.²⁴

Motivated by the new information about the Antarctic ozone 'hole' and high levels of public concern, Canada hosted and was at the forefront of talks culminating in the *Montreal Protocol on Substances that Deplete the Ozone Layer* in 1987.²⁵ At the time when the *Montreal Protocol* was negotiated, there was still scientific uncertainty about the process of ozone depletion, the speed of the ozone layer's deterioration and the extent of the health and environmental impacts. However, nations agreed to implement the precautionary principle, meaning that "where there are threats of serious or

irreversible damage, lack of full scientific uncertainty should not be used as a reason for postponing measures to prevent environmental degradation."²⁶ As a result, the *Montreal Protocol* established a concrete schedule for the major industrialized countries to reduce CFC consumption 50% by 1999 and freeze halon consumption levels at 1986 levels by 1992.

Developing countries were given a ten-year grace period to meet these targets because historically most ozone-depleting substances were produced, consumed and released by the industrialized countries. The ten-year grace period also enabled industrialized nations to research and develop new technologies which could then be transferred to the developing world. The *Montreal Protocol* also established a Multilateral Fund to sponsor research into substitutes for CFCs and to assist developing countries in their efforts to phase out ozone-depleting substances.

Overcoming Obstacles To Protecting the Ozone Layer

The successful negotiation of the binding and ambitious targets in the *Montreal Protocol* came despite the opposition of the chemical industry. Led by CFC manufacturers, the industry made three main arguments against taking concrete steps to protect the ozone layer. The first argument attacked the science behind ozone depletion, claiming there was "no concrete evidence" that synthetic chemicals were causing ozone depletion.²⁷

The second argument was based on economics. A 1990 study estimated that CFC production and use in the United States alone involved 5,000 companies employing 700,000 people and producing goods and services worth \$28 billion.²⁸ The industry-sponsored Alliance for Responsible CFC Policy "maintained that CFCs were unique and irreplaceable, and that their elimination would result in devastating impact on the quality of modern lifestyles as well as on national economies."²⁹ Similarly, Canada's Fraser Institute suggested that cutting back on the use of CFCs would probably require "large sacrifices on the part of everyone."³⁰

The third industry argument was that banning CFCs would cause 20-40 million deaths annually due to the "collapse of refrigeration" and 5 million additional children's deaths due to lack of refrigerated vaccines for immunization.³¹ A book published by the Fraser Institute suggested that "more people would die from food poisoning as a consequence of inadequate refrigeration than would die from depleting ozone."³²

Then in 1988, the World Meteorological Organization's Ozone Trends Panel produced the so-called 'smoking gun', scientific evidence confirming beyond a reasonable doubt that CFCs and other manmade substances were responsible for ozone depletion.³³ Within a week, DuPont, one of the world's largest manufacturers of CFCs, announced it would phase out the chemicals completely.³⁴

As the scientific evidence of ozone depletion grew more compelling, the international community recognized the need to act even more swiftly.³⁵ In 1990, a follow-up meeting in London resulted in amendments to the *Montreal Protocol* to accelerate the elimination of CFCs and halons and add methyl chloroform and carbon tetrachloride to the list of substances to be eliminated. Subsequent meetings in Copenhagen (1992), Vienna (1995) and Beijing (1999) further accelerated the elimination schedule while adding more chemicals (HCFCs, HBFCs and methyl bromide) to the list of substances targeted for elimination. The *Montreal Protocol* was ratified by 175 nations as of November 2000.³⁶

Canada--International Leadership, National Action

As mentioned earlier, Canada was one of the first nations to ban the use of CFCs as a propellant in consumer products and one of the first nations to ratify the *Vienna Convention*. Canada then set and strengthened domestic targets for eliminating ozone-depleting substances based on the *Montreal Protocol* and the subsequent London, Copenhagen, Vienna and Beijing adjustments as follows:

- 100% elimination of halons by 1994;
- 100% elimination of carbon tetrachloride by 1995;
- 100% elimination of CFCs by 1996;
- 100% elimination of methyl chloroform by 1996;
- 100% elimination of HBFCs by 1996;
- 100% elimination of methyl bromide by 2005; and
- 100% elimination of HCFCs by 2020.³⁷

In many cases, Canada's domestic targets were even more ambitious than required by our commitments under the *Montreal Protocol* and its subsequent amendments. Working cooperatively, the federal and provincial governments passed strong, effective laws and regulations to fulfill our international commitments. The first federal regulations were passed in 1989 under the auspices of the *Canadian Environmental Protection Act*. These binding rules placed strict, mandatory limits on the manufacture, use, sale, import and export of ozone-depleting substances. These regulations also imposed strict record-keeping and reporting requirements on users of ozone-depleting substances. The federal regulations were amended in 1990, 1991, 1994, 1995, 1998 and 2000 to address more ozone-depleting substances, accelerate the schedule for elimination of certain substances, close loopholes and streamline reporting requirements. As a result, Canada's current *Ozone Depleting Substances Regulations* fulfill our obligations for all substances covered by the *Montreal Protocol* and the subsequent London, Copenhagen, Vienna and Beijing adjustments.³⁸

The federal regulations are comprehensive and well drafted, with loopholes only for essential uses--such as allowing CFCs to be used in inhalers for asthma. To qualify as an essential purpose, the use of a controlled substance must be "necessary for health and safety" or "critical for the good functioning of society." As well, there must be "no

technically or economically feasible alternatives or substitutes."³⁹ Efforts are currently continuing in an attempt to find viable substitutes for the remaining essential uses.

There are two ozone-depleting substances not yet eliminated in Canada--methyl bromide and HCFCs. Methyl bromide, used in agriculture, is to be eliminated by 2005 while HCFCs, a CFC substitute, can no longer be used beyond 2020. To accelerate the phasing out of these substances, Canada implemented an experimental permit-trading program. Users of methyl bromide and HCFCs were allocated consumption quotas based on historic levels of use. Users with access to more affordable alternatives could sell their quotas to other users.⁴⁰ The environmental end result is the same, as methyl bromide and HCFCs are gradually phased out. From an economic perspective, the trading system provides partial financing of alternatives (to users who sell their quota) and results in the use of least cost alternatives and substitutes. In effect, the program allows government to set reduction targets and then use free market principles to minimize the costs of achieving those targets. A similar program, based on sulphur dioxide emissions, was a highly successful component of the American effort to reduce acid rain.⁴¹

The provinces passed laws complementing the federal regulations by dealing with other aspects of ozone-depleting substances, such as the large quantities of CFCs that remain in use in air conditioners, refrigeration units and fire-fighting equipment. All provinces and territories, with the exception of the Northwest Territories (NWT) and Nunavut, have enacted extensive, legally binding rules to prevent the release of CFCs into the environment as well as regulating the recovery, recycling and disposal of ozone-depleting substances. For example, Ontario added a new part (part VI) to its *Environmental Protection Act* to deal specifically with ozone-depleting substances. Ontario also passed the *Ozone Depleting Substances General Regulation* to complement the federal regulations.⁴² The NWT created a set of guidelines (weaker than regulations because they are not legally binding) while the new government in Nunavut has not yet addressed this problem.⁴³

Like the federal regulations, most of the provincial regulations are also strong. The most recent version of British Columbia's ozone regulations (1999) uses the mandatory phrase "must not" 23 times and the positive obligation "must" another 16 times in controlling the release, recovery and recycling of ozone-depleting substances.⁴⁴ This mandatory language is much more effective than the discretionary language, using the word "may," that characterizes much environmental law in Canada. To understand the fundamental importance of this superficially minor difference in language, imagine the impact on government revenues if income tax laws used the word "may" instead of "must."

Another important factor contributing to the effectiveness of the federal and provincial laws is that both are backed by stiff penalties. For example, under British Columbia's *Ozone Depleting Substances and Other Halocarbons Regulation*, fines range up to \$200,000 per offence.⁴⁵ Under the *Canadian Environmental Protection Act, 1999*, fines can be as high as one million dollars and jail sentences can be up to five years.⁴⁶

Progress in the Air

The combination of federal and provincial regulations is working very well to reduce Canada's impact on the ozone layer. In 1993, DuPont closed the world's largest CFC manufacturing facility, located in Canada.⁴⁷ By 1995, Canada successfully eliminated the production of CFCs, halons, carbon tetrachloride and methyl chloroform. **Overall, Canadian production of ozone-depleting substances fell more than 95% between 1987 and 1996.**⁴⁸

Canada's remarkable progress in tackling ozone depletion is confirmed by both the federal Auditor General and the Commissioner for Environment and Sustainable Development. The Commissioner commended Environment Canada for showing "strong commitment and leadership, internationally and domestically, in developing policies and programs aimed at eliminating or reducing ozone-depleting substances."⁴⁹ The Auditor General reported in 1997 that "Canadian achievements compare favourably with those of other countries, in both influencing and implementing the international agenda."⁵⁰

Globally, CFC production has dropped 88% from its peak in 1988.⁵¹ Atmospheric concentrations of some ozone-depleting substances have peaked and begun to decline.⁵² Canada deserves additional credit for this international progress for two reasons. First, we played "a pivotal role in the early development and ongoing evolution of the *Montreal Protocol*."⁵³ The chief negotiator for the United States of the various treaties on ozone-depleting substances, Richard Benedick, praised Canada's role, noting that Canada consistently pushed for "strong measures to protect the ozone layer" and exerted "disproportionate leverage on the course of events."⁵⁴ Second, Canada has contributed over \$30 million (U.S. dollars) to the Multilateral Fund, to which industrialized nations, collectively, have now contributed over \$1.2 billion.⁵⁵ This fund plays a critical role in enabling developing countries to meet their obligations under the *Montreal Protocol*.

Like Canada, the United States succeeded in meeting its international obligation to eliminate the production and consumption of ozone-depleting substances. The Americans used a combination of regulations, taxes and an innovative market-based trading regime.⁵⁶ The *Ozone Protection and CFC Reduction Act* passed by Congress in 1989 imposed strict limits on the manufacture, use and import of CFCs. This law also established the Ozone Depleting Chemicals Tax, which targeted producers and importers of CFCs. This new tax raised over \$3 billion, some of which was used to develop CFC alternatives and promote new non-ozone-depleting technology.⁵⁷

The Economic Benefits of Reducing Ozone Depletion

Did Canada, the United States or the world pay a steep economic price for this environmental progress? No. To the contrary, numerous studies show that reducing the use of ozone-depleting substances actually pays substantial economic dividends. Cost-benefit analyses by Environment Canada and the United States Environmental

Protection Agency show that benefits outweigh costs by a ten-to-one ratio.⁵⁸ A comprehensive review of the American efforts to reduce ozone-depleting substances concluded:

Contrary to early predictions, meeting this Protocol goal did not severely disrupt the U.S. economy, trigger massive job losses, or deny popular products or services to consumers. With considerable ingenuity, and aggressive investment in innovation, many U.S. industries eliminated CFC use more quickly, at lower cost, or with greater environmental benefits than observers once predicted.⁵⁹

In 1997, Environment Canada published a report concluding that the full implementation of the *Montreal Protocol* would provide the world with \$224 billion in net economic benefits (mainly from reduced damage to fisheries, agriculture and materials).⁶⁰ This figure does not include estimates of the economic benefits related to human health, which would push the total net benefits much higher. Full implementation of the Protocol will prevent an estimated 20 million cases of skin cancer, 129 million cases of cataracts and 333,000 deaths.⁶¹ To grasp the magnitude of the economic aspect of these health benefits, consider that in the United States alone, the government spends \$3.4 billion annually on 1.2 million cataract operations.⁶²

The opponents of strong regulatory action to protect the ozone layer had also argued that substitutes for CFCs would be less safe and significantly more expensive.⁶³ These predictions proved to be false. Studies show that the switch from CFC-based propellants to substitutes reduced industry costs by as much as 80%, saving U.S. businesses and consumers over \$1 billion. Cost savings have also been reported by former users of CFC-based solvents who switched to more environmentally benign alternatives.⁶⁴

Many corporations, such as AT&T and Nortel, benefited from the elimination of ozone-depleting substances because regulatory changes forced them to critically re-examine their manufacturing processes. Nortel, the Canadian high-tech firm, saved \$50 million by eliminating the use of ozone-depleting substances in electronics manufacturing. Nortel vice-president Margaret Kerr noted that the changes "allowed us to reduce manufacturing defects, improve reliability, improve product performance and reduce costs."⁶⁵

Unfinished Business

There continue to be several areas where Canada could improve its efforts to protect the ozone layer, including: better enforcement of the regulations under the *Canadian Environmental Protection Act, 1999*; more consistent provincial regulations; the development of genuinely environmentally-friendly substitutes for CFCs; and a clearer strategy to destroy ozone-depleting substances that are still in use.⁶⁶

Enforcement is a problem because there is apparently a black market for CFCs now that they have been banned. New CFCs are smuggled or fraudulently described as recycled.

Environment Canada admits that a lack of resources has caused them to adopt a "minimalist" approach to enforcement of environmental laws generally, including the ozone-depleting substances regulations.⁶⁷ Between 1989 and 1999 there were 29 successful prosecutions for violations of Canada's various ozone-depleting substances regulations under the *Canadian Environmental Protection Act, 1999*, resulting in \$393,600 in fines and one 15 month jail sentence.⁶⁸

In contrast, in the United States, there have been hundreds of charges and millions of dollars in fines.⁶⁹ The U.S. Environmental Protection Agency formed a joint task force with the Internal Revenue Service, Department of Justice and Customs Service to uncover illegal CFC imports. In one single case, the efforts of this task force resulted in a \$1 million fine, dwarfing ten years of Canadian enforcement efforts.⁷⁰

A federal-provincial working group on ozone depletion recently undertook a comprehensive analysis of the various provincial and federal regulations. While concluding that the federal regulations are strong and consistent, the study found a high degree of variability among the provincial regulations.⁷¹ The Auditor General, the Commissioner for Environment and Sustainable Development and the Friends of the Earth have all expressed concerns that the provincial regulations may be uneven and in some provinces, inadequate.⁷² The inconsistency among provincial regulations could undermine Canada's efforts to be an international leader in protecting the ozone layer, and obviously needs to be addressed.

Many ozone-depleting substances, such as CFCs and halons, are also powerful greenhouse gases, contributing to climate change. Thus eliminating ozone-depleting substances should have a minor, but positive impact in reducing greenhouse gas emissions. This seemingly good news is tempered by the fact that many of the substitutes for ozone-depleting substances, such as hydrofluorocarbons (HFCs), are also powerful greenhouse gases. Greenpeace and others warn, with good reason, that in moving away from ozone-depleting substances, it should be a priority to find benign substitutes so as to avoid solving one global problem at the cost of exacerbating another.⁷³

Canadian consumption of HCFCs, a less harmful substitute for CFCs, increased 76% between 1986 and 1995. It should be noted that although HCFCs have only two to five percent of the ozone-depleting potential of CFCs, they still have a long-term impact on the ozone layer. Under the amended *Montreal Protocol*, HCFCs are to be phased out by 2020. European nations are trying to accelerate this schedule.

In many European nations, consumption of CFCs has virtually reached zero. Europe has been more aggressive in not only ending the production of CFCs but in eliminating them from current uses where they are stored and targeting them for destruction.⁷⁴

Lessons Learned

Given the success of Canada's efforts both at home and abroad to protect the ozone layer, it is valuable to identify the reasons behind this unsung progress. First of all, because of the scientific uncertainty about ozone depletion that existed in the early to mid-1980s, it was important to implement the precautionary principle and take concrete steps without waiting for scientific certainty. At the same time, extensive investments in scientific research produced regular improvements in our knowledge about ozone depletion, resulting in a positive feedback loop between scientists, the public and lawmakers. Stronger science provided information that fueled greater public concern, which led politicians to address the issue, including the allocation of further funds for scientific research.

The clear, firm schedules for reducing CFC production and use were integral to the success of Canada and other nations in addressing ozone depletion. The well-publicized and ambitious targets motivated extensive investment in research and development for more environmentally friendly alternatives to CFCs. The deadlines also made it obvious that nations would be held accountable. A failure to fulfill commitments could result in international embarrassment, a particularly humiliating prospect for nations like Canada with reputations for leadership in fighting ozone depletion.

Flexibility and transparency were strengths of both the *Montreal Protocol* and Canadian laws to implement the Protocol. In terms of flexibility, the *Montreal Protocol* set clear targets but did not specify how those targets would be achieved, giving governments and industry the freedom to find the most effective and efficient reduction strategies to meet the legal requirements. The Canadian government met repeatedly with concerned citizens and industry and held hearings about ozone depletion.⁷⁵ This openness, flexibility and transparency contributed to a high degree of cooperation between government, scientists, the public and industry.

The principle of shared but differentiated responsibility also contributed to the success of the *Montreal Protocol*. This principle recognizes that countries at various stages of economic development face different challenges. The industrialized countries, like Canada and the United States, who were the major producers and consumers of ozone-depleting substances, took responsibility for acting first. Developing countries were given extra time to phase out ozone-depleting substances as well as technical and financial assistance through the Multilateral Fund financed by the industrialized nations.

The Canadian and American experiences in addressing ozone depletion indicate that:

- regulations are an effective means of achieving environmental policy objectives;
- economic costs and technological obstacles tend to be exaggerated by industry;
- constant pressure from the public and environmental groups motivates governments and businesses to act;

- the benefits of solving environmental problems can exceed the costs, even using conventional economic analysis;
- taxes are potentially powerful tools for environmental protection;
- economic instruments, like permit trading programs, can achieve environmental goals with greater flexibility and at lower cost;
- smart policies will drive technology innovation, increase net societal benefits and bring compliance costs down; and
- federal, provincial and corporate leadership are important.

Conclusion

The world's leading scientific experts agree that the international community's rapid response to ozone depletion prevented a genuinely horrible crisis. The doomsday scenario prophesied in 1990 by Dr. David Suzuki that, without a swift human response, by the year 2040 people in Australia would rarely venture outside their homes because of a skin cancer epidemic was not far off the mark.⁷⁶ According to the latest assessment by the World Meteorological Organization,

One measure of the success of the *Montreal Protocol* and its subsequent Amendments and Adjustments is the forecast of 'the world that was avoided.' . . . Ozone depletion [in 2050] would be at least 50% at mid-latitudes in the Northern Hemisphere and 70% at mid-latitudes in the Southern Hemisphere, about ten times larger than today.⁷⁷

Based on our current knowledge of the health and environmental impacts of increased UV-B radiation, the consequences of ozone depletion of this magnitude would have been devastating.

The latest global scientific assessment of ozone depletion reveals that atmospheric concentrations of ozone-depleting substances peaked or were about to peak in the late 1990s.⁷⁸ Assuming that countries continue to comply with the *Montreal Protocol* and its various amendments governing the use of ozone-depleting substances, scientists anticipate that the ozone layer will repair itself by the end of the 21st century.

The *Montreal Protocol* is regarded as "the most successful attempt at protection of a global commons."⁷⁹ Although the problem is not yet solved, in that interim substitutes like HCFCs are less damaging but still harmful to the ozone layer, the speed with which Canada and the world have moved to address ozone depletion is genuinely impressive. The protection of the ozone layer is an inspiring success story, a beacon of hope and optimism that we can overcome seemingly insurmountable environmental challenges. Political leadership, strong laws and regulations and innovative economic instruments were an integral part of achieving this success.

Unfortunately, there is a caveat to this optimism. There are growing scientific concerns that climate change may impair the ozone layer's ability to rebuild.⁸⁰ Recent research reveals that while greenhouse gas emissions have an overall warming effect on the lower layers of the atmosphere, they have a cooling effect higher up in the stratosphere where colder temperatures exacerbate ozone destruction.⁸¹ The implication of this emerging linkage between the two issues is that protection of the earth's life-sustaining ozone layer depends not only on eliminating the use of ozone-depleting substances, but on addressing climate change as well.

III. Up in the Air: Canada's Record on Global Warming

"If we don't move now there will be a disaster. I don't want to scare people but we're dealing with the survival of the species."

Federal Environment Minister Lucien Bouchard, in a radio interview with Dr. David Suzuki about global warming in 1989⁸²

"The Government of Canada addressed fiscal deficits, to avoid leaving a burden for future generations. Likewise, it would be irresponsible to leave an environmental deficit of climate disruptions and pollution for future Canadians."

Prime Minister Jean Chretien, Letter to Business Council on National Issues, 2001⁸³

Both ozone depletion and climate change pose serious threats to humanity and, more broadly, to the future of life on earth. While there has been rapid progress, both domestically and internationally, in tackling the threat of ozone depletion, Canada continues to stumble badly in our efforts to confront climate change. Why? What explains our progress in arresting ozone depletion and our paralysis on global warming? Can we adapt the legal, economic and policy lessons learned from successfully addressing ozone depletion in order to effectively reduce greenhouse gas emissions?

The Science of Climate Change

Climate change is caused by the increasing concentration of greenhouse gases in the atmosphere. Like a greenhouse, these gases trap the sun's heat, (which ordinarily would be reflected back into space), resulting in warmer temperatures. Warmer temperatures also increase the rate of evaporation, resulting in more water vapor, which traps even more heat. Without the greenhouse effect, the earth would be about 33 degrees Celsius colder, making it uninhabitable for most forms of life. However, as human activities send more greenhouse gases into the atmosphere, more heat is being trapped and the planet is growing progressively warmer with profound consequences.⁸⁴

The overwhelming majority of the world's climate scientists concur that greenhouse gas emissions generated by human activities are altering the earth's climate.⁸⁵ Scientists agree that the level of carbon dioxide (CO₂) in the atmosphere remained relatively steady for the last 10,000 years at an average of about 260 parts per million (ppm) until recently. Since the beginning of the industrial age about 200 years ago, the level of CO₂ in the atmosphere has risen to about 368 ppm today -- a dramatic increase. In concert with this increase in atmospheric CO₂ and other greenhouse gases, the global mean temperature has risen 0.6° C in the last 100 years, the most rapid increase in 1000 years.⁸⁶ The 1980s and 1990s were the warmest decades of the millennium.⁸⁷ 1998 was the warmest year of the past thousand.⁸⁸

The world's leading climate scientists expect that by the year 2100, the global climate will be between 1.4 and 5.8 degrees Celsius warmer.⁸⁹ At present rates of warming and emissions growth, there is a 9 in 10 chance that the rise in temperature during this

century will be somewhere between 1.7 and 4.9 degrees.⁹⁰ This will be the most rapid warming in 10,000 years, and represents a change that is roughly equal to the temperature difference between today's world and the last ice age, when much of North America was beneath a thick sheet of ice.⁹¹

The Health and Environmental Impacts of Climate Change

Global warming is already having an impact. Sea levels rose an average of 0.1 to 0.2 metres during the 20th century and are projected to rise a full metre in the 21st century, jeopardizing the existence of some island nations. Snow and ice cover has decreased, with most glaciers retreating. Permafrost is thawing. Rivers and lakes are freezing later and melting earlier. Arctic sea ice has declined significantly in both extent and thickness. Precipitation patterns have changed. Extreme weather events, such as droughts, floods, heat waves, cyclones and intense precipitation storms have increased in frequency and severity.⁹² Scientists are already observing "lengthening of mid- to high-latitude growing seasons, poleward and altitudinal shifts of animal ranges, declines in some plant and animal populations, and earlier flowering of trees, emergence of insects and egg-laying in birds."⁹³

Anticipated future consequences of climate change vary widely from region to region, depend on many different variables and are expected to be predominantly negative. Potential negative impacts include reduced crop yields (particularly in tropical and sub-tropical regions where hunger is already a problem), more forest fires, more insect infestations, decreased water availability (particularly in some areas already experiencing water shortages), increased incidence of diseases such as malaria, dengue, schistosomiasis and cholera, more heat stress mortality, more extreme weather events and increased energy required for cooling.⁹⁴ Human communities face increased risks of flooding, landslides and other so-called 'natural' disasters with devastating environmental, economic and social consequences. Global warming exacerbates local air pollution problems, contributing to higher levels of smog and resulting in deaths, illnesses and major economic losses. Experts also expect significant negative impacts on biological diversity due mainly to habitat changes.⁹⁵ Potential positive impacts include increased crop yields in some mid-latitude regions, increased timber supply in some forest regions, increased water availability in some places, fewer deaths due to milder winters and less energy required for heating.⁹⁶

The long-term impacts of global warming are less certain. Scientists believe that temperature increases and rising sea levels will continue for centuries after atmospheric concentrations of carbon dioxide are stabilized. If greenhouse gas emissions continue to rise, more dramatic impacts are anticipated, such as the complete melting of the Greenland ice sheet--which would raise sea levels by seven metres--or the slowing of the ocean circulation system that transports warm water to the North Atlantic, currently giving Europe a hospitable climate. At the present time, the likelihood of large-scale changes of this magnitude is thought to be low, although some scientists are concerned by the prospect of unpredictably rapid, non-linear climate shifts.⁹⁷

The Impacts of Climate Change on Canada

Because of our northern latitude, Canada will experience disproportionate impacts from global warming, with particularly profound implications for northern ecosystems and northern peoples. The Intergovernmental Panel on Climate Change warns that "climate change in polar regions is expected to be among the largest and most rapid of any region on the Earth, and will cause major physical, ecological, sociological and economic impacts, especially in the Arctic."⁹⁸ Temperatures are expected to rise by up to 8 degrees Celsius in the Arctic by 2100.

Problems are already beginning to manifest themselves in the Canadian north. Malnourished polar bears provide a compelling and tragic early warning about the impacts of climate change. Changes in ice patterns have reduced some polar bears' ability to hunt effectively for the seals that are a mainstay of their diet.⁹⁹ For Aboriginal people living in the far north, traditional indigenous lifestyles are being upset by changes in the distribution and abundance of wildlife species as well as by severe transportation difficulties. Melting permafrost will also cause "severe damage to buildings and transport infrastructure."¹⁰⁰ A Republican Senator from Alaska, Ted Stevens, admits "We face the problem of moving native villages that have been located along the Arctic and West coast of Alaska for centuries. This is a creeping disaster."¹⁰¹ Canadian communities in the Arctic may also face relocation.

Canadians working in climate sensitive sectors including fisheries, forestry, energy and agriculture face mounting uncertainties. For example, wild salmon, which are sensitive to warmer temperatures, are in dire jeopardy on both Canada's east and west coasts.¹⁰² Reduced water availability on the prairies means that the grain harvest could decline.¹⁰³ Unique ecosystems, including prairie wetlands, alpine tundra and cold water ecosystems will be at risk, pushing some species towards the brink of extinction.¹⁰⁴

The Canadian Public Health Association describes climate change as a major public health threat.¹⁰⁵ For Canadians, one of the main effects of climate change will be more hot weather, resulting in more smog and more heat stress.¹⁰⁶ Combined, these factors already cause somewhere between 5,000 and 16,000 deaths in Canada annually.¹⁰⁷ These figures are expected to rise as global warming increases.

On the other hand, some Canadians could potentially benefit from climate change. Environment Canada suggests that in some regions there could be "increased crop yields" and "certain forests could become more productive."¹⁰⁸ Health studies indicate that "in areas with relatively colder climates, an increase in ambient temperature could result in a decrease of cardiovascular mortality."¹⁰⁹ Overall, these speculative regional benefits pale in comparison to the massive negative consequences and uncertainties associated with climate change.

The Causes of Global Warming

The three main greenhouse gases produced by human activity are carbon dioxide, methane and nitrous oxide.¹¹⁰ These gases also enter the atmosphere through natural processes and are re-absorbed through natural processes, resulting in climate stability when these sources and sinks are balanced. However, since the beginning of the Industrial Revolution, human activities have altered the natural balance by emitting vast quantities of greenhouse gases into the atmosphere. Since 1750, global atmospheric concentrations of carbon dioxide are up 31%, methane up 151% and nitrous oxide up 17%. There is more carbon dioxide in the earth's atmosphere today than there has been for 20 million years.¹¹¹

In Canada, 76% of our contribution to global warming comes from carbon dioxide emissions--produced primarily through the combustion of fossil fuels. Twelve percent of Canada's contribution to global warming is caused by methane produced mainly by farms and landfill sites. Nitrous oxide, produced by the burning of fossil fuels and the use of fertilizers, accounts for 11% of Canada's contribution to climate change. Modern industrial chemicals such as chlorofluorocarbons, hydrofluorocarbons, per-fluorocarbons and sulphur hexafluoride account for the other 1% of Canada's contribution to climate change.¹¹²

Greenhouse gas emissions in Canada broken down by sector are as follows¹¹³:

- Transportation 25%
- Fossil fuel production and distribution 19%
- Electric power generation 17%
- Agriculture 9%
- Industrial energy use 8%
- Miscellaneous industrial processes (cement, aluminum, iron, and steel) 7%
- Residential buildings 6%
- Commercial buildings 4%
- Landfills 3%
- Other 2%

Understanding the sources of Canada's greenhouse gas emissions is an essential first step in determining where attention and resources need to be focused in order to reduce these emissions.

The Evolution of International Concern about Climate Change

Although the suggestion that carbon emissions from human activities could influence the global climate dates back to Baron Jean Baptiste Fourier in 1827, global warming first reached public consciousness in the mid to late 1980s, as scientists expressed growing concern about unusually warm temperatures and extreme weather events.¹¹⁴ In 1988, Canada hosted the “Global Conference on the Changing Atmosphere” which

concluded with scientists calling for a 20% reduction of carbon emissions by 2005 and a long-term reduction of at least 50% in order to stabilize the climate. In response, the United Nations appointed the Intergovernmental Panel on Climate Change (IPCC) to assess the impacts of global warming. Over 2500 leading scientists worked to investigate the science and assess the impacts of climate change.

The first IPCC reports were published in 1990. The IPCC is described as "one of the most authoritative bodies of scientists ever assembled around a single area of scientific concentration."¹¹⁵ In the IPCC's first report, scientists projected that a doubling of carbon dioxide concentrations in the atmosphere would result in temperatures increasing by up to 4.5 degrees Celsius by 2050.¹¹⁶

As early as 1990, Canada was covertly undermining international progress on efforts to limit greenhouse gas emissions. Publicly, the federal government was promising to seek "a comprehensive international agreement on targets and schedules for the reduction of carbon dioxide and other greenhouse gas emissions."¹¹⁷ Privately, a confidential briefing document prepared for Canadian delegates at a May 1990 meeting in Bergen, Norway revealed that "Canada will not support expected proposals from the Nordic countries for targets and timetables on emission reductions."¹¹⁸ Canada's early opposition to taking concrete steps to reduce greenhouse gas emissions proved to be a sign of things to come.

International negotiations led to the *United Nations Framework Convention on Climate Change* in 1992, signed and ratified by 186 nations including Canada and the United States.¹¹⁹ The *Framework Convention* called for "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" but did not establish any legally binding targets or timelines for reducing greenhouse gas emissions.¹²⁰

The second IPCC reports were published in 1995. In typically cautious scientific language, the IPCC concluded that "the balance of evidence suggests that there is a discernible human influence on global climate."¹²¹

In response to growing public concern and stronger scientific evidence, the *Kyoto Protocol* was negotiated in December 1997. Under the terms of the *Kyoto Protocol*, industrialized countries set specific targets and a schedule for reducing greenhouse gas emissions. However *Kyoto* left questions unanswered by incorporating "flexibility mechanisms" but not specifying how these mechanisms would be implemented. The basic premise behind flexibility mechanisms such as international emissions trading, joint implementation, and the Clean Development Mechanism was that industrialized nations could get credit for actions to reduce greenhouse gas emissions in other countries and that this flexibility would lead to more "cost-effective" reductions.¹²² Another unresolved issue involved the granting of credit for sinks, i.e. agricultural and forestry activities that result in the absorption of carbon dioxide. At the time, environmental organizations and some European nations expressed concern about the possibility that some countries would focus on international flexibility mechanisms instead of domestic reductions.

Further negotiations intended to finalize details on the implementation of the *Kyoto Protocol* took place in Buenos Aires (1998), Bonn (1999) and at the Hague (2000) but Canada helped undermine these negotiations. A group of industrial nations led by Canada, the United States, Australia and Japan sought to exploit potential loopholes in the *Kyoto Protocol* by maximizing emission reduction credits for: selling nuclear reactors to developing countries; replacing old-growth forests with tree farms; and buying so-called "hot air", meaning "unused" emissions from countries that have suffered economic collapse and are producing far fewer greenhouse gas emissions, like Russia.¹²³ The European Union and a number of small island nations attempted to restrict credit to actions that actually reduced greenhouse gas emissions. The negotiations at the Hague ended in failure, as countries could not resolve the debate about what activities qualified for what scale of credit in reducing greenhouse gas emissions. Canada was internationally humiliated as global climate protection groups gave Canada five "fossil-of-the-day" awards for anti-environmental negotiating positions, concluding that Canada was the most obstructive of the 180 nations participating.¹²⁴

In 2001, the IPCC released its Third Assessment Report on the science and impacts of climate change. In its strongest language yet, the IPCC stated "there is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities" and "anthropogenic climate change will persist for many centuries" even if greenhouse gas emissions are stabilized.¹²⁵

The probability of progress on the *Kyoto Protocol* took a turn for the worse in 2001 when U.S. President George W. Bush announced the U.S. would not support the Protocol.¹²⁶ At subsequent meetings, Canada continued to undermine efforts to reach an agreement on implementation of the Protocol.¹²⁷ However, a political breakthrough occurred in July 2001 during meetings in Bonn, Germany. All nations agreed on the principles of implementing Kyoto, except the United States.¹²⁸ Canada joined the rest of the global community in moving forward toward the goal of protecting the planet's climate. To reach agreement, Canada relinquished its insistence that credit be given for nuclear reactor sales to developing countries while succeeding in getting unexpectedly generous credits for agricultural and forest sinks.

In November 2001, the detailed rules regarding implementation of the *Kyoto Protocol* were finalized in negotiations in Morocco. Again, Canada played a prominent role in stretching the interpretations of Protocol provisions to gain maximum flexibility and to minimize concrete reduction obligations. As observers of the negotiations noted, "the final outcome suggests a remarkable level of intransigence amongst certain parties, most notably the Russian Federation, Japan and Canada, all of whom secured favourable deals as a precondition for their ratification."¹²⁹

Canada's Response to Climate Change

How has Canada's legal system responded to the challenge posed by climate change? What new laws and policies were implemented, either federally or provincially, to reduce greenhouse gas emissions? What incentives and disincentives (i.e. carrots and sticks) or other economic policies have been created to reduce emissions of carbon dioxide, methane and nitrous oxide, the three main greenhouse gases?

Canadian governments have repeatedly promised progress in addressing climate change. In 1990, Canada pledged to stabilize emissions of carbon dioxide and greenhouse gases at 1990 levels by the year 2000.¹³⁰ Canada repeated this promise in 1992 at the Rio Earth Summit when we signed the United Nations Framework Convention on Climate Change. The Liberals confirmed this commitment in their Red Books in 1993 and 1997.¹³¹ Then in December 1997, in Kyoto, Canada formally agreed to reduce greenhouse gas emissions to 6% *below* 1990 levels by 2008-2012.

Ostensibly in order to meet our climate change commitments, Canada produced a plethora of plans, strategies, and consultations during the past decade, including:

- in 1990, a National Action Strategy on Global Warming;¹³²
- from 1992 to 1994, a series of national consultations on climate change resulting in 88 recommended actions;¹³³
- in 1995, Canada's National Action Program on Climate Change;¹³⁴
- in 1998, another series of national consultations as part of the National Climate Change Process, engaging 450 experts in 15 round table discussions;¹³⁵ and
- in 2000, the First National Climate Change Business Plan, the National Implementation Strategy on Climate Change, the Federal-Provincial-Territorial Framework Agreement on Climate Change and the Government of Canada Action Plan 2000 on Climate Change.¹³⁶

Despite the abundance of action strategies, action programs and action plans, Canada has taken few concrete actions to directly reduce greenhouse gas emissions. The language in these plans and strategies sounds good on a superficial level but lacks teeth, using loose phrases like "expand the program of *voluntary* action for energy conservation", "phase in a significant *voluntary* improvement in fuel efficiency, "encourage" the development of renewable energy and "promote" construction of energy efficient homes.¹³⁷ The federal government candidly admits that "the bulk of the initiatives identified are voluntary in nature."¹³⁸

In 1994, at the end of the first multi-year, multi-stakeholder national consultation process on climate change, 88 actions were recommended to federal and provincial governments.¹³⁹ A comprehensive study by the Pembina Institute for Appropriate Development concluded that by the year 2000, only one-third of these actions had been taken.¹⁴⁰ Almost all of the actions taken involved soft measures such as voluntary initiatives, education or research. Canadian governments avoided using the most

effective tools at their disposal (laws, regulations and economic instruments, such as taxes or financial incentives) to reduce greenhouse gas emissions.¹⁴¹ A review of the hundreds of actions profiled in the governments' "Taking Action on Climate Change: A Compendium of Canadian Initiatives," reaches the same conclusion.¹⁴² The overwhelming majority of the actions, both federal and provincial, focus on education, research and voluntary programs.¹⁴³

Do Voluntary Measures Produce Lower Greenhouse Gas Emissions?

Industry and provincial governments lobbied hard throughout the 1990s to convince Ottawa that voluntary programs were the best way to address climate change. Tom d'Aquino, President of the influential Business Council on National Issues (BCNI) argued that "reliance on regulation and punitive measures by our governments will not work."¹⁴⁴ In 1995, Canada's then-Minister of Natural Resources, Anne McLellan announced that she was impressed by industry's willingness to voluntarily reduce greenhouse gas emissions and claimed that "legislation is often the least effective and most costly way to go."¹⁴⁵

Throughout the 1990s, Canadian governments capitulated to political pressure and relied on education and voluntary programs instead of using laws, regulations and economic instruments to reduce greenhouse gas emissions. Three of Canada's most prominent voluntary initiatives include: a voluntary program to encourage industry to reduce greenhouse gas emissions; voluntary agreements with vehicle manufacturers to increase fuel efficiency; and a voluntary national building code.

The flagship of Canada's voluntary emissions reduction program is the Voluntary Challenge and Registry Program (VCR). Begun in 1995, the VCR invites companies to report both their greenhouse gas emissions and the actions taken to reduce their emissions.¹⁴⁶ The theory is that companies will gain publicity and goodwill for being responsible corporate citizens. By the end of 1999, 980 companies registered with the Voluntary Challenge and Registry Program. Analysis of the VCR program reveals that only ten percent of the participating companies provided full information to the registry on their greenhouse gas emissions. Worse yet, "on average, emissions of companies in the program do not appear to be rising more slowly than companies outside the program."¹⁴⁷ The Pembina Institute and others conclude that the "VCR has been wholly ineffective in helping Canada to meet its greenhouse gas emissions requirements."¹⁴⁸

A second example of the inadequacy of voluntary programs involves the fuel efficiency of motor vehicles. In 1982 Canada enacted the *Motor Vehicle Fuel Consumption Standards Act* (Bill C-107) to impose mandatory fuel efficiency standards on vehicles. Vehicle manufacturers strenuously objected to this law and successfully persuaded the government not to implement the *Act* but to rely on voluntary agreements instead.¹⁴⁹

The result of the voluntary agreements between government and the vehicle makers is that the average fuel efficiency of new vehicles in Canada has not improved since 1982.¹⁵⁰ In part because of soaring sales of trucks, minivans and sport utility vehicles, the overall fuel efficiency of new vehicles sold in Canada worsened from 8.4 L/100km to 9.5 L/100km between 1986 and 1998.¹⁵¹

Despite 18 years of proven failure using voluntary agreements with vehicle makers, the federal government recently announced plans to phase in a "voluntary improvement in fuel efficiency" for motor vehicles.¹⁵² Canada admits that we march to the beat of the American drum when addressing fuel efficiency.¹⁵³ Despite advances in technology, improvements to American fuel efficiency standards are unlikely in the short-term, given President George W. Bush's lack of enthusiasm for conservation.¹⁵⁴

A third example of the lack of success of voluntary programs to reduce Canadian greenhouse gas emissions involves the national building code for new homes. The leading standard for energy efficient construction is known as the R-2000 standard, established in 1982. Building an R-2000 home reduces energy use and energy costs by 26% compared to conventional new home construction, provides superior air quality, reduces maintenance costs and improves resale value, while costing only four to six percent more than the average new home.¹⁵⁵

Despite the attractive features offered by R-2000 homes, fewer than ten thousand R-2000 homes have been built in Canada in almost 20 years, and only about 0.6% of recent housing starts involve R-2000 construction. Despite millions spent on promotion and education, the "history of the R-2000 program proves that a non-regulatory approach will not result in the construction of R-2000 homes."¹⁵⁶ The federal government anticipates that only three percent of new homes built in Canada by the year 2010 will meet the voluntary R-2000 energy efficiency standards.¹⁵⁷

The inadequacy of voluntary measures in achieving greenhouse gas emissions should come as no surprise. Numerous studies have examined the ineffectiveness of stand-alone voluntary programs in achieving environmental objectives. A KPMG Environmental Risk Management study conducted in 1996 surveyed 1,547 large corporations in Canada about factors motivating them to take action on environmental issues. By far the dominant factor, with 92% of corporations surveyed identifying it as an "important motivating factor" was compliance with regulations. In second place at 69% was director and officer liability for environmental offences. Down at 15th place, with only 16% of corporations surveyed identifying it as an important motivating factor, were voluntary programs.¹⁵⁸

A report prepared by Environment Canada in 1998 also provides compelling evidence of the relative inadequacy of voluntary measures, concluding that "voluntary compliance programs and peer inspection programs could not achieve satisfactory levels of compliance." The study looked at nineteen industrial sectors and found that sectors that relying on voluntary measures and self-monitoring had a compliance rating of 60%

whereas industries subject to regulations, consistent inspections and enforcement had a compliance rating of 94%.¹⁵⁹

Voluntary measures lack accountability. They are, by definition, unenforceable, like a politician's promise to eliminate the G.S.T. Numerous independent experts conclude "It is therefore abundantly clear that voluntary, educational and research measures are wholly insufficient to meet Canada's climate change challenge when they are not backed up by regulatory standards and positive financial incentives."¹⁶⁰

Do Laws and Regulations Produce Lower Greenhouse Gas Emissions?

Despite international obligations and repeated promises, "no controls on carbon dioxide emissions have been legislated" by any Canadian government--federal, provincial or territorial.¹⁶¹ The only significant regulatory step taken by the federal government in the 1990s to reduce greenhouse gas emissions was the 1992 enactment of the *Energy Efficiency Act*, a law to increase the efficiency standards for thirty-three products, such as refrigerators, lights and some kinds of motors.¹⁶² Some provinces, notably British Columbia and Ontario, also introduced minor regulatory changes, including provincial energy efficiency standards.¹⁶³ Although both Ontario and B.C. created mandatory vehicle inspection and maintenance programs in major urban areas, these programs have had a minimal effect on carbon dioxide emissions.¹⁶⁴ Ontario now requires the mandatory capture of methane from landfills above a certain size.¹⁶⁵

The federal *Energy Efficiency Act* prohibits the import or inter-provincial trade of products that do not meet prescribed standards. The law and regulations are clear, mandatory and generally well-drafted. Failure to comply with the mandated energy efficiency standards can result in fines of up to \$200,000 and the government can seize the unlawful products.¹⁶⁶

The products covered by the *Energy Efficiency Act* and regulations account for roughly 65% of residential energy use. According to Natural Resources Canada, the *Act* and regulations will reduce carbon dioxide emissions by four to six megatonnes by 2000 and 12 to 19 megatonnes by 2020 (the reductions increase over time as more people replace older appliances and equipment).¹⁶⁷ For example, as of 2001, the latest fridges use 75% less energy than fridges made 20 years ago, and thus produce up to 75% less greenhouse gas emissions.¹⁶⁸ Amendments, made in 1999, extending the regulations to include lights are expected to reduce carbon dioxide emissions by an additional 5.3 megatonnes per year (equivalent to the emissions of about one million cars).¹⁶⁹

The *Energy Efficiency Act* is reducing Canadian energy use, saving Canadians money, reducing greenhouse gas emissions and protecting the environment. The David Suzuki Foundation and the Pembina Institute refer to the *Act* as "the single action taken by Canada since 1990 that is likely to make the most significant contribution to greenhouse gas emission reduction."¹⁷⁰

But why does government focus on regulating fridges and a handful of other products? The products covered by the *Energy Efficiency Act* and regulations account for less than 10 percent of Canada's greenhouse gas emissions, yet these are the only emissions directly addressed by Canadian governments through regulations. What about coal-fired utilities, trucks, automobiles, sport utility vehicles, oil sands projects, cement plants, pipelines and other major contributors to Canada's total emissions? There are absolutely no regulatory limits on greenhouse gas emissions from the four sectors most responsible--transportation (25% of Canada's greenhouse gas emissions), fossil fuel development (19%), electricity generation (17%) or industrial activities (15%).

In 1997, the federal government admitted that "the small number of regulatory measures accounts for a large percentage of the total impact" of their climate change initiatives.¹⁷¹ Despite this candid assessment, Canada continues to rely heavily on voluntary measures to reduce greenhouse gas emissions.

The Results of Canadian Efforts to Reduce Greenhouse Gas Emissions

After a decade of solemn promises, international commitments and impressive-sounding Action Plans to reduce Canada's contribution to global warming, Canadian greenhouse gas emissions rose 15% between 1990 and 2000.¹⁷² The only possible conclusion is that the steps taken by Canada to reduce emissions were completely inadequate.

At the dawn of the 21st century, Canadians continue to be among the world's leaders in per capita greenhouse gas emissions, generating 22.5 tonnes of greenhouse gases per person annually.¹⁷³ The global average is 3.8 tonnes of greenhouse gases per person annually, or about one-sixth the Canadian level.¹⁷⁴ With 0.5% of the world's population, Canada produces approximately 2.2% of the world's greenhouse gas emissions. With 30 million people, Canada uses more energy and produces more greenhouse gas emissions than the entire continent of Africa with its population of 700 million.¹⁷⁵

Canada's performance is getting worse, not better. The latest projections indicate that unless something dramatic happens in the next decade, Canada will be nowhere near meeting its Kyoto commitment. Canadian greenhouse gas emissions are already 15% above 1990 levels. Experts expect that Canadian emissions in 2010 will be 27% above 1990 levels instead of 6% below 1990 levels, as promised in Kyoto.¹⁷⁶ By 2020, Canadian greenhouse gas emissions could be 41% above 1990 levels.¹⁷⁷ The increases are due mainly to increased natural gas exports, oil, gas and coal activities (especially oil sands development), electricity generation, increased transportation (both travel and freight) and growth of Canada's population and economy.¹⁷⁸ Surging American energy demands under the George W. Bush administration could push Canadian greenhouse gas emissions even further from our international commitments.¹⁷⁹

There were many early warning signs suggesting that Canadian actions to reduce greenhouse gas emissions were inadequate. A 1993 report by Parliament's Standing Committee on the Environment warned that "under a business-as-usual scenario it is

believed that by the year 2000 Canadian emissions of carbon dioxide would grow by between 11 and 13%.¹⁸⁰ In a 1994 report prepared for the United Nations, Canada admitted that our greenhouse gas emissions were projected to rise 13% by 2000.¹⁸¹ Canada's second State of the Environment Report, published in 1996, admitted that "with competing pressures from economic concerns and continuing uncertainty about the extent of human-induced global warming, it is hard to generate a sense of urgency about climate change."¹⁸² In 1997, the federal government confessed that "current actions are not sufficient to meet Canada's goal of stabilizing emissions at 1990 levels by the year 2000."¹⁸³

Despite the writing on the wall, Canadian governments continue to rely on voluntary initiatives to reduce greenhouse gas emissions, denying the reality that these programs are not producing the desired results. There is a reason why governments do not rely solely on voluntary measures for collecting income tax, enforcing speed limits, or reducing lead content in gasoline. The reason is that voluntary measures generally do not work when used on their own, without complementary carrots and sticks.¹⁸⁴ There is nothing inherently wrong with voluntary programs, and many pay dividends. Those dividends do not, in the short to mid term, include lower greenhouse gas emissions.

Conclusion

To date, the record of Canadian governments and industry in responding to the issue of climate change, both internationally and domestically, is dismal. Canada's Commissioner for Environment and Sustainable Development reached the same conclusion, criticizing the federal government's lack of a clearly developed strategy for reducing emissions, lack of effective action, lack of accountability, failure to take a leadership role, failure to educate the public, refusal to impose a carbon tax and heavy reliance on voluntary measures. The Commissioner continued: "Overall, we found that the federal government has not applied sound management principles. The result is an implementation gap, with Canada's performance falling far short of its longstanding domestic policy commitment. This gap reflects the failure to translate policy direction into effective action."¹⁸⁵ These criticisms apply with equal force to the provincial and territorial governments. In 2001, the Commissioner observed that "the continuing rise in Canada's greenhouse gas emissions place the country on a path that is far from sustainable."¹⁸⁶

Global warming is a signal to us that our society is harming the planet's climate control system, just as a high temperature indicates that an individual is ill. The longer we refuse to address the causes of the malady, the more difficult it will be to recover. Scientists expect that industrialized nations will have to reduce greenhouse gas emissions by more than fifty percent from 1990 levels in the long term in order to stabilize the climate.¹⁸⁷ Canada's commitments under the *Kyoto Protocol* are a relatively modest first step toward resolving the problem and even these commitments have been 'softened' significantly by the successful efforts of Canada and other industrialized nations to expand loopholes in the *Protocol*.

It is extraordinary that the federal and provincial governments of Canada, more than a decade after promising bold actions, have done so little to address what many scientists believe to be the planet's most pressing environmental threat. Canada's failed attempt to reduce greenhouse gas emissions through voluntary programs and public education is compelling evidence of the need for a different approach. Continuing to rely on these ineffective policies is reminiscent of Einstein's definition of insanity, which is "doing the same thing over and over, and expecting a different result."

IV. Obstacles to Progress in Reducing Canada's Greenhouse Gas Emissions

Canada's failure to reduce greenhouse gas emissions stands in stark contrast to our success in reducing the production and use of ozone-depleting substances. Confronted by two equally pressing global challenges, Canada reduced consumption of ozone depleting substances by 95% in a decade while increasing greenhouse gas emissions by 15% over the same time frame.

From a Canadian perspective, there are many similarities between ozone depletion and climate change. Both problems:

- are caused by human activities;
- pose substantial threats to human well-being and the environment;
- are expected to have a disproportionate impact on Canada because of our northern latitude;
- involve similar contributions from Canada, as we used to produce about 2% of the world's ozone-depleting substances, and currently emit about 2% of the world's greenhouse gases (despite having only 0.5% of the global population);
- were vigorously denied by industry until the scientific evidence became difficult to refute; and
- are the subject of international environmental agreements that evolved from vague pacts of cooperation to specific targets committing countries, including Canada, to reduce emissions by certain amounts on a strict schedule.

Given these similarities, how can Canada be an impressive world leader on one global environmental issue and a laggard on another? Why did our federal and provincial governments swiftly implement effective regulations and innovative economic instruments to address ozone depletion while relying almost exclusively on education and voluntary programs in their unsuccessful efforts to address climate change?

There are numerous factors suggested as differences between ozone depletion and climate change, including:

- the science of climate change is less certain;
- substitutes and alternatives to fossil fuels are less readily available;
- there is a perceived lack of public concern about climate change, unlike the public furor about the "ozone hole";
- the federal government lacks the constitutional jurisdiction to play a leadership role on climate change because the provinces are responsible for natural resources;
- the economic stakes are larger for climate change and there are widespread concerns about impacts on competitiveness;
- those with vested interests in the status quo have more political power;
- addressing climate change is more complex because there are more sources of greenhouse gases to deal with;
- the *Kyoto Protocol* is weaker than the *Montreal Protocol*; and

- the United States was a global leader in tackling ozone depletion but is undermining international efforts to tackle climate change.

The first four differences described above are red herrings used as excuses to justify government and industry inaction. The remaining differences are more substantive obstacles to Canadian action to reduce greenhouse gas emissions.

The notion that scientific uncertainty is a reasonable excuse for refusing to address climate change is no longer tenable. Only a handful of largely discredited scientists continue to deny the existence of ozone depletion and climate change.¹⁸⁸ The vast majority of scientists concur that both of these global atmospheric problems exist and are caused by industrial human activities. As Dr. Andrew Weaver, Canada Research Chair in Atmospheric Science in the School of Earth and Ocean Sciences at the University of Victoria, states:

Those of us who work in the area of climate science are continually befuddled as to what the so-called debate on global warming is all about. There is really no scientific debate on the issue, only an artificial debate perpetuated by the media and certain corporate interests.¹⁸⁹

Similarly lacking in merit is the suggestion that our industrial society lacks viable alternatives and substitutes. There are dozens of practical, economical solutions waiting for politicians, corporations and individuals to embrace and implement them. Canada's two extensive national consultation processes on climate change prescribed many of these solutions.¹⁹⁰ Many respected research and advocacy organizations including the Pew Centre on Global Climate Change, the Pembina Institute for Appropriate Development, the American Council for an Energy Efficient Future, the World Wide Fund for Nature, the Union of Concerned Scientists, the Tellus Institute, the Rocky Mountain Institute and the David Suzuki Foundation have published comprehensive reports outlining a range of regulatory and policy changes, financial incentives and research and development priorities.¹⁹¹

Canadian author Guy Dauncey published "Stormy Weather: 101 Solutions to Global Climate Change," a book offering solutions at all levels from local to worldwide.¹⁹² Energy expert Ralph Torrie argues that using existing technology, Canada could reduce greenhouse gas emissions 50% by 2030 in ways that benefit, rather than harm, the economy.¹⁹³ European nations are demonstrating leadership in cutting greenhouse gas emissions by up to 25% through a variety of innovative means while maintaining quality of life, social well-being and economic prosperity.¹⁹⁴ A European Union study estimates that Europe could create 900,000 new jobs by doubling production of renewable energy in the next ten years, while saving \$32 billion and 402 million tonnes of carbon dioxide emissions annually.¹⁹⁵ As well, passing laws and regulations that provide clear targets and timelines for reducing greenhouse gas emissions would stimulate innovation in the pursuit of alternatives, as occurred during the phase-out period for ozone-depleting substances.

The third erroneous argument used to defend a lack of strong action to reduce greenhouse gas emissions is a perceived lack of public concern about climate change, perhaps due to the lack of dramatic images such as the 'hole' in the ozone layer. Yet a striking 93% of Canadians want Canada to meet or exceed its international commitment to stabilize greenhouse gas emissions.¹⁹⁶ Only 6% of Canadians believe that the *Kyoto Protocol* goes too far and would hurt Canadian jobs and industry.¹⁹⁷ A growing number of Canadians believe that governments should assume the worst about the impacts of climate change and take major action now, despite significant costs and scientific uncertainty.¹⁹⁸

The fourth excuse relied upon for Canada's failure to take effective action to address climate change is the division of law-making powers between the federal and provincial governments under Canada's *Constitution Act, 1982*. The federal government is responsible for negotiating international agreements, such as the *Kyoto Protocol*. Provincial governments are responsible for managing most natural resources and therefore play a potentially large role in implementing many of Canada's international environmental commitments, including *Kyoto*.¹⁹⁹

At first blush, Canada's arcane constitutional arrangement appears to provide a reasonable justification for the federal government's unwillingness to take concrete steps to address climate change. In reality, it is a smokescreen used by the federal government to evade responsibility for environmental matters. The Supreme Court of Canada has repeatedly ruled that for issues of national and international concern, the federal government has the jurisdiction to act. Known as the national concern doctrine, this legal principle has been used to uphold federal legislation dealing with ocean dumping in provincial waters and the establishment of a green belt around Ottawa.²⁰⁰ If laws to regulate marine pollution and maintain natural space around Canada's capital qualify as issues of national concern, then surely so would laws passed for the purpose of protecting the global climate by reducing greenhouse gas emissions. As Environment Canada stated in the context of jurisdiction to address ozone depletion:

The federal government is generally responsible for issues deemed to be in the national interest, and as such is responsible for implementing the provisions of the *Montreal Protocol*, including controls on the manufacture, import and export of Ozone Depleting Substances under the Canadian Environmental Protection Act. Provincial governments are responsible for the regulation of emissions and discharges to the environment and govern the implementation of ODS recovery and recycling programs.²⁰¹

Given the strong scientific consensus about climate change, the availability of cost-effective alternatives and substitutes, the high degree of public concern and the strong legal basis for federal action, the question remains: Why is Canada a leader in fighting ozone depletion and a laggard in battling climate change? There are five plausible reasons why Canada has failed to take effective action to reduce greenhouse gas emissions.

First and probably foremost are economic concerns. Throughout the 1990s, claims of economic impacts were used to justify the lack of concrete steps taken to reduce Canadian emissions. Gwyn Morgan, President and Chief Executive Officer of the Alberta Energy Company Ltd., claimed that taking concrete steps to reduce greenhouse gas emissions “could spread a virulent virus which emaciates the livelihood and living standards of millions of Canadians.”²⁰² Although Morgan's hyperbolic rhetoric is a poor substitute for reasoned argument, the energy sector does contribute 7% of Canada's GDP, produces \$26 billion in exports and directly employs 280,000 people.²⁰³ Reducing greenhouse gas emissions will certainly require major changes to Canada's energy industry and overall economy, but these changes are not necessarily negative. The impacts will certainly not amount to “trillions of dollars” of losses for Alberta alone, as suggested by Alberta Premier Ralph Klein.²⁰⁴

Expert opinion is divided over whether reducing greenhouse gas emissions will have negative economic impacts or positive economic effects. The Intergovernmental Panel on Climate Change estimates that the costs of complying with the *Kyoto Protocol* for industrialized countries like Canada will be between 0.1 and 1.1 percent of GDP.²⁰⁵ A comprehensive study done for the federal government concluded that meeting Canada's Kyoto obligation could cost Canada between 0 and 3 percent of GDP by the year 2010, or in absolute terms, \$40 billion dollars.²⁰⁶ Although this figure sounds large, it means that economic growth from 2000 to 2010 would be 26% instead of 30%. An Australian study pegs the costs to Canada of Kyoto compliance at roughly 0.4% of GDP annually.²⁰⁷

On the other hand, numerous studies anticipate economic benefits from reducing greenhouse gas emissions. In 1990, a federal government research report estimated that reducing carbon dioxide emissions by 20% could save Canada \$99 billion.²⁰⁸ Estimates of the economic value of health care benefits from reducing greenhouse gas emissions range from \$300 to \$500 million annually to more than \$10 billion annually.²⁰⁹ The World Resources Institute, the Royal Society of Canada, the U.S. Department of Energy and the U.S. National Academy of Sciences all anticipate that reducing greenhouse gas emissions will provide long-term net economic benefits.²¹⁰ A statement signed by 2800 economists from Canada and the United States (including eight Nobel Laureates) declared “economic studies have found that there are many potential policies to reduce greenhouse gas emissions for which the total benefits outweigh the total costs.”²¹¹

Another group of studies focuses on the substantial costs that will be incurred if Canada and the world fail to meaningfully address climate change. A recent study prepared for Environment Canada concluded that the impacts of climate change in Canada could cost from \$3.5 billion to \$24.5 billion annually.²¹² Another study projects a 1.5% reduction in Canada's GDP due to the impacts of climate change (\$8 to \$12 billion annually).²¹³ Other economists warn that “the public and private cost of climate change related health problems is potentially high.”²¹⁴

No consensus exists about the economic impacts of climate change or the net costs and benefits of reducing greenhouse gas emissions. Canada's experience in addressing ozone depletion suggests that potential costs tend to be exaggerated and prospective benefits underestimated. There are many specific initiatives to reduce greenhouse gas emissions that are expected to produce net economic and environmental benefits, such as investments in improving the energy efficiency of buildings and expanded public transit, yet Canada has implemented few of these win-win solutions.

The second plausible reason for Canadian policy paralysis on climate change is that corporate Canada and the provincial governments, particularly the fossil fuel industry and Alberta, are fighting vigorously against taking concrete action by questioning the science, warning of economic doom, scoffing at public concerns and aggressive lobbying. The influential Business Council on National Issues, representing 150 corporations with 1.3 million employees and over \$2 trillion in assets, has tried to dissuade the federal and provincial governments from implementing any new laws, regulations or taxes or other effective strategies to reduce greenhouse gas emissions.²¹⁵ As Canada moves toward ratifying the *Kyoto Protocol*, industry efforts to dissuade parliamentarians from acting are intensifying, with the Canadian Chamber of Commerce, the BCNI, and large industrial sectors all exerting pressure.²¹⁶

Unfortunately, most of corporate Canada is completely out of step with the international business community in its dogged denial of the importance of responding to climate change. Business executives attending the World Economic Forum 2000 in Davos, Switzerland voted climate change as “the greatest challenge facing the world at the beginning of the century.”²¹⁷ Even British Petroleum and Shell openly acknowledge the reality of climate change and are investing billions of dollars in renewable energy.²¹⁸ Nevertheless, heavy lobbying by corporate Canada has thus far managed to convince Canadian governments to rely on voluntary programs instead of taking effective steps to reduce greenhouse gas emissions.

The third factor contributing to Canada's lack of progress is that addressing climate change is much more complex than ending ozone depletion. While ozone-depleting substances played a useful but minor role in our industrial society, activities causing greenhouse gas emissions are ubiquitous, particularly when it comes to our reliance on fossil fuels for energy. As a result, measures to reduce emissions will be more complex, and will have to be carefully crafted to avoid placing a disproportionate share of the costs on one particular group of people or businesses. Although it is a legitimate concern, complexity is not a valid justification for failing to act, particularly when other nations are overcoming this hurdle. Again, if European nations such as Sweden, Denmark, Germany and the United Kingdom can address the challenges of climate change through innovative changes to their economies, so can Canada.

The fourth possible explanation for Canada's unwillingness to take strong steps to address climate change involves perceived flaws in the *Kyoto Protocol*. Unlike the *Montreal Protocol* on ozone-depleting substances, the *Kyoto Protocol* does not include any reduction targets or timetables for developing nations. However, these issues are to

be addressed as the *Kyoto Protocol* evolves, in a manner similar to that employed in the *Montreal Protocol*. As with the production and use of ozone-depleting chemicals, industrialized nations have produced most of the world's greenhouse gas emissions to date. Equity demands that these nations be the first to reduce their emissions.

Nevertheless, because developing nations like China, India and Brazil account for a substantial proportion of today's global greenhouse gas emissions, there is a perception that the lack of targets and timelines for these nations undermines the treaty's ability to effectively address climate change. At the November 2001 *Kyoto Protocol* negotiations in Morocco, a process was initiated that will address this issue. Another problem is that whereas the *Montreal Protocol* set out clear reduction targets and deadlines that applied to all industrialized nations equally, under *Kyoto* different industrialized countries have different targets. The end result is that some countries, including the United States, now regard *Kyoto* as both ineffective and unfair.

The problem with these criticisms is that the *Kyoto Protocol* is intended to be a first step, not a panacea. The *Montreal Protocol* was far from perfect in its original conception, but was strengthened repeatedly over a twelve-year period to be more and more effective.

The fifth reason for Canada's reluctance to reduce greenhouse gas emissions is our close relationship with the United States. In part, this is another economic argument, based on fears that unilateral Canadian policy changes could damage Canada's competitive position vis-a-vis our major trading partner. At the present time, the likelihood of the United States taking strong steps to address climate change is low, which negatively affects the likelihood of Canadian action.

The United States sees Canada as a reliable solution to its current energy woes. The new U.S. National Energy Policy forecasts that in the next twenty years, American consumption of oil will rise 33%, natural gas more than 50% and electricity demand will grow by 45%, requiring 1300 to 1900 new power plants.²¹⁹ In 2001, President George W. Bush rejected the *Kyoto Protocol* and announced that the United States would not comply with its emissions reduction schedule. Although Prime Minister Chretien responded by reiterating Canada's intention to fulfill its *Kyoto* pledge to reduce greenhouse gas emissions to 6% below 1990 levels by 2008-2012, this must be viewed with considerable skepticism because of Canada's rising emissions and corporate Canada's heavy anti-*Kyoto* lobbying.

The latest projections show Canadian emissions rising 27% above 1990 levels by 2010. If Canada increases energy exports to meet American demand, Canadian emissions could soar to 44% above 1990 levels by 2010, a far cry from our international commitment.²²⁰ Canada's willingness to satisfy burgeoning American energy demands badly compromises our ability to meet our climate change commitments. According to former Liberal cabinet minister Lloyd Axworthy, "the potential contradiction between Canada's position on energy development and climate change needs to be addressed sooner rather than later."²²¹

V. Conclusion

Canada deserves tremendous credit for its leadership in the global campaign to protect the ozone layer. Not only did Canada play a vital role in the negotiation of international agreements to protect the ozone layer, we met and exceeded our commitments under those agreements. Canada lived up to its obligations by implementing a coordinated array of strong laws and regulations at both the federal and provincial levels, complemented by the innovative use of market-based tools. Instead of harming our economy, as critics predicted, the phase-out of ozone-depleting substances produced net economic benefits for companies, countries and the world. Canada is also contributing to the global solution by investing in the efforts of developing nations to reduce and eliminate their use of ozone-depleting chemicals.

While the problem of ozone depletion is not completely solved, both Canada and the international community have demonstrated an unprecedented ability to cooperate in addressing a dramatic environmental threat to the future. Scientists expected that the ozone layer would begin healing later this century because atmospheric concentrations of ozone-depleting chemicals are now beginning to decline. Unfortunately, new scientific research reveals that the anticipated healing of the ozone layer is now being jeopardized by climate change.

In contrast to the remarkable progress on ozone depletion, the threat of climate change has not been effectively addressed. To date, neither the international community nor Canada has made significant progress towards reducing greenhouse gas emissions. Despite a plethora of potentially effective regulatory and fiscal options, the federal and provincial governments, under pressure from industrial polluters, have relied primarily on voluntary programs to address the threat of climate change. These voluntary programs, which could play a useful role in a comprehensive strategy to reduce greenhouse gas emissions, are grossly inadequate on their own. The incontrovertible proof of their failure is provided by the fact that Canadian greenhouse gas emissions rose 15% during the 1990s, a period in which Canada had promised they would fall by 20%.

The good news is that there are some recent signs, both globally and nationally, that we may be turning the corner. The contentious details surrounding implementation of the *Kyoto Protocol* were finally hammered out. Canada is promising to ratify Kyoto in 2002, making our international pledge to reduce greenhouse gas emissions legally binding. In a recent disagreement with Alberta Premier Ralph Klein, who opposes Kyoto, Prime Minister Chretien re-confirmed that "We have the intention of ratifying [the protocol]."²²²

To make progress in addressing climate change, Canadian governments need to adapt the formula that successfully targeted ozone-depleting substances for elimination. Canada should provide international leadership by ratifying the *Kyoto Protocol* early in 2002 and working to strengthen the agreement, rather than weakening it. Domestically, Canada should use effective tools including laws, regulations, improved standards, and

innovative economic instruments, while aggressively investing in renewable energy, energy efficiency, public transit and other proven emission reduction measures. If progressive corporations and industrialized northern European nations can make progress using these strategies to reduce greenhouse gas emissions without experiencing economic turbulence, Canada should be able to do the same. The aggressive objections of certain industrial sectors and their lobbyists must not be allowed to outweigh the overall public interest in protecting the climate. As a recent Globe and Mail editorial stated, "In Morocco, Canada and other industrialized countries agreed on the rules for cutting noxious emissions. Now there are no more excuses."²²³

There is no shortage of solutions to the challenge of climate change, only a shortage of social and political will. The protection of the earth's ozone layer provides an extraordinarily powerful symbol of environmental optimism and hope, proving that humanity in general, and Canadians in particular, are capable of summoning the wisdom necessary to protect the planet for future generations. Because Canada's inaction on climate change threatens to undermine the progress in protecting the ozone layer, it is doubly important that Canadian governments, corporations and citizens immediately take the steps necessary to reduce greenhouse gas emissions. Until then, the health of the earth's atmosphere remains up in the air.

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- ⁸⁴ Environment Canada, 1996. "The State of Canada's Environment, 1996" (Ottawa: Minister of Public Works and Government Services) p. 15-4.
- ⁸⁵ In November 1995, 2500 leading climate scientists endorsed the United Nations Intergovernmental Panel on Climate Change (IPCC) "Summary for Policymakers: Scientific Technical Analysis of Impacts, Adaptations and Mitigation of Climate Change", (NASA). In 1995 the IPCC stated that "The balance of evidence suggests a discernible human influence on global climate. In 2001, the IPCC described "new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities" (IPCC, "Climate Change 2001: The Scientific Basis, Summary for Policy Makers"). Noted scientist, broadcaster, author and environmentalist David Suzuki describes climate change as "the greatest threat to humanity in the modern era." See www.davidsuzuki.org
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- ⁸⁷ Government of Canada, 1999. "Global Climate Change: It's About Our Environment, Our Economy, Our Future."
- ⁸⁸ Intergovernmental Panel on Climate Change, 2001. "Climate Change 2001: The Scientific Basis, Summary for Policy Makers." www.ipcc.ch
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- ⁹³ IPCC Working Group II, 2001. "Climate Change 2001: Impacts, Adaptation and Vulnerability, A summary for Policymakers", p. 3. www.ipcc.ch
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