

From Commitment to Compliance: Dealing with Atmospheric Risks in Canada and the United States[†]

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Draft for Discussion – Please Do Not Cite or Quote

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Abstract

We describe the history of international efforts to design and implement multi-party agreements to address the global atmospheric problems of acid deposition, stratospheric ozone depletion and climate change, and compare U.S. and Canadian policies oriented towards these risks over the past quarter century. An adaptation of Putnam's (1988) two-level games metaphor is presented, focusing on the complex chain of events from international agreement formulation, through domestic ratification and policy implementation to the actions of private and public actors which ultimately determine compliance and implementation success. With increasingly converging policy approaches in the two countries, efforts to address global climate change have come to focus on the search for technological solutions and the prospects for voluntary compliance. While voluntary approaches tend to rely on self interest as a motivating force, social capital may have a role in promoting altruistic behavior.

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Introduction

The twentieth century has witnessed an accelerating compression of the world into a global village, where the integration of economic, cultural and environmental forces has made the recourse to isolationism less plausible with each passing year. The understanding of global atmospheric risks, and the international efforts to deal with those risks in multi-party, cooperative, regimes has been an important part of this trend. When viewed over the past quarter century, international cooperation to protect the environment stands as a success story in a world prone to cooperators' dilemmas.

But the long road between risk assessment and implementation success involves many players at several levels of activity. Along that road, global abstract ideas must be translated into national action plans formulated as laws, regulations and policies. But ultimately, the success of international approaches hinges upon the billions of individual actions undertaken each day around the world. For even as the world comes to resemble more and more a global village, it is still comprised of numerous real villages, communities and individuals operating at scales that make sense to people. It is this tension, between the abstract global and the immediate local, that lies as a key feature in the management of global atmospheric risks.

We start here by describing the context of the global atmospheric risks of acid deposition, stratospheric ozone depletion and climate change, the international (and bilateral) agreements that have been forged in an effort to address those risks, and the international record on translating that concern into nationally supported commitments to share the burden of managing that risk. The policy making contexts of Canada and the United States are then highlighted and contrasted. Then, the international record generally, and the Canadian and American records specifically, are explored, looking at the relationship between action taken and results achieved under the international management regimes. As we continue along the path from concern through commitment to compliance, we shift our focus to the unconquered problem in global atmospheric risks: climate change. In order to make sense of the failures in addressing greenhouse gas emissions, we adapt Putnam's (1988) two level games metaphor to incorporate a third level: individual decisions made by public and private actors, and their position in the chain between commitment and compliance. With policy approaches continuing to narrow between Canada and the United States, the differences in governing instruments have become differences of degree rather than kind. Some observations about the contrasting cultures of the two countries – still distinct enough perhaps to make a difference – and how they might contribute to success in reducing greenhouse gas emissions are offered in closing.¹

1 The Setting: Two Countries, Three Risks, Many Meetings

1.1 Global Atmospheric Risks

As part of an evolving understanding of the relationship between humans and nature, the effort to organize global environmental science with the International Geophysical Year (IGY) of 1957 built upon the previous half-century's growing understanding of humanity's place in the biosphere. As reflected in Vernadsky (1945), humankind had shown itself to be "a mighty geological force" – and science has sought to improve its understanding and measurement of the impacts of that force. The second half of the 20th century has witnessed dramatic increases in knowledge surrounding global environmental risks, bringing with it important advances in attempting to manage those risks. As the science of global environmental change has come better to understand the biosphere as a dynamic, integrated system, however, the understanding of the place of humans within that system has lagged. In this paper we take the scientific consensus on these issues at face value and focus instead on how collective decisions and individual action respond to the scientific evidence as it evolves.

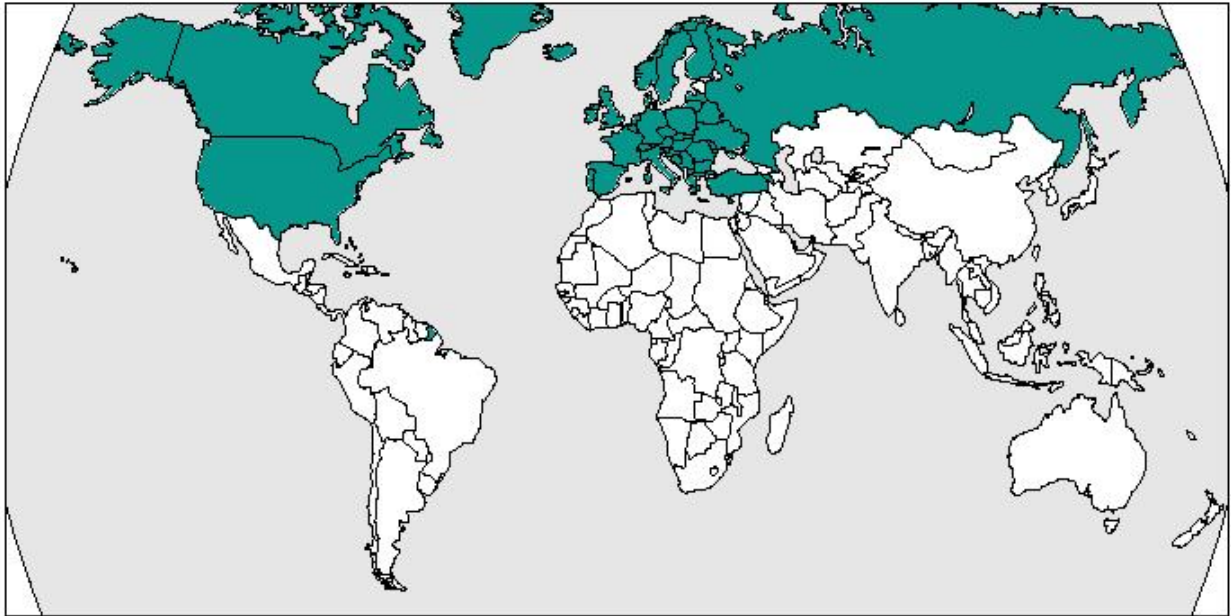
Global atmospheric risks – the specific environmental focus of this paper – are a subset of global change, concerned with anthropogenic emissions which manifest themselves as degraded air quality, a decline in the capacity of the atmosphere to perform particular functions, or an unbalancing of the biospheric system. But to call the atmosphere a subsystem of the biosphere is obviously an artificial construct; the integrative nature of the planet and its surrounding envelope make their abstract separation impossible in reality. And to extend that artifice to single out long-range acid deposition, stratospheric ozone depletion and global climate change² as three separate kinds of global atmospheric risks asks further for some suspension of disbelief. Yet the focus of this paper, how governments – in particular those in the United States and Canada – deal with these specific atmospheric risks, requires just such an artificial construction of the biosphere.

1.2 Bilateral and International Agreements (and Disagreements)

With the growth in understanding of the global nature of some atmospheric environmental problems, efforts to manage those problems internationally have followed. With the peak in international environmental cooperation occurring around the time of the United Nations Conference on Environment and Development (UNCED), convened in Rio de Janeiro in 1992, the appetite for negotiating grand new agreements appears to have waned.³ Into this vacuum of bold leadership has flowed attention to the implementation of domestic efforts designed to meet the abstract commitments set out in the agreements (see Victor *et al.*, 1998).

1.2.1 Convention on Long Range Transboundary Air Pollution

In the mid-1970s, the diverse agendas of Scandinavian acid rain concerns and east-west détente efforts resulted in an agreement to measure and control transboundary air pollutants. Convened in 1977 under the auspices of the United Nation's Economic Commission for Europe (ECE), the negotiations led to the Convention on Long-Range Transboundary Air Pollution (LRTAP), signed by 34 states and the European



Community in 1979.⁴

Figure 1: Parties to the LRTAP Convention.

Source: Bergesen et al., 1999.

- The 1984 Geneva Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP)⁵
- The 1985 Helsinki Protocol on the Reduction of Sulphur⁶ Emissions or their Transboundary Fluxes by at least 30 per cent⁷
- The 1988 Sofia Protocol concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes⁸
- The 1991 Geneva Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes⁹
- The 1994 Oslo Protocol on Further Reduction of Sulphur Emissions¹⁰
- The 1998 Aarhus Protocol on Heavy Metals¹¹
- The 1998 Aarhus Protocol on Persistent Organic Pollutants (POPs)¹²

Table 1: Protocols to the LRTAP Convention¹³

The LRTAP Convention was the first international legally binding instrument¹⁴ designed to deal with the long-range transmission of air pollution. The Convention established the general principles of international cooperation for controlling air pollution, and set up an institutional framework for bringing together scientific research and policy making. The LRTAP did not accomplish much on its own, but has been extended by seven protocols (listed in table 1, above) which have provided for monitoring, evaluation and binding emissions reductions targets for a number of pollutants.

1.2.1.1 Canada-U.S. Air Quality Agreement

Bilateral negotiations between the US and Canada resulted in a 1980 non-binding memorandum of intent similar to the original 1979 LRTAP Convention. However, a binding bilateral agreement on transboundary air pollution did not emerge until the United States had developed a domestic sulfur control policy (enunciated in the 1990 amendments to the Clean Air Act) consistent with the Canadian demands for an air quality treaty. Signed in March 1991, the Agreement enshrined measures already existing in both countries' domestic legislation and commitments into a bilateral commitment. The United States agreed to a mutual exchange of commitments on reducing national emissions, while Canada adopted a national sulfur cap¹⁵ and enacted automobile NOx standards equivalent to the US Clean Air Act. The agreement also established monitoring coordination and information exchange mechanisms, and procedures for developing protocols on other pollutants.

The main criticisms of environmental NGOs and other critics of the Canada-U.S. AQA was that it achieved nothing beyond that which was contemplated under each country's domestic legislation. Munton and Castle (1995), however, claim that the Agreement's achievements are significant, not least of these being the mechanisms established for dealing with future transboundary air pollution problems (see below).

1.2.2 Vienna Convention on Ozone Depleting Substances

UNEP, the United Nations Environment Programme, is due the greatest credit for marshalling and coordinating the research, monitoring and, above all, interest in protecting stratospheric ozone (Clark *et al.*, 2000). In 1977, UNEP convened a meeting to craft a *World Plan of Action* to protect the ozone layer, which was followed by the establishment of the Coordinating Committee on the Ozone Layer (CCOL) to oversee implementation. In 1982, UNEP further established a Working Group of legal and technical experts to prepare a framework convention for protection of the ozone layer, which eventually became the 1985 Vienna Convention for the Protection of the Ozone Layer. The Convention achieved no immediate objective other than to reaffirm the *Plan of Action*, with no commitments or binding mechanisms put in place, but ultimately led to the Montreal Protocol and several strengthening amendments. The Convention was initially signed by only 28 countries, but today has 169 Parties.¹⁶



Figure 2: Parties to the Vienna Convention and Montreal Protocol

Source: Bergesen et al., 1999.

With mounting dramatic evidence of advancing deterioration of the ozone layer (particularly the Antarctic “ozone hole”), the Montreal Protocol to the Vienna Convention was signed in 1987, committing signatories to reduce production and use of CFCs by half by 1998 and to freeze production and use of halons by 1992. The Protocol, while quite ambitious at the time, was crafted to be flexible enough to allow new scientific evidence to drive further strengthening of the Protocol. The Protocol came into force on January 1st, 1989, and has been amended four times: in London (1990), Copenhagen (1992), Vienna (1995)¹⁷ and Montreal (1997). The Protocol aims to reduce and eventually eliminate anthropogenic emissions of ozone depleting substances.¹⁸

1.2.3 United Nations Framework Convention on Climate Change

In December, 1990, a resolution of the United Nations General Assembly called for the establishment of an International Negotiating Committee (INC) to develop a framework convention on climate change. Starting in early 1991, the INC completed the UN Framework Convention on Climate Change (UN FCCC), which was signed at the UN Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992. The UN FCCC, like the LRTAP and Vienna conventions, contained no binding commitments; however, industrialized countries did agree to a non-binding target to stabilize their CO₂ emissions at 1990 levels by the year 2000, and the convention established subsidiary bodies and a process for submission and review of national reports on mitigation and adaptation strategies.¹⁹

The FCCC entered into force on March 21, 1994. With 156 original signatories, the number of parties currently stands at 176.

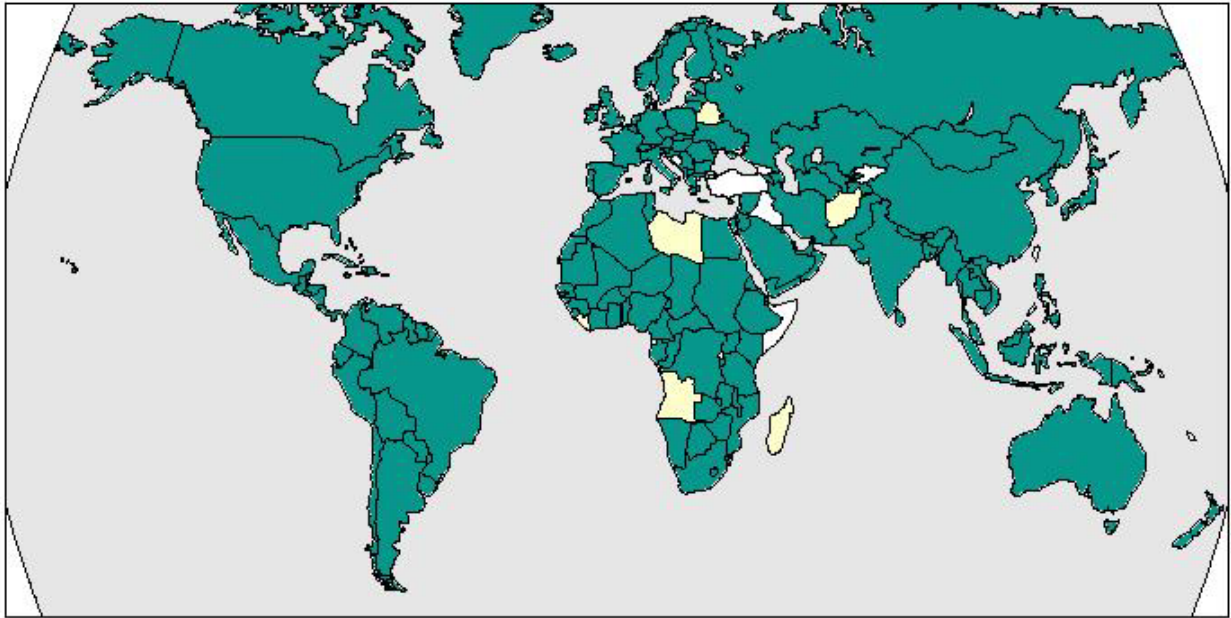


Figure 3: Parties to the UN FCCC

Source: Bergesen et al., 1999.

The framework convention established Conferences of the Parties (COPs) which are to be convened every year (article 7, UN FCCC). COP1 was held in Berlin in 1995, where the Ad-Hoc Group on the Berlin Mandate (AGBM) was charged with assessing appropriate action for the FCCC beyond 2000, and negotiating binding targets and timetables for greenhouse gas limitations or reductions through the adoption of a protocol or other legal instrument.²⁰ At COP2 in Geneva, the conclusions in the Second Assessment Report of the IPCC (1996) were endorsed, and the COP called for legally binding objectives and significant reductions in greenhouse gas (GHG) emissions. Joining this sentiment was the United States which, for the first time, supported a legally binding agreement under the terms of the Berlin Mandate – with the stipulation that this support was linked to its preference for a tradable permit system.

At COP3 in Kyoto, Japan in December 1997, the parties agreed to the Kyoto Protocol, which contains binding reduction targets for six greenhouse gases²¹ for the convention’s Annex I (i.e., industrialized) countries. The Annex I Parties adopted differentiated reduction targets of at least 5% below 1990 levels to be reached during the commitment period 2008 - 2012²² (the average reduction commitment was 5.2%)²³. The Protocol also established several new instruments including joint implementation between developed countries, emissions trading and a “clean development mechanism” to encourage joint emissions reduction projects between developed and developing countries.²⁴

COP4, held in Buenos Aires in November 1998, was to work out the implementation details of the Kyoto Protocol. It involved long negotiations which produced the *Buenos Aires Plan of Action*, in which the Parties declared their determination to strengthen the implementation of the Convention and prepare for the future entry into force of the Kyoto Protocol. More importantly, the host country Argentina broke ranks with non-Annex I partners (called the G-77/China group) and said that it would undertake a binding commitment at COP5 to abate its GHG emissions. With the first step towards developing countries undertaking a “meaningful commitment” to the Kyoto Protocol, a

key U.S. condition for signing the Protocol was met; the U.S. signed less than 24 hours after the Argentinean commitment.

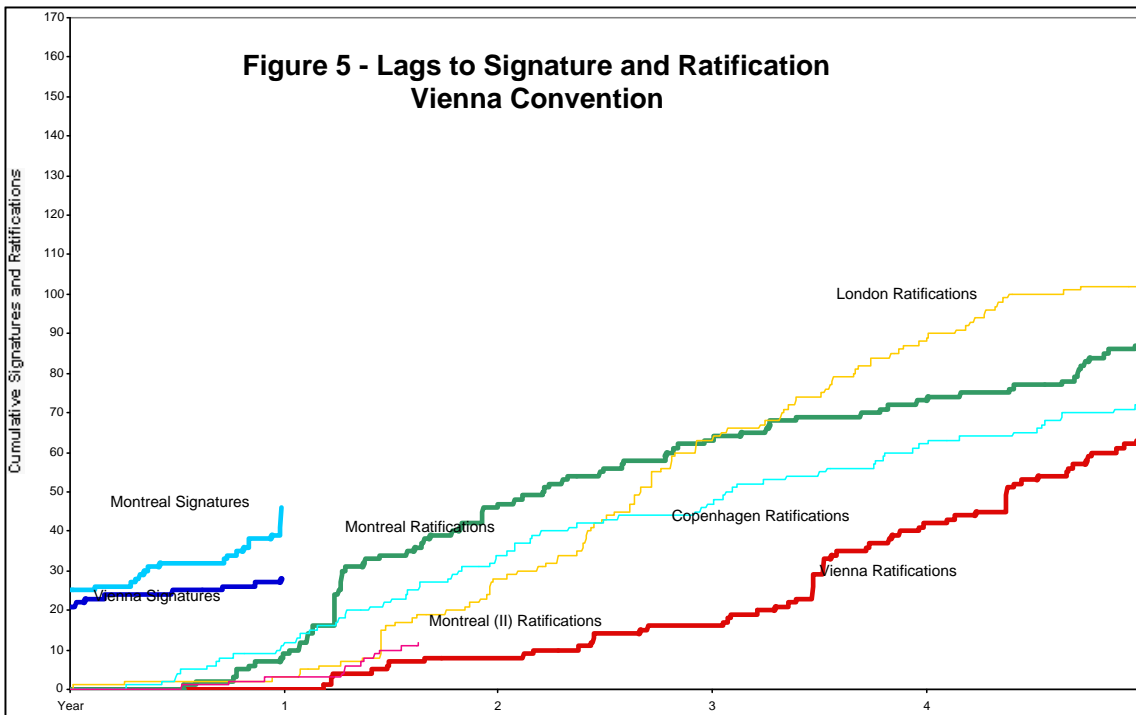
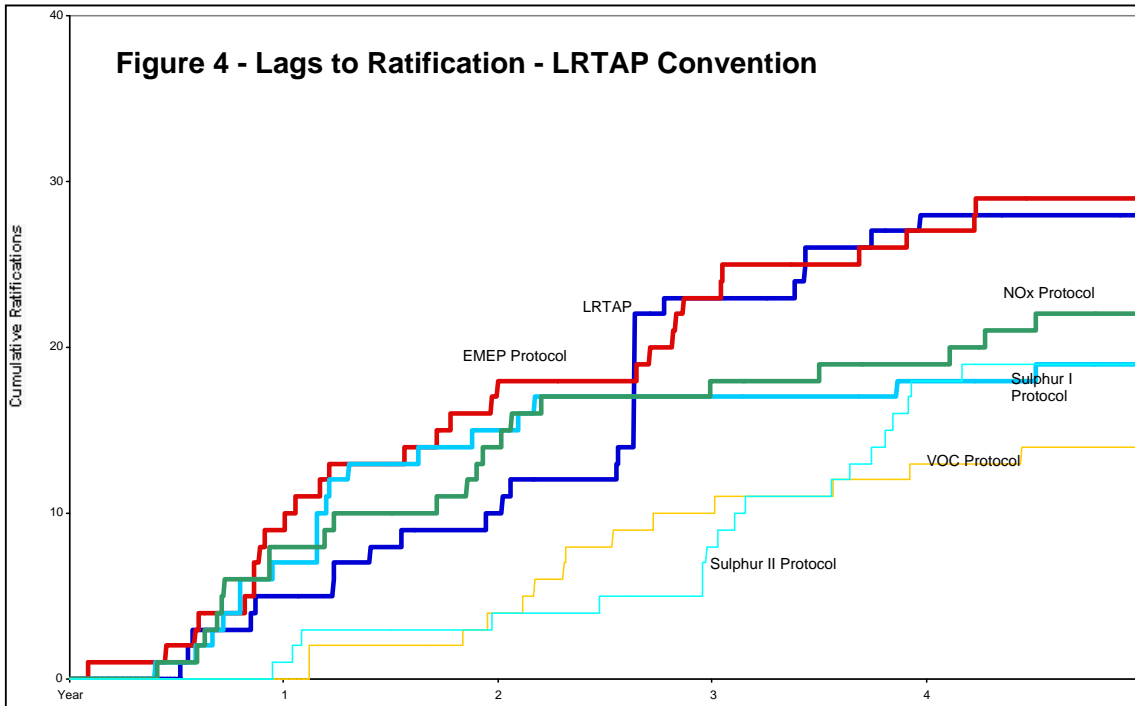
As had occurred at Kyoto, there was disagreement on the issue of emissions trading. The U.S. favors the use of emissions trading to achieve Kyoto's goals, whereas Europe favors higher taxes as well as regulatory strategies such as fuel efficiency requirements for vehicles and mandated pollution controls for utilities and industry. At Buenos Aires, Canada asked for agreement on a standard unit for emissions trading that could become the system's currency, and called for national registries of available credits. Canada wants private companies to participate directly in trading rather than working through governments, and is aligned with the U.S. in support of such a trading regime. Canada also supported plans to examine the development of clean technologies and encouraged private sector involvement.²⁵

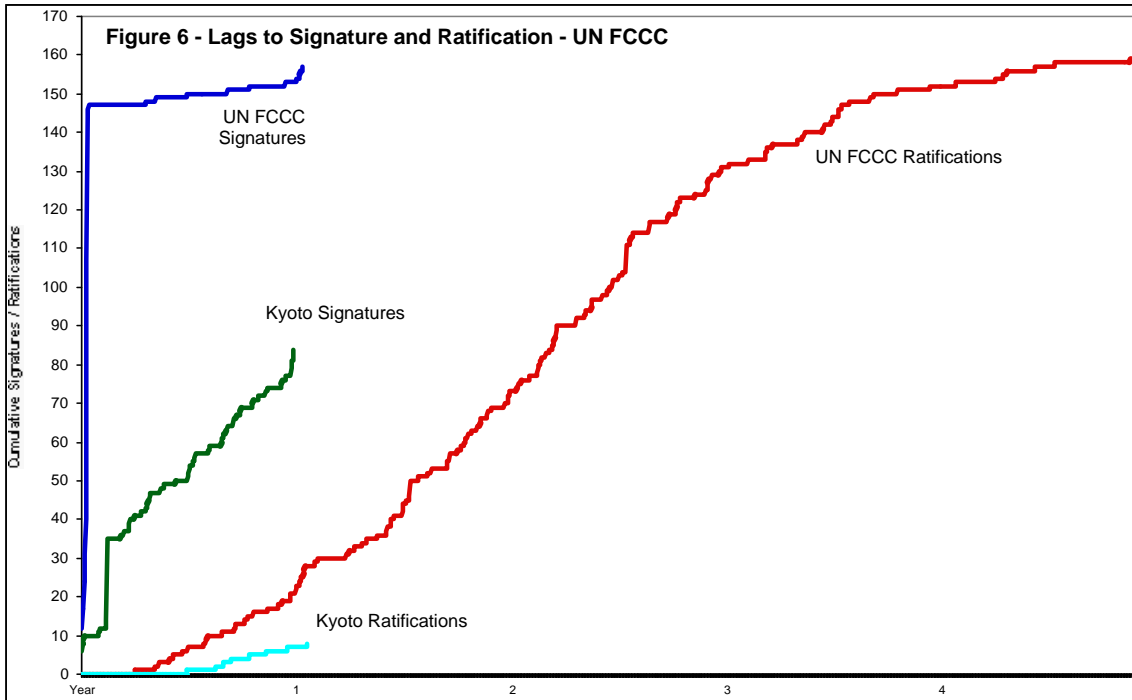
1.2.4 Level One ... Going Up? Ratification of Commitments

We turn to the question of two-level games below (see section 3.1), but note here briefly that the commitments made by national governments in the international negotiating forums described above all require a process of ratification, as the formal signal of acceptance of the terms of the agreement, for the agreement to bind the Party in international law.²⁶ This section briefly explores the process between commitments made at international forums and ratification by national legislatures. While this review rests simply on the timing of these events and the delays between negotiation and ratification, such an analysis should not imply too much about a nation's commitment to the ultimate aims of the agreement. Rather, the quantification of delays to ratification can only give an impression of one part of the path from commitment to compliance; as an indication that the national legislative body has given its assent to the agreement and committed the nation to the general principles of the convention, ratification signals that the process of domestic implementation has reached "the end of the beginning."

Three Cases and Their Messages

All three of the following charts (figures 4 – 6) measure the cumulative signatures and ratifications that a particular international environmental convention, protocol or amendment received, tracked over a five-year period taking as the starting point the date on which the instrument was negotiated or officially opened for signature. Signatures are tracked for the Vienna Convention and UN FCCC, and for the Montreal and Kyoto Protocols, while ratification data is presented for the above instruments as well as the LRTAP Convention (and five of its seven Protocols) and the amendments to the Montreal Protocol.²⁷ All three charts use the same time scale along the x-axis, measured in days and marked in one-year increments (365 days).²⁸ The five-year cut-off was selected in order to give an impression of the overall ratification process without extending the charts unreasonably.²⁹ The y-axis uses as a maximum the approximate number of Parties to the founding Convention (LRTAP, Vienna or UN FCCC³⁰) in order that the lines should represent approximate percentage-of-total cumulative signatures and ratifications, rather than a measure of some common absolute number. Using this method, the slopes of the individual lines can be seen as comparable measures of the relative "enthusiasm" of the Parties in signing or ratifying the particular agreement.





Conventions and Protocols are usually open for signature for one year, though an agreement usually allows non-signatories to accede to the treaty at any time. But while signature does not commit a country to become a full Party bound by its terms if the country chooses not to ratify the agreement, and not signing does not constrain a country from becoming a full member in due course, we see that there is a marked difference between the two cases where meaningful signature data exists – ozone (figure 5) and climate change (figure 6). In the case of both the Vienna Convention and its subsequent Montreal Protocol, there was little enthusiasm for signing, with only 28 and 46 countries respectively choosing to sign during the one-year window – though through accession the number of Parties has grown to 169 over time (168 for the Montreal Protocol).³¹ Contrast this with the climate change convention and protocol, where there existed at Rio de Janeiro (where the UN FCCC was opened for signature) a veritable line-up of countries waiting to show off their green credentials by being an early signatory to the Convention. While support during the first year of the Kyoto Protocol was muted in comparison to the environmental hysteria evident at UNCED, signatures of Kyoto were much stronger than in the Montreal Protocol case. While it is true that the signature process does not entail *de facto* commitments or missed opportunities, it is clear that countries take the signature process seriously: very rarely do signatories not follow up with an instrument of ratification.³² Thus, the signature process can be said to demonstrate some indication of the Parties' interest in the objectives of the agreement.

The enthusiasm for the FCCC exhibited during the signature stage was apparently carried over to the ratification process. The climate convention case demonstrates the steepest slope of any of the ratification curves, with early commitments by the key Parties (the U.S. was the first country to ratify the FCCC) and a sustained rate of ratifications during the five-year study period. We will return to the paradox of this

enthusiasm below, but note briefly here the dichotomy between general enthusiasm for the objectives of the convention and the lack of progress in controlling greenhouse gas emissions. While the framework convention contains no targets or timetables for controlling or reducing ghg emissions, it can be assumed that ratification of the principles and “soft” targets in the convention (i.e., stabilizing ghg emissions at 1990 levels) was a serious process for most countries and an exercise of “sober second thought” away from the ebullience of the Earth Summit.

The ratification record for the various protocols and amendments shows similar patterns for the LRTAP and Vienna cases. Gradually, more Parties to the Convention ratify the ensuing protocols – though, since the later agreements require specific targets and performance, countries are generally cautious in ratifying a commitment before they are certain they are capable of achieving its terms. At this early date in the history of the Kyoto Protocol, that process looks even less vigorous than its anemic LRTAP and Vienna cousins, though only time will tell whether environmental and scientific pressure will increase the ratification rate significantly within the next three and a half years.³³

What is more telling is the comparison of the ratification records for the three founding conventions. The UN FCCC ratification record clearly shows the highest rate of commitment, with LRTAP ratifications close behind.³⁴ What is striking, however, is how the Vienna / Montreal ratification records exhibit such slow beginnings, picking up noticeably in later years.³⁵ The early skepticism surrounding the difficulty of reaching the Vienna / Montreal objectives has given way to a technological solution acceptable to most countries (i.e., to the identification and production of non-depleting substances that replaced CFCs and other chemicals). That this most successful of the three treaties should have started with such a poor ratification record is notable. Contrast that with the emerging skepticism with which many are beginning to view the FCCC and Kyoto commitments³⁶ – agreements which enjoyed strong early support.

With such a discrepancy between the signature / ratification record and the implementation / compliance “success” (as evidenced most notably between the ozone and climate cases), one is tempted to ask whether the ratification data is meaningful or relevant. If the Vienna / Montreal process has been successful, why should the ratification process matter? We contend here that it is this discontinuity in the climate case, between commitment and compliance, which shows that controlling greenhouse gas emissions is the truly hard part of global atmospheric risks that governments in their commitments, and environmental enthusiasts everywhere, have underestimated. In the climate case, states find they are faced with two separate problems: the hoped for technological solution to greenhouse gas emissions has not yet materialized, and the citizenry’s call for action on climate change has not translated into voluntary action by the individual consumer. While we argue that states took their UN FCCC signature and ratification processes seriously, the enthusiasm shown at Rio for the climate convention seems to have blinded the global community to the reality of climate change: reducing greenhouse gas emissions (in the absence of revolutionary technological solutions) is going to require some tough decisions.³⁷

1.3 Domestic Approaches to Global Environmental Risks

While our interest here is in international responses to global atmospheric risks, our focus is on the way in which those risks have been addressed in Canada and the United States and how the similar yet distinct cultures of the two countries have framed the issue in the past quarter century.³⁸ Occupying the second largest landmass in the world,

Canada's population of 31 million people ranks it as one of the more sparsely populated on the planet.³⁹ While this population is highly concentrated along the United States border,⁴⁰ Canada's size, colder climate and resource-intensive economy contribute to high per capita energy use and emissions of major atmospheric pollutants. The dramatic differences in geography, resources, climate and economic structure across the country mean that the sources, as well as impacts, of that pollution are also highly differentiated amongst the regions and provinces. The United States, while responsible for vastly greater absolute levels of pollution contributing to global atmospheric risks, generally contributes lower levels of these pollutants when measured in per capita terms or as a function of GDP, by virtue of its geographic, demographic and economic structures.

At the end of the century, Canada is increasingly linked – politically, economically and socially – with its neighbor to the south. Driven by proximity, these ties have been strengthened over the past decade by the Canada-U.S. Free Trade Agreement and its successor, the North American Free Trade Agreement. As a counterbalancing force to the dominant role that the U.S. plays in Canadian life, Canada has tended to stabilize its external posture through its support for international organizations and multilateral mechanisms (Keating 1993). This tendency is revealed in a history of Canadian support in building international environmental regimes.

Many of Canada's international agreements are bilateral accords with the United States. The vast shared border and close economic ties mean that bilateral environmental issues with the United States continue to figure prominently in Canada's international environmental agenda. Important bilateral accords such as the Canada-US Air Quality Agreement and the Great Lakes Water Quality Agreement have been instrumental in establishing protection regimes over shared air and water resources.

1.3.1 Environmental Policy Making in Canada and the United States

Perhaps the most singular feature of Canadian politics lies in the tension between the Westminster model of the federal parliament (in which a ruling majority generally ensures that the wishes of the government will be enacted) and the federal nature of the country (comprised of ten provinces and three territories). The Canadian constitution defines the relationship between these two orders of government, in which the federal parliament and the provincial/territorial legislatures are sovereign within their own spheres of competence – defined in the Constitution by the formal distribution of specifically enumerated legislative powers.⁴¹ In an increasingly complex world, however, these spheres often collide, with no obvious solution as to which order of government has jurisdiction.⁴² While the Constitution appears to favor a strong central government, early judicial decisions in favor of provincial authority, coupled with later forces driving decentralization, have produced a federation marked by politically powerful provinces.⁴³ The result is a legal description of the constitutional division of authority over environmental concerns that has been described as “federal in theory but often provincial in practice” (Morton, 1996, p.50). Negotiation, ratification and implementation of international environmental agreements can pose a particular challenge for Canada because of this complex jurisdictional mix. Consultation with provinces and territories, therefore, is a key element not only in building a national consensus on a Canadian negotiating position but also in ensuring successful implementation once an agreement is concluded.

Province-building efforts have engendered federal-provincial competition in many areas, not the least of which is environmental protection. The federal, provincial and territorial governments all have cabinet level departments responsible for environmental issues.⁴⁴ Environment Canada, the federal ministry, was formed as the Department of Environment in 1971 out of a number of existing departments and agencies. And the first Canadian Clean Air Act, enacted the same year, covered a broad set of ambient air issues related to human health and ecosystem damage. But the federal government is a relative latecomer to the environmental field, and recent moves by the federal government indicate a further retrenchment away from Environment Canada's hitherto increasing involvement in domestic and international environmental affairs.⁴⁵

Despite the complex array of administrative and legislative involvement on the part of both orders of government, implementation and enforcement of most environmental regulations is the responsibility of the provinces – whether *de jure* or by virtue of the large number of bilateral delegation agreements between the federal government and the provinces (Skogstad and Kofinas, 1992). The primary mechanism for coordinating the activities of the federal and provincial environment ministries is through the Canadian Council of Ministers of the Environment (CCME).⁴⁶ CCME is established as a non-governmental organization⁴⁷ comprised of environment ministers from the federal, provincial and territorial governments, providing a forum for discussion of the harmonization of laws, policies and actions, and the development of cooperative action by the member governments to address issues of national and international concern. These 14 ministers normally meet twice a year to discuss national environmental priorities and determine work to be carried out under the auspices of CCME (civil servants meet more often). Specifically, CCME focuses on: Information exchange to assist with problem solving and change management; harmonization (relating to nationally consistent standards and guidelines, process/approach/strategy, data management, policy development); coordinated jurisdictional input into federal, provincial and territorial environmental legislation as appropriate; and coordinated jurisdictional input on national and international environmental issues and problems.

Foreign Affairs and International Trade has the mandate to manage and conduct international negotiations, and to sign the resulting agreements on behalf of Canada. Although this Department is always part of the negotiating delegation, the lead responsibility is often given to or shared with the federal department having the expertise in the area of concern. In the environmental field, Environment Canada plays a key role in this process. The Department of Justice and the Department of Foreign Affairs and International Trade share the responsibility for advising on the legal implications of entering into treaties.

The federal government does not need the agreement of other orders of government to ratify international environmental commitments, however, as a matter of policy, Canada will not ratify a convention until it is sure that it is in a position to comply with the accord (CESD, 1998). In practical terms, this means enacted laws or regulations that meet the new international standards and ensure that the necessary administrative structures are in place – often at both the federal and provincial levels.

One other specific feature of Canadian environmental policy making mentioned here is the use of consultative processes designed to open decision making to more diverse public input and scrutiny. Dubbed the "Rio Way"⁴⁸ as it came to prominence during the multi-stakeholder discussions convened prior to the 1992 UNCED meeting in Rio de

Janeiro, *accountable*, *inclusive* and *transparent* processes appeared as a "profound transformation" in the way Canadian governments made decisions (Dorais, 1995) and as "the most significant innovation in the Canadian policy process in the past decade" (Glen Toner, quoted in Doering, 1995). The "Rio Way" does not survive today with the vigor that propelled it five years ago. The apparent demise of the multi-stakeholder consultative process is addressed in the closing section, below.

In the United States, the explicit separation of powers which underlies the constitution, maintaining distinct functions clearly demarcated between the executive, legislature and judiciary, poses obvious challenge for the development of clear and consistent policies. Executive authority to address climate change or other environmental issues is subject to the consent of the Congress. In most instances, a simple majority is necessary for a proposal to become law or for funding to be approved. In exceptional circumstances, such as the ratification of the international agreements that are the subject of this study, a two-thirds majority in the U.S. Senate is required.

In some instances, the federal nature of the United States imposes constraints similar to the Canadian context. For example, decisions on how to allocate federal highway funds, set building standards and speed limits are made at the state level; electric utility regulation is largely a state responsibility. Thus to a large extent the control of greenhouse gas emissions requires a cooperative approach throughout the Union. However, the United States federal structure is generally seen as more centrist than the Canadian context. In both countries, the respective high courts have been instrumental in defining the nature of the federal / sub-federal relationship: in the United States, crucial decisions in the past have served to strengthen the jurisdictional hand of the central government.⁴⁹

Clark and Dickson (2000) describe four characteristics of politics and policy making – particularly related to environmental issues – in the United States that inform the approach taken here.

1. The relationship among federal, state and local layers of government, branches of the national government, and within the federal executive bureaucracy itself – institutionalized in constitutional and administrative law and practice – is the result of an explicit design which makes the arbitrary exercise of power unlikely. What results is a state of fragmentation and overlap of responsibility which allows multiple governmental actors a great deal of latitude for independent initiatives. When there appears an effort to coordinate such initiatives, the objective is more to provide a forum for debate within government than to develop a coherent national policy. With a unified government position rarely emerging, other nations seeking to negotiate international environmental agreements with the U.S. often confront a confusing and frustrating cacophony of actors.⁵⁰
2. The above propensity is accentuated by the reliance on political appointments to fill top positions in the bureaucracy – in contrast to the Canadian case.⁵¹ This ability and propensity to bring senior recruits from business and academic communities directly into the senior grades of the civil service has produced a steady supply of talented and energetic people bearing new ideas and initiative. But a less desirable

outcome is the loss of institutional memory, long-term perspective and the corporate-based social capital which engenders cooperative efforts.

3. American politics and decision making can be said to be particularly open to non-governmental parties – traditionally the media, business and other corporate interest – who wish to influence the policy cycle (Lindblom 1990). The past several decades have seen a widening of the range of interests that have sought to enter the decision making process, to include an increasing number of civil society groups motivated by non-monetary, public interests.
4. The relationship between scientific findings and decision making in the policy process displays a tension between the historically privileged position of scientific and technical experts in the risk assessment process and the barriers to that expertise in processes of decision-making and implementation. In response to the trans-scientific nature (Weinberg, 1972) of many complex problems surrounding global environmental risks, and questions about the value-neutrality of science applied to societal problems, scientific inquiry has taken on a dual role: to both seek the “truth”, as well as support “justice” (Salter, 1988). Policy decisions based on uncertain science (something that has characterized the science of global atmospheric risks over the past several decades) then must inevitably resort to political or value judgements (Hoberg and Harrison, 1994). Different values in turn highlight the conflicts within the scientific community, further weakening the influence of science in decision making.

The historical development of the domestic environmental movement over the past quarter century has had a significant influence on U.S. management of global atmospheric risks. When significant and socially diffuse environmental concern first manifested itself in the early 1970s, it was characterized by an increasing concern for the domestic environment; the development of a global perspective took some time to materialize, however. But when that consciousness did emerge, the United States began to play a significant leadership role in the management of those risks.

2 Implementation and Compliance

We explored briefly, above (in section 1.2.4), the process of ratification by national legislatures of international environment agreements. If ratification signals the acceptance by the national legislature of the terms of the international environmental agreement, the evolving implementation literature in policy studies notes that that is perhaps one of the easier steps in the long road from concern to compliance. For results do not occur simply because Congress or Parliament has said “make it so.” Instead, compliance must follow on a process of implementation, which is seen here as that phase of the policy cycle⁵² where:

- the ideas and intentions that underlie adopted policies are given force and effect through laws and regulations which carry constraints and incentives for actors, and
- action is taken by both private and public actors operating under those constraints and incentives.

At its most obvious level, implementation represents the faithful adherence to, and fulfillment of, legislative intentions by civil servants. The early implementation research accepts policy intentions literally, and implementation success or failure is judged based

on the degree to which the actions of government agents adhere to those intended policy effects. Policy intentions are often less than clear however. Policy usually results from a process less orderly and contained than simplistic academic treatments of policy formation. Policy intentions often emerge from a process of conflict and compromise that takes place in fragmented and dispersed decision making environments. As a result, civil servants must often contend with unclear, unintended or unattainable policy intentions. But even where clear legislative intentions exist, implementation which relies on the cooperation and compliance of many actors becomes complicated if their goals do not coincide with the objects of the legislation.

This wider view informs the approach taken to implementation here: implementation is seen as the purposeful or strategic action taken domestically by public actors, or decisions made by private actors reacting to incentives and constraints in markets and law, that has an effect on the attainment of the collective goals of a community enunciated through its legislature.⁵³ Implementation is not a single event, but an open, evolutionary, adaptive and disorderly process (Majone and Wildavsky 1979; Palumbo 1987). What is of primary importance is that implementation does not stop at the point of an enunciation of government policy into law, nor through the promulgation and enforcement of regulatory / administrative action, but in the chain of discretionary action on the ground where individual public and private actors make decisions and adapt their behavior in light of the law, regulation, policy or collective will.

While we cannot observe the impact that changing incentives and constraints have on individual behavior, we might observe two loci of activity and from them make inferences about implementation success or failure: first, we can account for the official implementation record (e.g., resources committed, legislation enacted, regulations promulgated, or other action undertaken that establishes the collective intention of the community); second, we can measure the aggregate change in behavior that follows on that official policy implementation (in this case, e.g., reductions in pollution emitted⁵⁴). For the really significant test of an agreement's effectiveness lies in the actual improvement in the state of the environment: "The adequacy of international law will be judged by its ability to protect and preserve the environment. [One must question] whether that objective is being met, and whether existing legal and institutional structures can meet that objective." (Sands 1995, p. 3-4). One would not want to ascribe all behavioral change to governing constraints and incentives, given the surrounding context of prices, preferences and technological change. But in the complex mix of markets, ecosystems, technology and social institutions, it is perhaps one of the stronger links that can be drawn.

In the context of global atmospheric risks, we note here that – until recently – the efforts of the international community had been concentrated on developing international environmental agreements to deal with newly understood risks. However, there has been growing recognition that for these agreements to accomplish their objectives, greater attention must be paid to ensuring that the nations who are party to them actually carry out their obligations. Questions of implementation and compliance have thus come to overshadow efforts at risk assessment, option assessment and goal formation. Continuing negotiation driving an ongoing process of adaptation to assure continued commitment and compliance, as well as a strengthening of commitments to reflect advances in scientific understanding, has emerged as a feature of these

agreements. Though commitments have been negotiated and put in place in an international setting, and successively refined and made more precise, it remains still to be seen whether these will be fully reflected in national action adequate to deal with the risk, openly and fully reported to the international institutions supporting the agreements, and also in the subsequent continuing operational measures necessary to meet national commitments. The growing focus on compliance rather than enforcement⁵⁵ is a significant feature of these international regimes. So also is the growing emphasis on provisions to encourage participation – technology transfer, resource transfer, or financial transfers now are seen as less directly related to development aid, and more as measures to induce participation of non-parties in treaties which otherwise they may see as not sufficiently in their interest, at least in the short run.⁵⁶

2.1 The International Record

In the management of global atmospheric risks, implementation efforts tend to cluster around regulatory action to reduce emissions, with further efforts and resources aimed at building cognitive capacity, institutional capability and consciousness-raising; government action tended to entail regulation, through either directives or incentives, but also involved support for scientific research programs, coordination capacity, and the creation of institutional capacity at domestic or international levels; industry action tended to concentrate in efforts to create or improve technological capacity, but also saw efforts to build institutional / consultative capacity and cooperative programs for information exchange; action by academic / governmental scientists focused on instruments directed toward building cognitive capacity; and NGOs sought to build institutional capacity (Dobell, 2000).

International action to deal with transboundary atmospheric risks, and specifically acid deposition, was anticipated before the 1972 United Nations Conference on the Human Environment (the Stockholm Conference), by a flurry of Clean Air Acts or similar legislation in several countries. Later efforts to control polluting substances as mandated under the LRTAP Protocols tended to center on regulatory directives to reduce emissions through fuel switching or technology requirements. In recent years, flexible regulatory approaches have allowed for greater case-specific discretion by government officials, focussed more on performance than process.⁵⁷

The response to stratospheric ozone depletion falls into two distinct parts. A first, 'bottom-up', implementation round was substantially led by local groups and individuals, with boycotts or bans stemming from sub-national or national regulation focussed on consumer products. The second round led to more comprehensive international cooperation in regulation of industrial uses and production of CFCs themselves. In this latter stage, one can see the escalation of the issue to an international scope, with a concern for environmental consequences winning out over worries about competitive position, and the focus of standard-setting on possible environmental impacts and health risks rather than direct regulation of specific products.

In the emerging context of controlling greenhouse gas emissions, regulatory action (either directive or incentive based) has not yet been adopted with much enthusiasm in North America. Minor changes in price structure, either through the deregulation of energy markets or limited use of user charges, have been contemplated or introduced. The bulk of the efforts aimed at reducing emissions have centered on the voluntary challenge⁵⁸ approach, in which governments attempt to convince firms of the cost

reduction benefits to be realized from more energy efficient processes and capital equipment – and in turn contribute to a reduction in national emissions. In some instances, governments offer financial incentives for firms and consumers to switch to lower emitting products. Afforestation efforts to sequester and offset increasing emissions of CO₂, have been advanced, as has joint implementation, international trading of emissions permits and research efforts to explore adaptation possibilities.

Tax measures of various kinds have been introduced to varying degrees in all three cases. Such measures have been enthusiastically advocated for decades by economists, but just as stoutly resisted by legislators. Overall, there have been many attempts to introduce economic instruments into the arsenal of government measures designed to promote environmental objectives. While these have generally taken the form of taxes and charges in Europe, the United States has led in the use of property-rights-based measures: tradable pollution allowances.⁵⁹ Economic instruments, whether exercised through Pigouvian pricing mechanisms or Coasean property rights, offer ways to achieve environmental targets more cost-effectively than rigid directives.

From acid deposition through ozone depletion to climate change, there appears an evolution generally toward greater discretion in the methods for meeting national targets, with gradual movement towards market-based incentives. However, in the chain of events that follows the path of

demand ⇒ emissions ⇒ impacts

the focus of efforts has consistently aimed primarily at the point of discharges into the atmosphere. Though consciousness-raising campaigns have been part of the strategy, and some efforts to adapt to impacts or consequences can be pointed to,⁶⁰ success in the acid deposition and ozone depletion cases did not result from targeting demand but from applying technological fixes to the problem of emissions. Implementation strategies have not had significant impacts on life-styles or consumption – despite “over-consumption” being a primary target of the environmental movement.

Experience with the Framework Convention on Climate Change reveals how much more difficult it was (and is) than even the very challenging cases of acid and ozone. Action and rhetoric to date on climate change has still tended to focus on emissions control relying on technological solutions and voluntary commitments. The great taboo of ghg emissions reduction is life-style and behavior, since the number of sources (including every car and house) is dramatically greater than in the acid and ozone cases and restrictions on CO₂ emissions – in the absence of technological breakthroughs – will require individuals to reduce their use of fossil fuels. Climate change implies that much more fundamental changes in behavior and life style are at issue. And in the absence of dead forests and lakes, or the abstract terror of ozone “holes”, costly and inconvenient changes in lifestyle are a difficult political sell.

2.2 Implementation in Canada and the United States

Here we contrast the Canadian and American record from concern through commitment to compliance across the three global atmospheric risks. Following the continuing integration of the two nations propelled by economic and cultural forces over the study period, the approach taken to dealing with these atmospheric risks narrows over time, from stark differences in the acid deposition case to nearly identical positions on climate change. Important distinctions still remain, but they appear as more differences of degree than of kind.⁶¹

Acid Deposition

Despite important specific concerns over pollution from smelters (e.g., Trail, British Columbia in the 1920s⁶², and the 1907 U.S. Supreme Court ruling in *State of Georgia v. Tennessee Copper Company*⁶³), and with some emerging regulation of sulfur emissions beginning in the 1960s, the issue of widespread acid deposition attracted little public attention in Canada or the United States until the late 1970s. But with growing scientific and public concern over the issue, specifically the effects on forests and aquatic life in eastern North America, both Canada and the U.S. participated in the multilateral negotiations under the UN Economic Commission for Europe (UN ECE), and signed the Convention on Long Range Transboundary Air Pollution (LRTAP), in November 1979.

A 1980 Memorandum of Intent between Canada and the United States, similar in structure to the LRTAP Convention, became unworkable under the new Reagan administration and, despite intense political efforts on the part of Canada, a formal agreement would be ten years in the making, and would require significant amendments to the U.S. Clean Air Act (enacted in 1991) to be completed. The *Canada-U.S. Air Quality Agreement* (AQA) was signed in 1991, and while the impetus for the agreement was concern over transboundary acid rain, the AQA provides a framework for cooperation on all transboundary air pollution issues. Canada and the United States committed to reductions in SO₂ and NO_x emissions and both countries have met these commitments fully. In 1997, an agreement to develop a Joint Plan of Action Addressing Transboundary Air Pollution was signed. The intent of this agreement was to add to the Air Quality Agreement the issues of ground-level ozone and fine inhalable particulates. A Progress Report on the development of the Joint Plan of Action establishes targets and a timeline of 1999 for recommendations to negotiate a new ozone annex under the Air Quality Agreement and for the creation of a joint workplan on particulates.

On the multilateral front, under both the 1985 *Helsinki Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 per cent*⁶⁴ and the 1994 *Oslo Protocol on Further Reduction of Sulphur Emissions*,⁶⁵ Canada has exceeded all of its current domestic and international commitments on acid rain. In 1997, SO₂ emissions were 24% below the eastern Canada cap, representing a 54% reduction from 1980 levels.⁶⁶ While the United States is party to neither sulphur protocol, the 1991 amendments to the Clean Air Act⁶⁷ (and possible further amendments following the 1999 review of those earlier amendments) will ultimately mean at least a 40% reduction in SO₂ emissions from 1980 levels.

Both Canada and the U.S. signed and ratified the 1988 *Sofia Protocol Concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes*⁶⁸ under the LRTAP Convention. The NO_x protocol requires the Parties, as a first step, to freeze national emissions of NO_x at 1987 levels by 1994. Both countries continue to meet this commitment. A second step within the context of the Convention is the goal of resolving acidification, ground-level ozone and eutrophication effects in Europe and North America. The completion of a Multi-Pollutant, Multi-Effects Protocol is expected in 1999.

In 1991, both countries signed the *Geneva Protocol Concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes*⁶⁹ under the LRTAP Convention, but neither country has ratified it. Both countries have relied on the AQA framework to deal with transboundary VOCs impacts. Canada's *Phase 1 NO_x/VOC Management Plan*, in place since 1990, includes a range of Federal and provincial⁷⁰ initiatives and measures to reduce NO_x and VOCs. The Phase 2 plan,

published in 1997, outlines further initiatives to be taken at the federal level to reduce NO_x and VOC emissions and broadens the issue to consider particulate matter (PM).⁷¹ The US-EPA issued a report⁷² to Congress in March of 1995, which evaluated the contribution of VOC emissions from consumer and commercial products on ground-level ozone levels, and subsequently published an initial list of product categories for regulation to be implemented by 2001. U.S. VOC emissions have fallen from approximately 23 million tonnes in 1980 to an estimated 14 million tonnes in 2000; Canadian emissions have remained stable at between 2 and 3 million tonnes during the same period.

Negotiations were recently completed on protocols for persistent organic pollutants (POPs)⁷³ and heavy metals (HMs)⁷⁴ under the LRTAP Convention. The POPs Protocol addresses the control of 16 POP substances by eliminating the production or use of 12 POPs, restricting the use of three POPs and controlling atmospheric emissions of four POPs from designated industrial sectors. Some of the POPs substances are subject to multiple control regimes.⁷⁵ The HMs protocol requires the control of the three metals (cadmium, lead and mercury) by: controlling atmospheric emissions from new plants in designated industrial sectors; reducing by 50% atmospheric emissions from existing facilities (based on 1990 values); and controlling lead content in gasoline and mercury content in alkaline batteries. Both countries signed the protocols at Aarhus, but of the 36 signatories only Canada has as yet ratified the protocols.⁷⁶

Despite the achievements under the LRTAP and the AQA, acid deposition remains a problem in eastern North America today. Even assuming full implementation of the Canadian and U.S. Acid Rain Programs by 2010, approximately 800,000 km² of eastern Canada will continue to receive acid deposition considered to be above critical loads.⁷⁷ In response, *The Canada-Wide Acid Rain Strategy for Post-2000*, a 1998 agreement signed by federal, provincial and territorial ministers of energy and environment. The primary goal of the *Acid Rain Strategy* is to ensure that critical loads for acid deposition are achieved across Canada. Current scientific information indicates that critical loads for wet sulfate deposition are being exceeded only in eastern Canada. Initial modeling estimates suggest that SO₂ emissions in Ontario and Quebec would need to be reduced by 75% from their existing caps, and in New Brunswick and Nova Scotia by 30 to 50% from their existing caps, in order to meet critical loads. U.S. emission, some of which result in transboundary effects, would need to be reduced (in the Midwest and eastward) by 75% above and beyond current requirements in the Clean Air Act Amendments (Canada, 1998).

Ozone Depletion

Ozone depletion first entered the American political sphere through a proposal to build an American fleet of supersonic transport (SST) aircraft. The possibility that SST exhaust might destroy stratospheric ozone (as a minor concern among many others) contributed to the project's abandonment. Scientific concern over stratospheric ozone depletion remained, though a re-emergence onto the public agenda did not occur until a link had been drawn between CFCs and ozone depletion (see Molina and Rowland, 1974). Environmental activism centered on eliminating aerosol uses of CFCs, and was largely successful in both countries in reducing non-essential uses.⁷⁸ With that apparent victory, public interest declined and the domestic channels seemed closed to further action. But with scientific interest still alive and growing, both Canadian and American "ozone entrepreneurs" used international forums to again guide the issue onto the

political agenda (Clark and Dickson, 2000; Parson, 2000). The discovery of a “hole” in the ozone layer over Antarctica in 1985 provided a useful vehicle for marshalling the political support needed to negotiate the Montreal Protocol.

Since Montreal, both countries have quietly worked with the parties to the Protocol to strengthen measures to protect the ozone layer. The United States has adopted a variety of national laws and international agreements that significantly reduced its production and use of ozone depleting substances, committed it to future phase outs, production limits or recycling of such substances, and provided modest assistance to help developing countries limit their own use of chemicals that might deplete the stratospheric ozone layer. The 1991 amendments to the Clean Air Act, adding provisions (under Title VI) for protection of the ozone layer, required the gradual end to the production of ODS.⁷⁹

In Canada, following the negotiation and ratification of the Montreal Protocol, the federal government committed to eliminate all uses of CFCs within 10 years. Environment Canada promulgated regulations restricting the production and import of ozone-depleting substances in 1989, and updated them several times since.⁸⁰ The federal and provincial governments are responsible for regulating various aspects of ozone depleting substances, and their combined efforts make up Canada's *Ozone Layer Protection Program*.⁸¹

Climate Change

Following the Toronto Conference and the summer drought of 1988 in North America, political and public concern over global climate change peaked in 1989 and has remained relatively high in Canada and the U.S. since. In May 1990, the Canadian federal environment minister unilaterally declare Canada's commitment to stabilize CO₂ emissions at 1990 levels by the year 2000 as a first step.⁸² Further consultations resulted in the *National Action Strategy on Global Warming*, developed by a committee of energy and environment deputy ministers, committing Canada to stabilizing *all greenhouse gases* at 1988 levels by the year 2000. The federal Green Plan, released in December 1990, confirmed the stabilization commitment but added explicit reference to the concept of net emissions – a continuing issue of import for Canada.

Global climate change (or, more accurately, global warming) was a factor of some importance in the 1988 and 1992 U.S. presidential elections, leading the Bush Administration to take the position of major initiator of the 1992 UN FCCC. However, conflict within the Administration between opposing environmental and economic forces led to a weak Framework Convention lacking targets or timetables for reducing emissions – one that would be acceptable to the U.S., which signed it reluctantly. Despite the new Clinton Administration's pledge to reduce greenhouse gas emissions to 1990 levels by the year 2000, further indication that the U.S. would support binding targets did not emerge until the second Conference of the Parties to the FCCC (COP2). But without a strong domestic constituency advocating action on climate change, it seems unlikely that the U.S. will ratify the Kyoto Protocol soon.⁸³

The United States ratified the UN FCCC on October 15, 1992 and in October 1993 unveiled the Climate Change Action Plan (CCAP),⁸⁴ which outlines a comprehensive set of measures to reduce greenhouse gas emissions to 1990 levels by the year 2000. Composed of more than 50 different federal voluntary programs, the CCAP built upon programs implemented under the 1990 Clean Air Act Amendments, the 1991 Intermodal

Surface Transportation Efficiency Act, and the 1992 Energy Policy Act. Most CCAP measures include a variety of different mechanisms to promote and encourage voluntary action to reduce ghg emissions. A three-stage domestic policy for curbing greenhouse gas emissions was announced in October 1997, prior to the Kyoto Conference, containing a suite of tax incentives and R&D investments to improve energy efficiency, as well as a proposal to restructure the electrical utility industry. A domestic emissions trading system will be developed and implemented during the next decade (subject to ratification of the Kyoto Protocol).

After signing and ratifying the UN FCCC, the Canadian government released the first *National Report on Climate Change* in 1994. The report stressed uncertainty in future emission trends, but estimated that Canada's energy-related greenhouse gas emissions would increase 10% by the year 2000 unless additional control measures were enacted. In 1995, a *National Action Program on Climate Change* (NAPCC) was approved by federal, provincial and territorial governments,⁸⁵ and projected that greenhouse gas emissions for Canada would be 13% higher in the year 2000 than in 1990.⁸⁶ Natural Resources Canada (NRCan) periodically updates this projection in its *Energy Outlook* report. The April 1997 *Energy Outlook: 1996-2020* projected that the gap would be narrowed to eight percent above 1990 levels in the year 2000, although it indicates that the projected range could be from 5 to 11 percent. The Second *National Report on Climate Change*, released in 1997, noted that total greenhouse gas emissions from all sectors were about 9% higher in 1995 than in 1990, but confidently predicted a lower figure by 2000. This national report also noted that most other developed countries were, like Canada, forecasting that they would not stabilize their greenhouse gas emissions at 1990 levels by 2000.⁸⁷

A November 1997 joint meeting of ministers of environment and energy agreed (with the exception of Quebec) to reduce ghg emissions to 1990 levels by 2010. Two weeks later, the federal government announced its Kyoto negotiating position of a 3% reduction from 1990 levels by 2010, with a further 5% reduction by 2015, a position not unanimously supported by the provinces. In Kyoto, the federal government unilaterally pledged to reduce Canadian greenhouse gas emissions by 6% below 1990 levels by 2008 - 2012. Canada signed the Kyoto Protocol on April 29, 1998.

Following the meetings in Kyoto, Canada's first ministers asked that their ministers of energy and environment take the necessary steps to examine the consequences of the Kyoto Protocol and provide for the full participation of the provincial, territorial and federal governments. The First Ministers also agreed that no region should be asked to bear an unreasonable burden as Canada seeks to reduce its greenhouse gas emissions. In April 1998, the federal, provincial and territorial ministers of energy and environment met in Toronto to establish the National Climate Change Process (NCCP) as the forum for provincial/federal discussions on Canada's response to the Kyoto Protocol. The NCCP, led by First Ministers, is tasked with examining the impact, costs and benefits of implementing the Kyoto Protocol, and assessing the various options for implementing the Protocol that are open to Canada. The NCCP includes agreement to: develop a system to credit companies for taking early action to reduce emissions; strengthen voluntary action measures; bring Canadian experts together at "Issue Tables" to explore various sector-specific options and cost estimates for addressing greenhouse gas emissions and meeting the Kyoto commitment in all parts of the Canadian economy; and, develop a public education and outreach program. The issue tables had all reported by May, 1999;⁸⁸ discussions and negotiations between the

federal and provincial governments on the content and implications of the reports, and how they will translate into an agreed upon set of actions for meeting the Kyoto commitment, are being conducted during the summer of 1999. A federal / provincial / territorial National Implementation Strategy is expected before the end of 1999.

The Canadian federal government employs a limited number of policy measures, though it has an extensive range of governing instruments within its own jurisdiction that it could use to meet its policy objectives. These include voluntary measures, information programs, research and development, regulations, taxes, charges, subsidies and incentives. Within these instruments, the federal government as well as provincial and territorial governments have concluded that a broad portfolio of measures will be required to respond to climate change. However, at this time the federal government has ruled out one of the many possible types of taxation – a carbon tax on fossil fuels – as a means of reducing greenhouse gas emissions, despite research by Standard and Poor's completed for the government in November 1997, arguing that a carbon tax could lead to higher growth of the economy in the long run.⁸⁹ To date, it has chosen to employ only a limited number of policy measures and has favored voluntary approaches.⁹⁰ Also, given recent fiscal restraints, fewer resources have been available for major grant and contribution programs. In addition, in recent times the government, wary of alleged effects on competitiveness, has generally been reluctant to make extensive use of regulations as a major policy tool. Efforts by the federal government center on Voluntary Challenge and Registry (VCR) Program, launched in early 1995 by federal, provincial and territorial energy and environment ministers under the NAPCC.⁹¹

From this record, we might also begin to identify some measures or indicators of implementation "success". First, the range of governing instruments actually used by Canada and the United States has broadened over the past quarter century. The theoretical arguments for "least cost implementation" have led to advocacy on behalf of more flexible regulatory measures and economic instruments, more notably in the U.S. but increasingly so in Canada. Second, implementation action has become more coherently related to fundamental concerns with human or ecosystem health outcomes or consequences of the risks in question in recent years. In all three cases, commitments with respect to national action are being calculated in light of anticipated impacts (e.g., critical loads or target loads), or potential contribution to the risk in question (e.g., ozone depletion potential or global warming potential).

However, the implementation process which seemed so dramatically democratized through the growing involvement of NGOs and other outside groups in the discursive policy formation process less than a decade ago (see Dobell, 2000) seems at risk of reverting to a tighter process controlled by elite representatives in politics, industry, science and bureaucracy, closed to the representation of the broader public interest and non-market advocates. The implications for compliance hinge on this reversal, as less acceptance of regulatory action (and thus "voluntary compliance" with the spirit as well as the letter of the new laws and regulations) might be expected to follow the questioning of legitimacy that less broadly conceptualized and support laws entail. This collapse of the "Rio Way" in Canadian environmental policy making is partly a function of the more pressing items on the federal-provincial agenda in recent years and partly a response to the confusing cacophony of voices to which the multi-stakeholder

experiments gave rise (leading governments to search for less dramatic venues in the comfort of more stable policy networks).

The main observation from this record is that, perhaps surprisingly, there exist only slight differences in orientation between the United States and Canada, centered not so much on the extreme ends of the policy instruments spectrum (i.e., between command-and-control regulations and market mechanisms), but in the nuanced approaches to regulatory efforts. In the application of market mechanisms, the Canadian preference for taxes to discourage certain uses is contrasted with the U.S. approach of using price signals to encourage the adoption of alternative technologies and more efficient methods, or the establishment of property rights within a trading regime.⁹² In the voluntary compliance approach – the primary mechanism of both governments for addressing ghg emissions – the comparison centers on what has traditionally been seen as a fundamental difference in the cultures of the two countries: the U.S. appeal to the profit-maximizing firm or cost-minimizing individual, in which the internal benefits are highlighted and the social benefits appended as an ancillary outcome versus the Canadian tradition of promoting a duty to the collective wellbeing of the nation, which happens to align with the self-interested objectives of the organization or individual.

3 From Commitment to Compliance

3.1 Two-Level Games in Canada and the United States

Putnam (1988) emphasizes the dual nature in how sovereign states engage in international relations, in that political leaders must conduct negotiations with foreign adversaries and partners (level-one) while at the same time being aware that they must arrive at a settlement which is acceptable to their domestic political audiences (level-two). Putnam, thus, attaches greater importance to the domestic politics of foreign policy than do some other scholars. The major “insight” of the two-level games metaphor is that states act in two arenas simultaneously: the domestic and the international. While many rightly sees this as axiomatic, the metaphor helps to frame the complexity of national strategies that are brought to bear in international negotiations. States do not drive hard bargains in international forums out of simple intransigence, nor are differences always a reflection of conflicting strategic interests; rather, domestic ratification processes (both formal and “political”) require that negotiators at international meetings not only protect the national interest but do so in a way that they will be seen as having protected that interest.

This “game” metaphor is applied further in that in the context of shared jurisdiction between the national government and other domestic actors, national actors will sometimes use international negotiations to further their domestic agenda. A commitment made in an international forum might then be presented as the best deal possible under the circumstances; thus, policies that were previously considered unacceptable across the range of jurisdictions within the country (but nonetheless favored by the national government) can be presented as a *fait accompli*.⁹³

Both Canada and the United States face a second level of decision making when dealing with international approaches to managing global atmospheric risks. While these process are distinct, they both hinge on the ability to agree on a national commitment that was designed to contribute to an international objective, based on regionally-specific weightings of costs and benefits. In the U.S. context, ratification by a

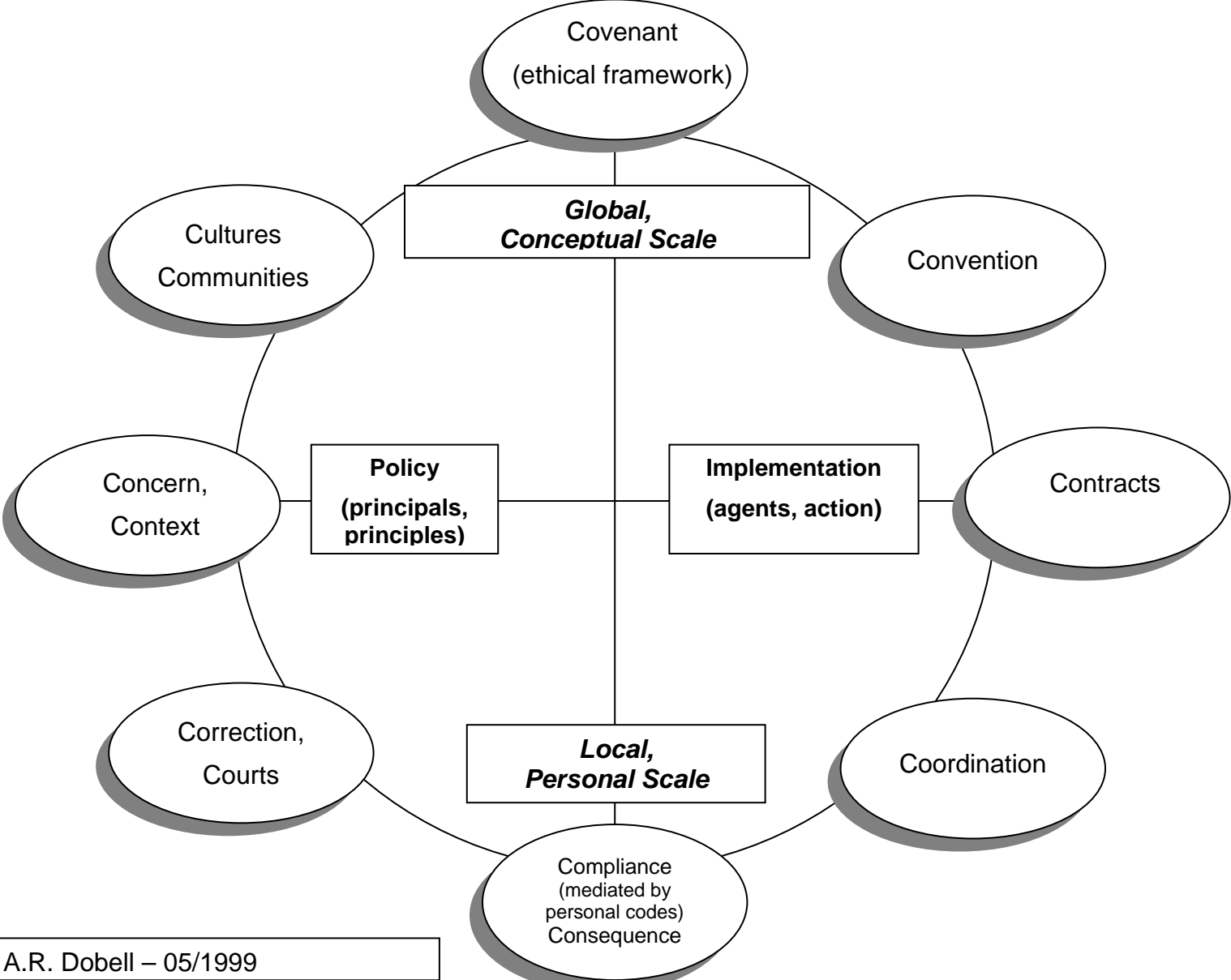
two-thirds majority in the Senate means that not only must the ideological differences between the two competing parties be overcome, but that the state-specific impacts of complying with the international agreement must be judged to be acceptable when weighed against the surrounding issues of international responsibility, possible impacts from not addressing the risks in question, and the complex swirl of political trade-offs that characterizes congressional decision making. Once the national legislative process has approved the international agreement however, the remaining questions of domestic jurisdictional compliance may be less problematic.⁹⁴

This lies in stark contrast to the Canadian setting where the national government that agrees to an international treaty can usually fairly readily ratify the agreement if it controls parliament. But while the constitution vests authority in the federal government to make international agreements, the division of powers (see note 41, above) often means that provincial governments have authority over the issues covered in the agreement. As noted above, the federal government's usual policy with respect to ratifying international environmental agreements is that it will not do so until it is certain that the commitments made in the agreement can be met – which in effect means that the federal government must be sure that the provincial governments are, in aggregate, committed to meeting the international target. Thus the ratification process can be seen as a formality that follows on the difficult federal-provincial negotiations which must reach a national consensus on how to achieve the commitment made internationally.

Both processes, the Canadian and American, highlight the difficulty in moving from agreement on the differential allocation of responsibilities for meeting global atmospheric risks at a level appropriate to that discussion (the international arena) to the level where the emissions which give rise to those risks are managed (the domestic arena). They thus illustrate well the two-level game nature of dealing with global atmospheric risks. The dichotomous nature of dealing with global atmospheric risks – international agreements producing national targets which must be dealt with regionally or locally (and ultimately in business decisions and individual action) – is an important feature of the modern world, which contains a tension between the desire for local control or autonomy in self-defined communities and the pressing forces of globalization which seek to integrate the community of nations into a coherent whole.⁹⁵ Mirroring this tension is the need to deal with global environmental risks in an integrated biospheric fashion while responding to the criteria encompassed in the concept of ecosystem-based management. Or perhaps, as expressed most directly, we are now compelled to “think globally, act locally.”

The difficulty in all of this is to find solutions which address the integrated nature of the global system (whether the biospheric or economic), respect the sovereignty of nation-states and their place in the world community, and respond to the continuing desire of people to organize themselves in communities of appropriate scale in which they feel they have some control over collective decisions which constrain and influence them.⁹⁶ Under such arrangements, individual behavior collectivized as social action can translate into national compliance and global cooperative outcomes.

Figure7: The Commitment-Compliance Clock



3.2 The Commitment / Compliance Clock

Figure 7 outlines a model of the process of coordinating global action, involving a continuing cycle of decisions and information flows at various stages from abstract context to concrete individual compliance. It elaborates the sequence of transitions in the dynamics of governance processes, moving from very general context (e.g., assessments of global atmospheric risks) through more specific formulations of national commitments, and on toward specific constraints limiting individual action.

From 12 o'clock to 3 o'clock, we begin to encounter the problems of global collective action, and see the problems of negotiation designed to deal with the co-operator's dilemma. We also begin to move from the international arena towards questions of national sovereignty and sub-national implementation (levels one and two in Putnam's [1988] two level game framework).

From 3 o'clock to 6 o'clock is where issues of implementation and compliance failure come to the fore. Here we begin to see the core difficulty: problems that seemed relatively easy to solve at the level of abstract principle, when addressed in dispassionate global negotiating forums, do not appear so simple when concrete issues of implementation and the tough decisions of resource allocation are faced by directly interested communities on the ground.

Around 6 o'clock, we observe action on the ground by individual actors, with observable consequences for the state of the system and the welfare of its inhabitants. We note here the potential contribution of various mechanisms for reporting on progress toward sustainability which attempt to make sense of systemic conditions and interactions (which take account of intangibles such as social cohesion, natural capital and cultural context that are missed by price systems and accounting initiatives) and craft the story of that system in such a way that people can start to link their individual decision making to the bigger picture (see, e.g., Hodge, 1995). Particularly informative in the context of global atmospheric risks might be devices like the personal CO2 calculators that are emerging in order to help individuals understand their place in the national and global picture of ghg emissions.⁹⁷

Moving further clockwise, we see the efforts to identify the gaps between intention and realization, goal and reality, and to consider appropriate correction and feedback to the system. Here is where concern for implementation gaps (or, more significantly, compliance gaps) washes over into agenda-setting and social movements to create a context for change.

Having dealt with the 12 to 3 o'clock problem under the framework of the two-level game, we narrow our focus to the "late afternoon / early evening" part of the clock, where action by individual public and private actors exists as the action on the ground that implements (or fails to implement) to commitments made at levels one and two.

3.3 The Emergence of the Three-Level Game

Putnam's two-level games metaphor, in dividing the political world into two levels does not focus on problems of implementation as skeptically as this study does. His model, instead, views the acceptance of an international agreement by the competent legislature and the point at which the commitment enters the nation's law as the end-point of the process. Our model, however, sees the process of ratification through to legislation / regulations as just the start of the implementation stage. For that reason we

divide level two into two components, thus effectively creating a three-level game metaphor.⁹⁸ Level two is the domestic political environment comprised of the various jurisdictional authorities who have an influence (ranging from veto to suasion) on the ratification of the commitment made at the international level, and level three focuses on the multitude of actors who stand between ratification and successful implementation. In order to separate out the differing motives and incentives of this range of actors, we separate level three into three separate loci of activity: “street level bureaucrats” (Lipsky, 1971) exercising discretion in applying and enforcing laws and regulations; alternative service delivery agents who carry out government functions as private organizations; and private individuals whose consumption behavior and pressure on political decision making has aggregate impacts on implementation success.

Street-Level Bureaucracy: Where policy intentions are unclear, the civil servant responsible for implementation is often left with little alternative than to create intentions through action on the ground. It is “out there,” where the actions of “street level bureaucrats” are manifest, that policy is clarified and policy impacts upon the actions of people. Lipsky (1978) points to three conditions that can lead to a situation where implementers at the bottom of the hierarchy have control over the realization of policy intentions: where implementers have wide discretion in carrying out their responsibilities (which is often the case where civil servants interact directly with citizens and corporations, or where the civil servant in question is a professional); where implementers have multiple objectives and the policy in question must compete with those other responsibilities;⁹⁹ and where a new policy causes disruption to existing practices and relationships.

Alternative Service Delivery (ASD): Different levels of government have been dabbling in forms of alternative service delivery since the 1980s. To the extent that it relies on the possibilities for more precise performance measurement or more credible substitutes, ASD arrangements have the potential of increasing compliance with national targets or international commitments more efficiently. However, in changing the practice of governance, ASD experiments raise questions about policy making, program design and delivery, and accountability (Langford, 1997). To the extent that it relies on self regulation and trust, more work may be needed to establish the necessary credibility, trust and sense of legitimacy needed to make the system work. The implication is that we need a considerably more skeptical examination of the rhetoric around ASD and “reinventing government.”

Individual Behavior: As the number of point sources for pollution increases (or in the case of non-point source discharges), the complexity of the implementation process increases with them. While to some extent the first round of the ozone depletion story centered on individual behavioral change to reduce ODS use through boycotts of CFC-propellant spray cans, the climate case is the only one of our three global atmospheric risks that to a large extent must rely on addressing individual behavioral choices – primarily with respect to transportation and housing energy use.¹⁰⁰ As governments appear timid in addressing private individual emissions of ghgs, avoiding limits on freedom of choice or increases in prices through taxation, the contribution of individual citizens to addressing climate change center on voluntary efforts to use energy more efficiently and to make consumption and investment decisions which lead to lower emissions.

In the case of “street-level bureaucrats” and alternative service delivery, the implementation problems which arise center on the aligning of incentives and motives so that the agent acts in such a way as to further the objectives of the legislature. In the case of individual action contributing to implementation success, where the state does not wish to use price as a means of aligning incentives or prohibition as a way of changing preferences, behavioral change will come to rely on: (a) the self-interested motivation of the individual and the possibilities of using that motivation to further social objectives; and (b) altruistic behavior and social cohesion to move individual decisions in line with social goals.

As in the industry-centered voluntary compliance programs, information which allows the decision maker to see how greater material efficiency and reduced emissions can lead to self-realized cost savings produces a context in which meeting a private objective has an ancillary social benefit. But because such efficiencies often require a capital investment in new equipment, subsidies or buyer incentives (as in the new U.S. Climate Change Action Plan amendments) will be required in order to induce consumers to move towards greater energy efficiency.

In the case of altruism and social cohesion, one might be tempted to ask why the consistent commitment of the citizenry to strong action on climate change (demonstrated in polling data) does not easily translate into reduced emissions from private consumption. With low energy prices as a strong disincentive for many to invest in fuel efficient cars, the lack of progress on the average fuel efficiency in the passenger car fleet is uncoupled from the enunciated values of the person on the street. Despite many indications that consumers want to make consumption decisions that reduce impacts on the environment, Harrison (forthcoming) has found that consumer demand for “green” products has generally declined in Europe and North America; in some cases, consumers are less willing to buy such products than comparably priced alternatives because they perceive a decline in quality. The link between environmental values and consumption decisions seems even more problematic in the context of more significant purchases such as houses and cars.

4 Conclusions

In the evolution of international action in addressing global atmospheric risks, from acid deposition through ozone depletion to climate change, the international community has found increasingly effective means for building commitments to the objectives of international treaty regimes. But after agreeing to conventions, protocols and amendments, the international community has moved on from reaching agreements to furthering compliance. At the international level, efforts are focussed on strengthening and detailing the commitments, strengthening monitoring, and providing mechanisms to both encourage and enforce compliance.

At the national level, early efforts to meet internationally committed targets first centered on regulatory instruments, but have become increasingly reliant on market mechanisms to meet the targets in more efficient fashion. In the acid deposition case, regulatory instruments mandating specific technology or process were ultimately complemented with some market structures (most notably in the U.S.) to produce a successful implementation process. In the ozone depletion case, regulation, pricing

structures and – most importantly – non-depleting substitutes have yielded a largely successful treaty.

Though the Kyoto deadlines are over a decade away, there is increasing speculation that the climate change commitments will not be met by most countries. Greenhouse gas emissions reductions stand as the truly hard part in global atmospheric risk management. With many more sources, entrenched demand tied to durable goods – both physical (e.g., houses, cars) and psychological (i.e., status symbols) – and an unwillingness on the part of governments to address energy demand through taxation, reducing ghgs has come to rely on a two-pronged approach in both Canada and the U.S.: finding a technological solution to the problem of energy-based CO₂ emissions,¹⁰¹ and relying on voluntary compliance to reduce energy demand. Both countries have targeted substantial funding for research and development aimed at finding practical non-CO₂ emitting energy sources, and incentives for individuals and firms to invest in lower-emitting technologies are made available. If, as in the ODS case, a practical cost-effective technological solution is found within the next several years, the Kyoto targets will be easily met and most certainly strengthened. If such a solution is not found, most countries will face increasingly embarrassing MOPs¹⁰² in the coming years.

What distinctions can we make about the relative likelihood of implementation success in Canada and the U.S. in coming years? Both countries have shied away from imposing significant tax increases (e.g., a carbon tax) in order to constrain demand.¹⁰³ And the evolving approach to regulatory instruments over the past several decades rules out a recourse to mandated changes in consumption or efficiency. Without regulation or taxation, and with technological solutions waiting in the wings, both countries have put many eggs in the voluntary compliance basket. Are there any indications that there are likely to be significantly different rates of success in voluntary measures between the two countries?

The success of such an approach relies on the receptivity to the two messages that emerge from voluntary compliance programs. Where such programs rely on the objectives of the profit maximizing firm and its desire to lower costs, the adoption of lower emitting technology and more efficient processes will be more likely in the context of greater market competition generally. Where firms are driven to reduce costs because their markets are highly competitive, and it can be clearly demonstrated to them that the adoption of efficient technologies and processes will help reduce costs, we can expect that more firms will join voluntary challenge programs. Where markets are not competitive, or where inputs are either subsidized or are themselves subject to weak competition (e.g., highly regulated electricity markets that provide low cost energy), firms will have less of an incentive to try to reduce energy use.

Where such programs rely on a sense of duty to promote collective welfare, the success of such a program will be a function of the social capital inherent in a society, and the ability of social systems to provide enough of a constraint on consumption behavior in order to curb demand and ghg emissions. The question of social capital arises as a key topic as a possible mechanism for ensuring the continuing alignment of incentives of individual consumers with overarching goals. Whether or when community scrutiny or peer pressures might serve better than economic instruments as mechanisms for devolved governance suffering from problems of principal-agent disjunctions is an important research question. Or, more generally, the strength of relationships built on aligning motivations through webs of commitment rather than

aligning incentives through explicit (market-based or hierarchical) self-interest is a central question.

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Annexes

Annex 1 – The Three Global Environmental Risks

Long-Range Acid Deposition

The term “acid deposition” (or more commonly “acid rain”) is used here to describe air pollution that manifests itself in acidic precipitation affecting areas far removed from the original emission source. Acid rain has been shown to have deleterious effects on ecosystems, humans, and materials. These effects include sulfur acidification of freshwater bodies (with consequent effects on aquatic life), nitrogen pollutants that harm vegetation, corrode materials, impair human health and diminish visibility, and sulfur and nitrogen acidification of soils (with its resulting effects on vegetation).

Sulfur oxides, nitrogen oxides and ammonia emissions are the most prevalent sources of acidifying deposition. Anthropogenic sources of these emissions originate with the burning of fossil fuels (for sulfur oxides), high temperatures combustion – e.g., internal combustion and jet engines (for nitrogen oxides), and some agricultural activities including the use of synthetic fertilizers (for ammonia). That pollution emitted in one locale can result in acid deposition in a far-off place is the result of a complex meteorological process, but with sulfur and nitrogen oxide emissions remaining airborne for, on average, up to three days, pollutants can travel up to 1200 km before returning to the planet’s surface as acid precipitation.

Options for minimizing the damage caused by acid deposition range from decreasing source emissions of pollutants to efforts to mitigate the impacts of acid rain (through, e.g., liming of lakes). Emissions reduction efforts are originally derived from local air pollution control measures, but recent efforts take a broader view aimed at either ambient air quality or critical loads.

Ozone Depletion

Stratospheric ozone acts as a protective shield surrounding the earth, absorbing harmful ultraviolet radiation from the sun deleterious to people, ecosystems and materials. Ozone consists of three atoms of oxygen, formed naturally in the stratosphere (in the lower atmosphere, or troposphere, ozone is a toxic substances contributing to, e.g., smog), with average annual total ozone between 250 and 350 Dobson Units.

Chemicals released into the atmosphere work with the sun’s energy to convert ozone into oxygen. The most important catalysts of ozone depletion are nitrogen oxides and halogens (such as chlorine and bromine). The primary source of nitrogen oxides is nitrous oxide (N₂O), a long lived gas emitted by a large number of small sources – many natural in origin. Most halogen compounds originate in industrial uses: chlorine compounds include chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs), methyl chloroform and carbon tetrachloride. These are used mainly as refrigerants, foam blowing agents, and solvents. Once in the stratosphere, intense UV radiation causes otherwise stable compounds like CFCs to turn into compounds which convert ozone into oxygen.

Observations of stratospheric ozone depletion over Antarctica, where a seasonal “ozone hole” was first reported in 1985, reveal that current ozone levels are commonly measured at approximately 50% of those levels measured during IGY (depletion in the Arctic region has been less severe, at approximately 25% below average levels

measured in the 1960s). Ozone depletion at mid-latitudes is less dramatic than those observed in the polar regions.

Ozone depletion results in higher levels of ultra-violet B radiation (UVB) reaching the earth's surface (however, the actual level of UVB radiation in any given location is a function of that area's latitude, elevation, geography and local atmospheric conditions). Increased levels of UVB threaten human health (and that of other animals) in at least three ways: the development of skin cancers, cataracts and other eye damage, and a decrease in the immune system response. Increased UVB exposure places stress on terrestrial and aquatic ecosystems. And natural and synthetic polymers, like wood and plastic, are severely degraded by exposure to UVB.

Options for reducing the risks of stratospheric ozone depletion have focussed on the production, use and emissions of ozone depleting substances (ODS), coupled with educational efforts to reduce human exposure to UV radiation. To reduce emissions of ODS, information programs (e.g., labeling), bans and production limits, and market incentives have been employed, leading to a reduction in use and, more significantly, the development of less harmful alternative substances.

Global Climate Change

While naturally occurring variations in the earth's climate have been recorded through geological records, climatic change resulting from anthropogenic additions of gases and particles to the atmosphere is a more recent phenomenon. Without the natural greenhouse effect, the earth's surface would be substantially colder than it is. However, human activities have been adding greenhouse gases such as carbon dioxide and methane to the atmosphere, thus enhancing the greenhouse effect.

Primarily the result of the combustion of fossil fuels and deforestation through burning, a number of other industrial and agricultural practices also make significant contributions to the greenhouse effect. The main anthropogenic greenhouse gas emitted into the atmosphere is carbon dioxide, produced when coal, oil, natural gas and derivative petroleum products are burned to produce energy used for transportation, heating, manufacturing, electricity generation, etc. The other main greenhouse gas, methane, is emitted through activities such as rice cultivation, ruminant livestock ranching, by decaying material in landfills, coal mining, and oil drilling and leaks from natural gas pipelines. Nitrous oxide is added to the atmosphere by combustion processes and biomass burning, the production and use of fertilizers and other agricultural practices.

While one can not conclusively attribute the phenomenon of observed global climate change to an anthropologically based enhanced greenhouse effect, the IPCC's report *Climate Change 1995* (IPCC, 1996) concluded that "the balance of evidence suggests that there is a discernible human influence on global climate" (p.45). Recent assessments estimate that global temperatures will rise from 1°C to 3.5°C, that average sea level would rise by 15cm to 95cm over the same period, and that these global effects would be paralleled by regional effects such as increased winter precipitation in high latitudes, and increased incidence of heat waves, flooding and droughts. Climate change has the potential to affect human health and agricultural production, as well as to alter many natural ecosystems over the next century. With over 50% of the global human population living in coastal areas, rising sea levels and changing storm patterns could have significant effects.

Options for dealing with potential climate change focuses on reducing emissions of CO₂ from energy use. On the question of energy demand, the IPCC (1996) estimates that improvements in energy efficiency of 10%-30% over the next quarter century should be possible with little net cost to society, whereas gains of 50%-60% are likely feasible over the same period. A range of supply-side options include substituting high carbon fossil fuels with low carbon fuels, and substituting non-fossil energy sources for fossil fuels generally.

Annex 2 – U.S. / Canada Comparative Statistics

United States	Canada
Geography: <i>total area:</i> 9,372,610 sq km; <i>land area:</i> 9,166,600 sq km; World's fourth-largest country (after Russia, Canada, and China)	Geography: <i>Total area:</i> 9,976,140 sq km; <i>Land area:</i> 9,220,970 sq km; World's second-largest country; nearly 90% of the population is concentrated within 161 km of the US border
Land boundaries: <i>total:</i> 12,248 km; <i>border countries:</i> Canada 8,893 km, Cuba 29 km (US Naval Base at Guantanamo Bay), Mexico 3,326 km	Land boundaries: <i>total:</i> 8,893 km; <i>border country:</i> US 8,893 km (includes 2,477 km with Alaska)
Coastline: 19,924 km	Coastline: 243,791 km
Land use: arable land: 20%; permanent crops: 0%; meadows and pastures: 26%; forest and woodland: 29%; other: 25%	Land use: arable land: 9%; permanent crops: 0%; meadows and pastures: 3%; forest and woodland: 45%; other: 43%
International environmental agreements: party to - Air Pollution, Air Pollution-Nitrogen Oxides, Antarctic Treaty, Climate Change, Endangered Species, Environmental Modification, Marine Dumping, Marine Life Conservation, Nuclear Test Ban, Ozone Layer Protection, Ship Pollution, Tropical Timber 83, Wetlands, Whaling. Signed, but not ratified - Air Pollution-Volatile Organic Compounds, Antarctic-Environmental Protocol, Biodiversity, Desertification, Hazardous Wastes, Tropical Timber 94	International environmental agreements: party to - Air Pollution, Air Pollution-Nitrogen Oxides, Air Pollution-Sulphur 85, Air Pollution-Sulphur 94, Antarctic Treaty, Biodiversity, Climate Change, Desertification, Endangered Species, Environmental Modification, Hazardous Wastes, Marine Dumping, Nuclear Test Ban, Ozone Layer Protection, Ship Pollution, Tropical Timber 83, Wetlands, Whaling. Signed, but not ratified - Air Pollution-Volatile Organic Compounds, Antarctic-Environmental Protocol, Law of the Sea, Tropical Timber 94
Population: 266,476,278 (July 1996 est.)	Population: 28,820,671 (July 1996 est.)
GDP: <i>per capita:</i> \$27,500 (PPP 1995 est.)	GDP: <i>per capita:</i> \$24,400 (PPP 1995 est.)
Electricity: <i>consumption per capita:</i> 11,236 kWh (1993)	Electricity: <i>consumption per capita:</i> 16,133 kWh (1993)
Type of government: federal republic	Type of government: confederation with parliamentary democracy (constitutional monarchy)
Administrative divisions: 50 states and 1 district	Administrative divisions: 10 provinces and 3 territories
Executive branch of government: <i>Chief of State and Head of Government:</i> President and Vice President <i>Cabinet:</i> Cabinet appointed by the president with Senate approval	Executive branch of government: <i>Chief of State:</i> Queen, represented by Governor General <i>Head of Government:</i> Prime Minister <i>Cabinet:</i> Federal Ministry chosen by the prime minister from members of his own party sitting in Parliament
Legislative branch: bicameral Congress <i>Senate:</i> 100 members <i>House of Representatives:</i> 435 members	Legislative branch: bicameral Parliament <i>Senate:</i> 104 members (normally) <i>House of Commons:</i> 301 members

Source: CIA World Factbook 1996, at <http://www.cia.gov/cia/publications/factbook>

Annex 3 – Emissions and Conditions

As noted in section 2, one measure of implementation success is the degree to which emissions of the targeted pollutants have been reduced over time, and how ecosystem conditions have fared following legislative and regulatory attempts to control those emissions. Here we present various charts and tables showing data on

1. the emissions of major pollutants for the U.S. and Canada as well as global totals where available or appropriate;
2. atmospheric concentrations of certain greenhouse gases, ozone depleting substances and other pollutants; and
3. measured impacts from these emissions and concentrations on ecosystem and biosphere conditions.

In addition to these data, some general observations are offered:

Acid Deposition

Emissions of acidifying deposition due to human activities increased both locally and globally throughout much of the 20th century. For North America and the countries of the European Union, sulfur emissions generally peaked in the late 1970s but have declined since that time. Nitrogen oxide and ammonia emissions, in contrast, have declined significantly in only a few of these countries and have risen substantially in others. For other parts of the world, however, acidifying emissions continue to grow.

The U.S. is expected to meet its legislated emission reduction requirements. As of 1996, it had cut its SO₂ emissions nationally by 26% from 1980 levels. By 2010, when its Acid Rain Program is fully implemented, emissions are expected to be down by a total of 40%. The United States is already investigating (through the 1999 review of the Clean Air Act Amendments) another 50% SO₂ emission reduction under the current U.S. initiative to meet the proposed new National Ambient Air Quality Standard for fine particulate matter.

Stratospheric Ozone Depletion

Overall, CFC production rose steadily from the commercial introduction of CFC refrigerants in the 1930s until the mid-1970s when boycotts and then regulation reduced use substantially in a few countries. European use continued to rise through the 1970s and early 1980s before restrictions were introduced under new international agreements. Those agreements did not immediately affect the developing countries, however, which began to emerge as significant users in the 1990s. Simultaneously with these changes were shifts in the predominant use of CFCs (away from aerosols towards air cooling), and increases in CFC substitutes, many of which have significant ozone depleting properties of their own. By the early 1990s, however, global consumption of CFCs had dropped to levels well below half of its peak values in the 1980s – a trend that would reach almost a 90% reduction by the end of the century.

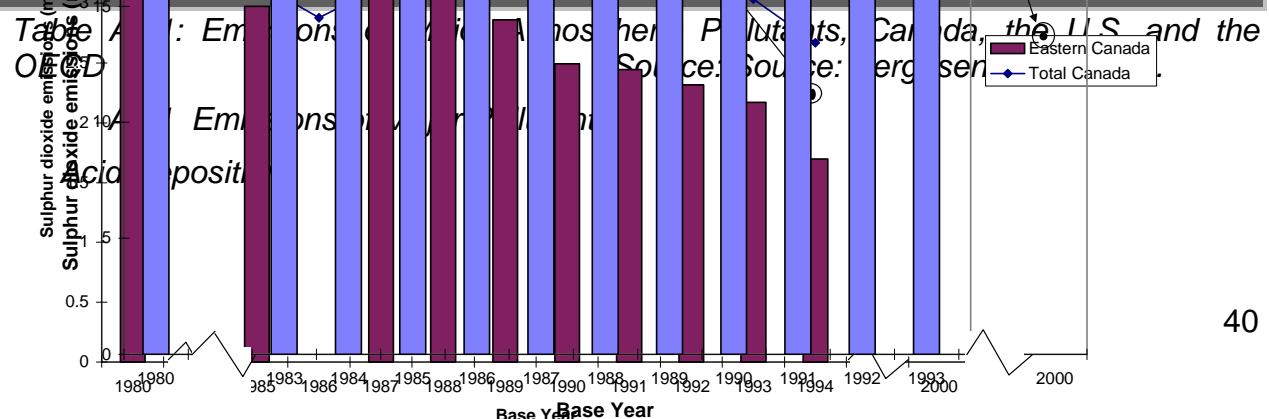
Global Climate Change

Towards the end of the 20th century, the use of fossil fuels was responsible for 80 - 85% of the carbon dioxide added to the atmosphere through human activities (UNEP/WMO 1997). This fraction was well above the 60% or so contribution of fossil fuels over the entire period of human emissions (IPCC 1990), reflecting the increasing dominance of the emissions picture by energy-related activities.

By 1992, atmospheric concentrations of major naturally occurring greenhouse gases had increased relative to pre-industrial times by about 30% for carbon dioxide, 145% for methane, and 15% for nitrous oxide. Because these major greenhouse gases have long atmospheric lifetimes relative to the time it takes for the planet's atmosphere to mix, their mean annual concentrations are relatively homogeneous throughout the lower atmosphere.

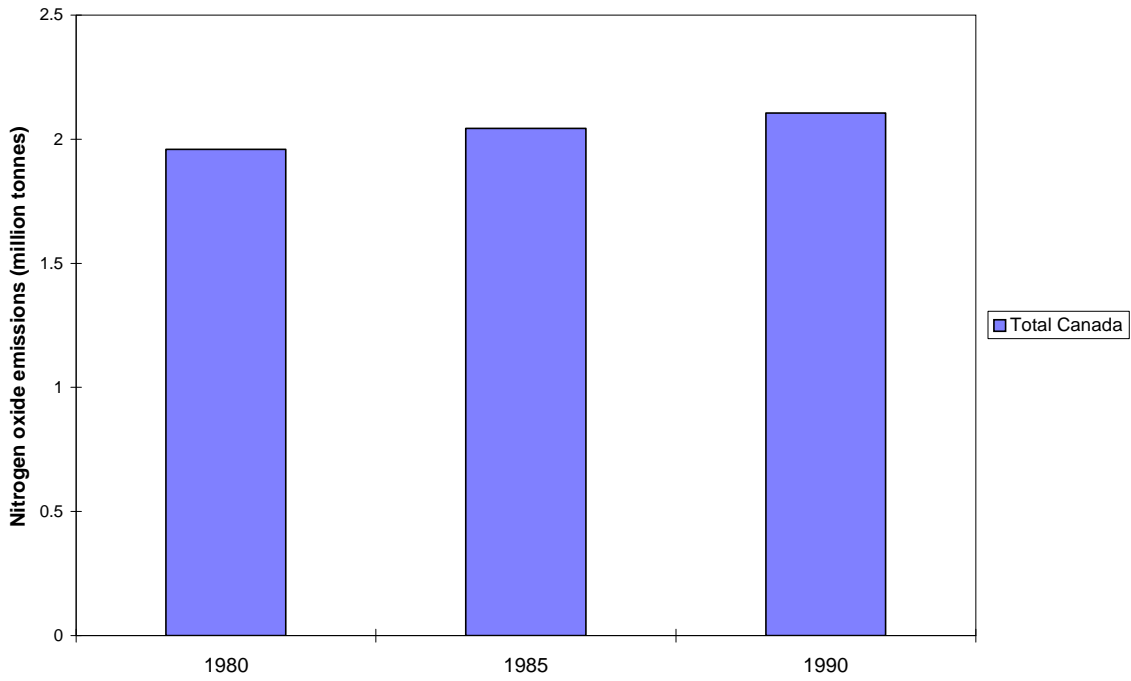
Canada consumes more energy per capita than any other country and is the 2nd largest emitter of ghg. Environment Canada reports that total Canadian greenhouse gas emissions in carbon dioxide equivalents, the common unit of measurement, were 567 megatonnes in 1990 (one megatonne of carbon dioxide emissions is equivalent to the annual carbon dioxide emissions of about 200,000 cars). In 1995 (the latest year for which data are available), total Canadian greenhouse gas emissions were reported to be about 9 percent higher than in 1990. Greenhouse gas emissions have grown more slowly in Canada than in the Netherlands but more rapidly than in six other countries: Australia, Germany, Japan, Norway, the United Kingdom and the United States. In Germany and the United Kingdom, emissions actually fell in the same time period.

Substance	Measure	Canada	U.S.A.	OECD
SO _x	total emissions ('000 tonnes)	2 668	16 619	
SO _x	kg / GDP (\$US '000)	4.8	2.5	2.4
SO _x	kg / capita	91.2	63.1	40.1
SO _x	change in emissions from 1980	-42.5%	-29.3%	-42.5%
NO _x	total emissions ('000 tonnes)	1 995	19 758	
NO _x	kg / GDP (\$US '000)	3.6	3.0	2.4
NO _x	kg / capita	68.2	75.1	39.7
NO _x	change in emissions from 1987	-6.0%	-2.8%	-5.3%
CFCs	total consumption (tonnes) (1994)	4 853	-91	
CFCs	kg / capita (1994)	0.17	-	
CFCs	change in consumption from 1986	-76%	-100%	
CO ₂	emissions from energy (million tonnes)	470.8	5 228.5	
CO ₂	tonnes / GDP (\$US '000)	0.85	0.85	0.60
CO ₂	tonnes / capita	19.9	19.9	11.1
CO ₂	change in emissions from 1990	+9.1%	+6.5	+4.4

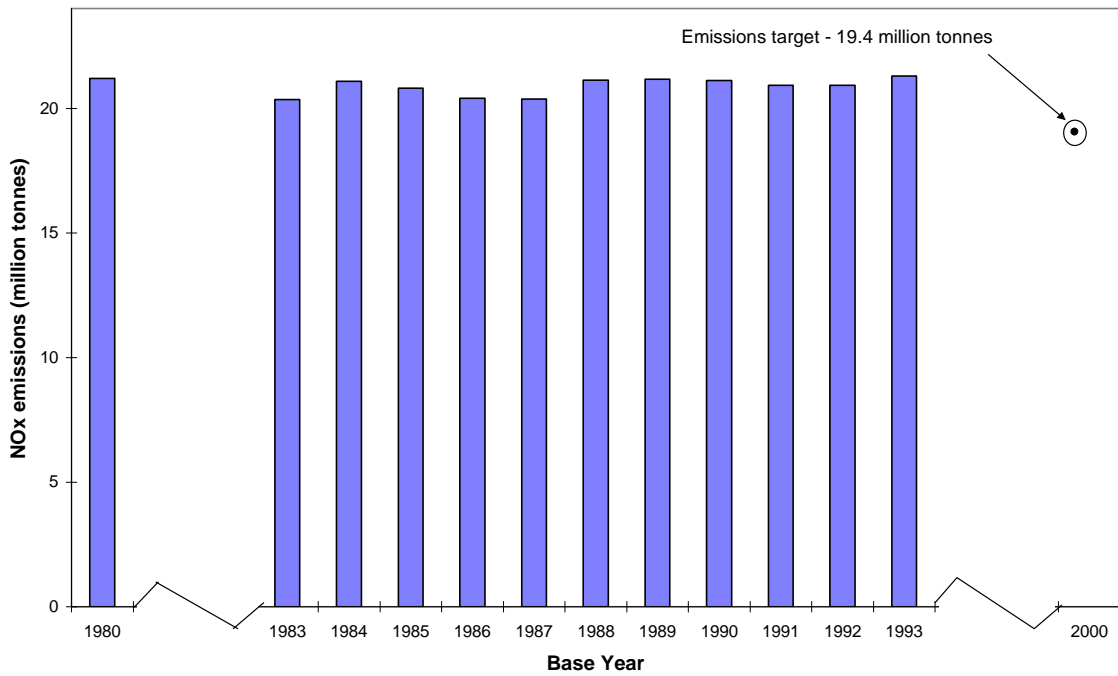


Emissions of Nitrogen Oxides

Canadian nitrogen oxide emissions (1980-1990)

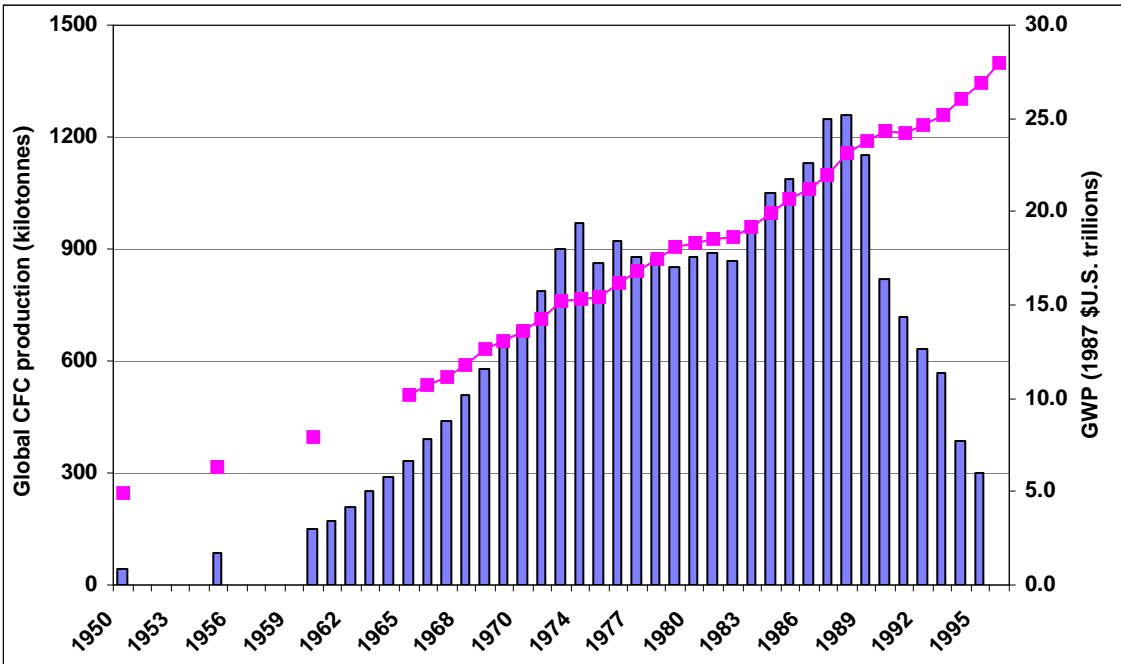
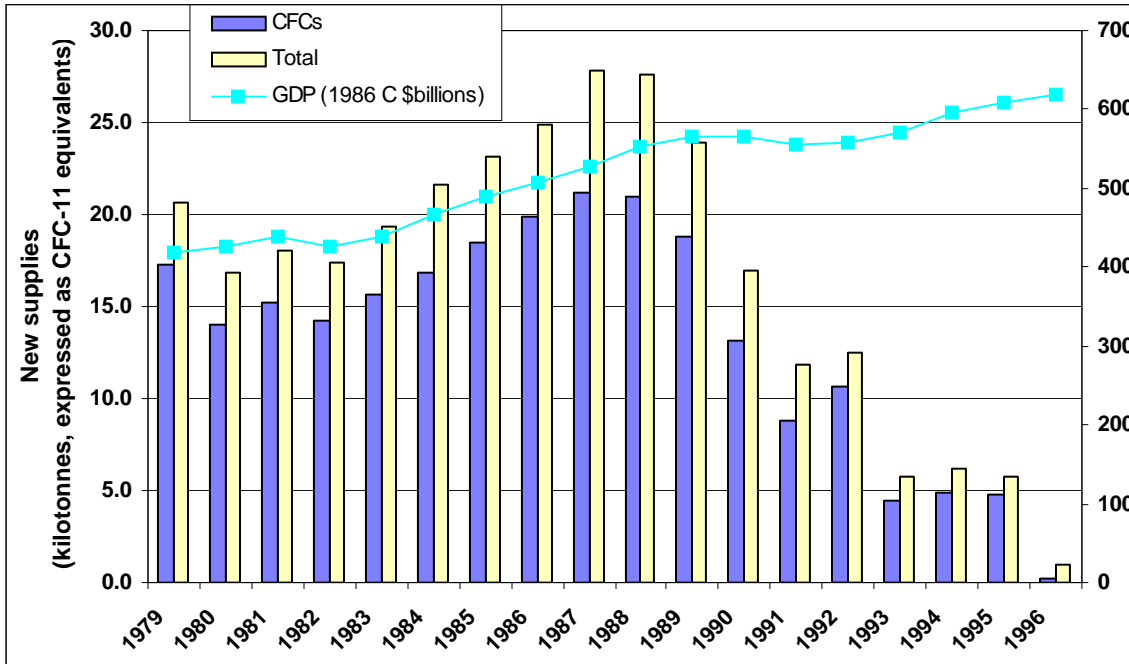


United States - nitrogen oxide emissions (1980-1993)



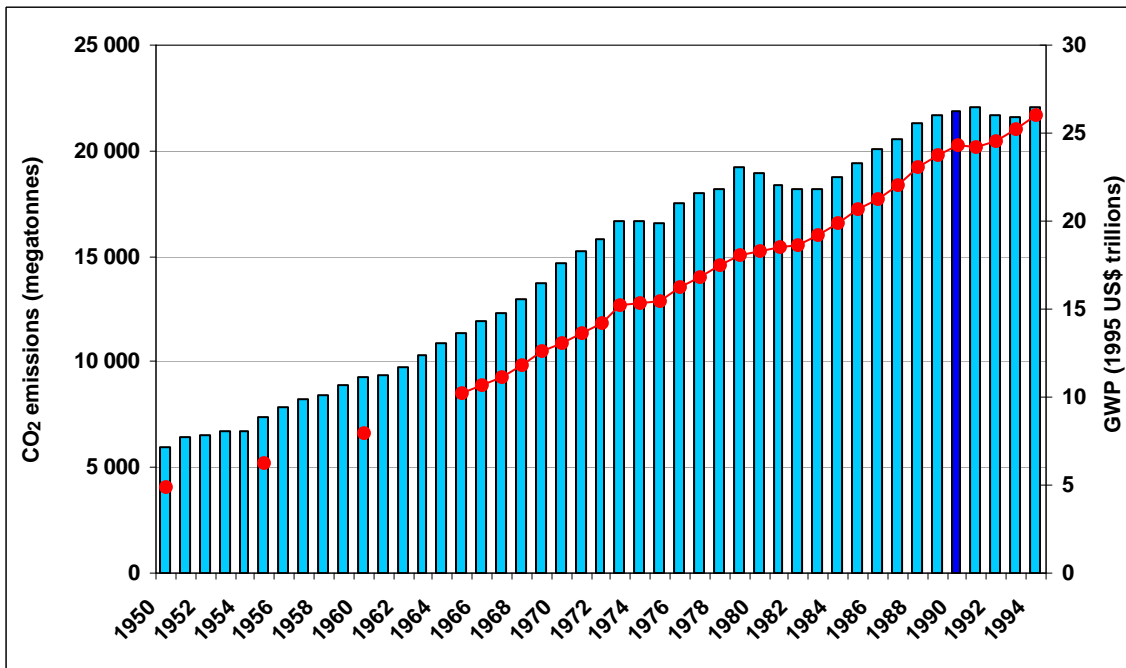
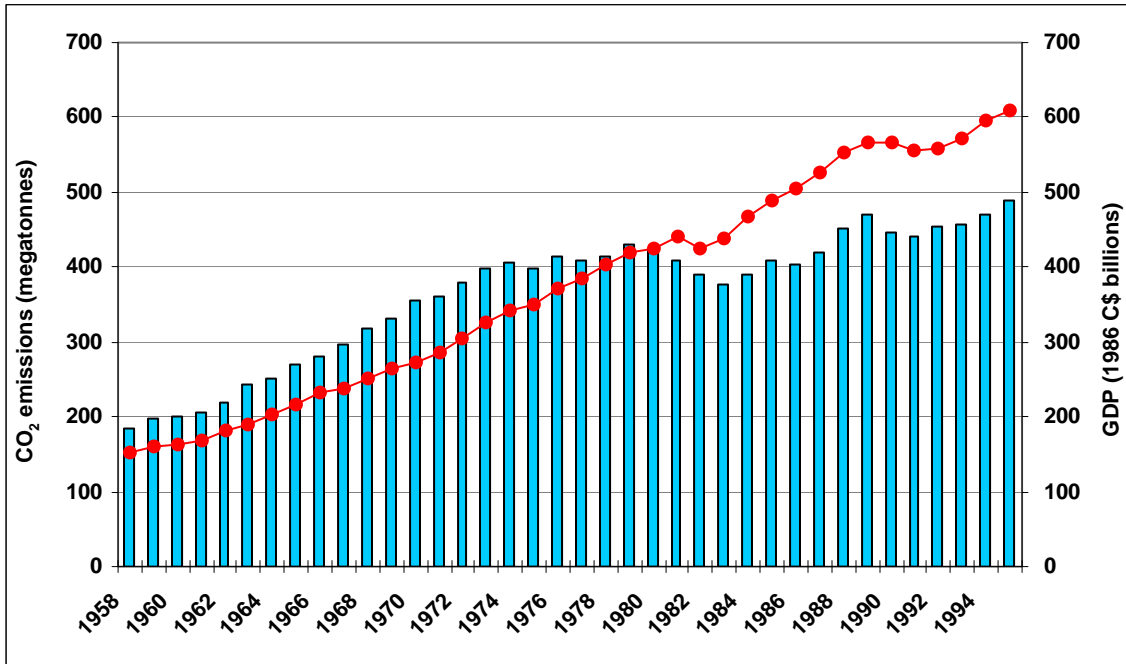
Ozone Depleting Substances

New Supplies of ODS, Canada



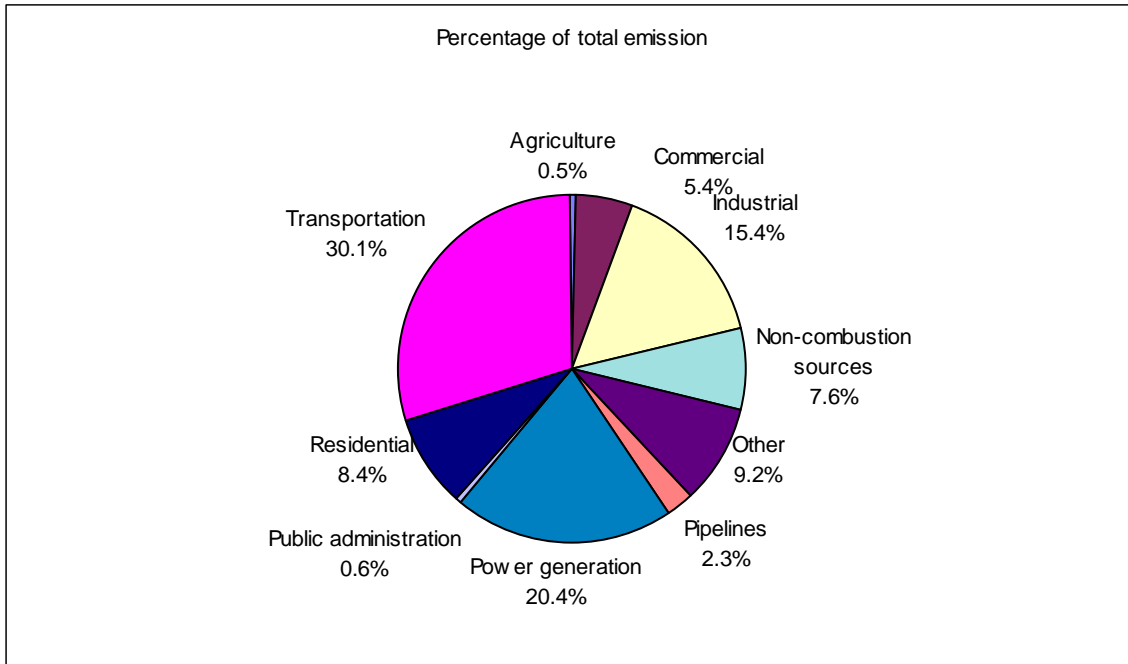
Global Climate Change

CO2 Emissions from Fossil Fuel Use, Canada

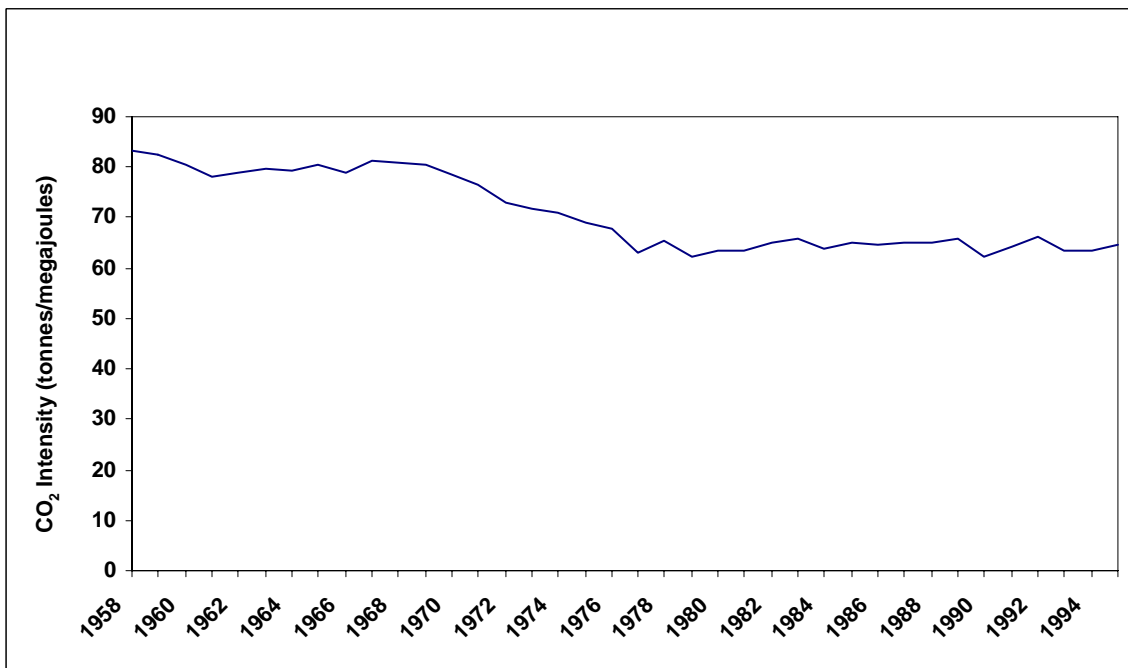


Global CO2 Emissions from Fossil Fuel Use

Sectoral Sources of CO2 Emissions, Canada



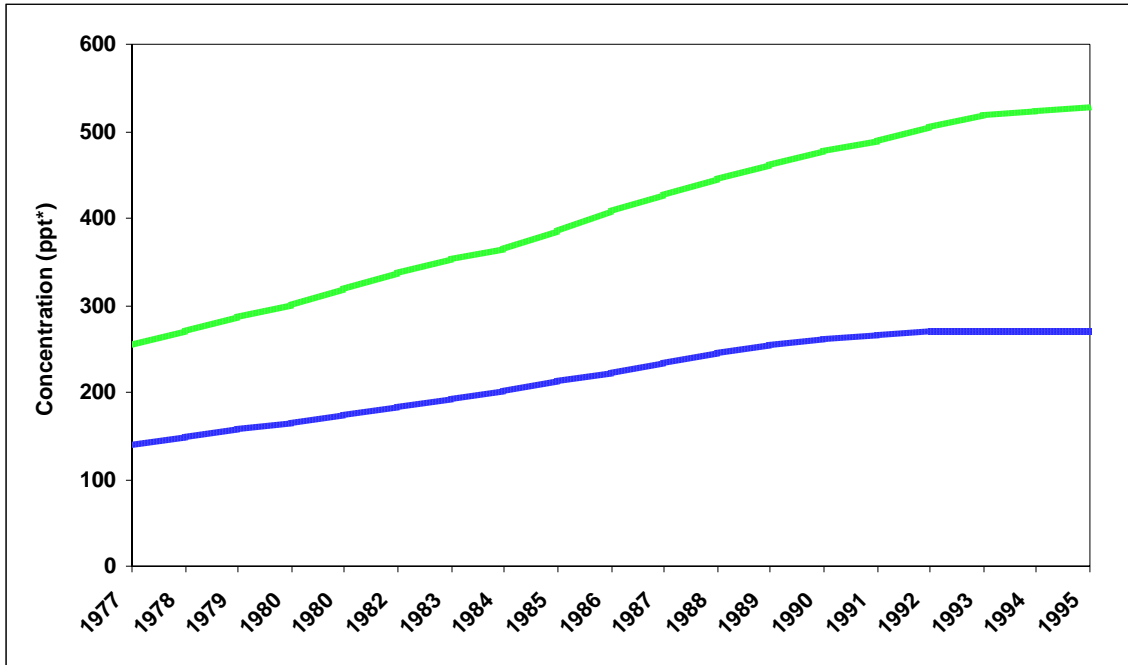
CO2 Intensity, Canada



A3.2 Atmospheric Concentrations

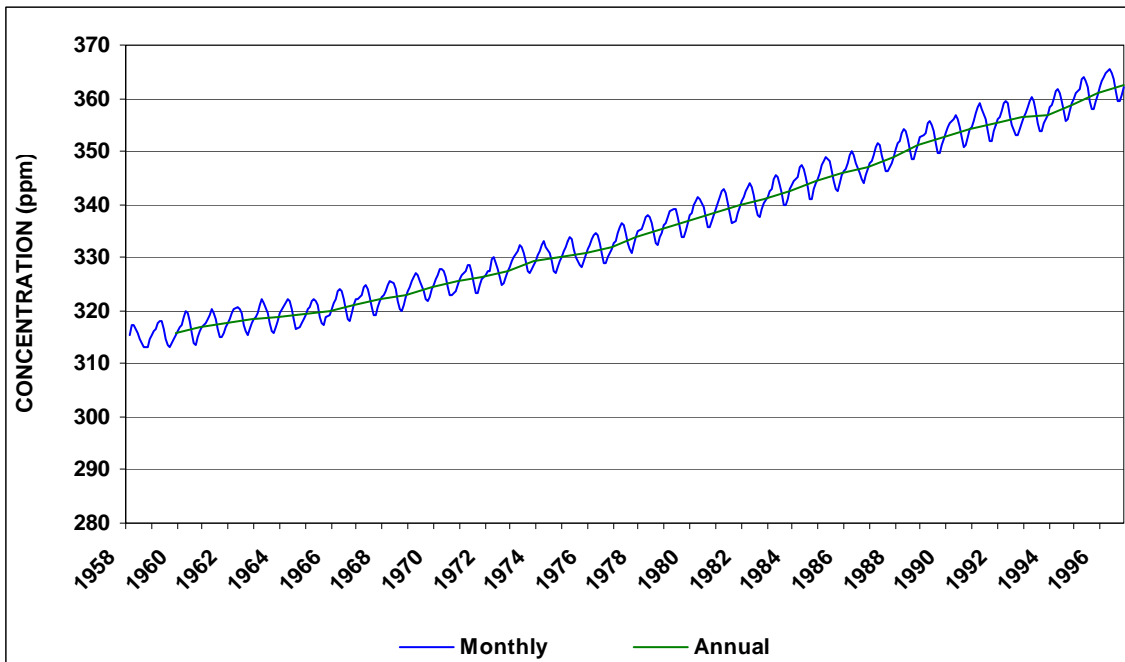
Acid Deposition

Not Applicable

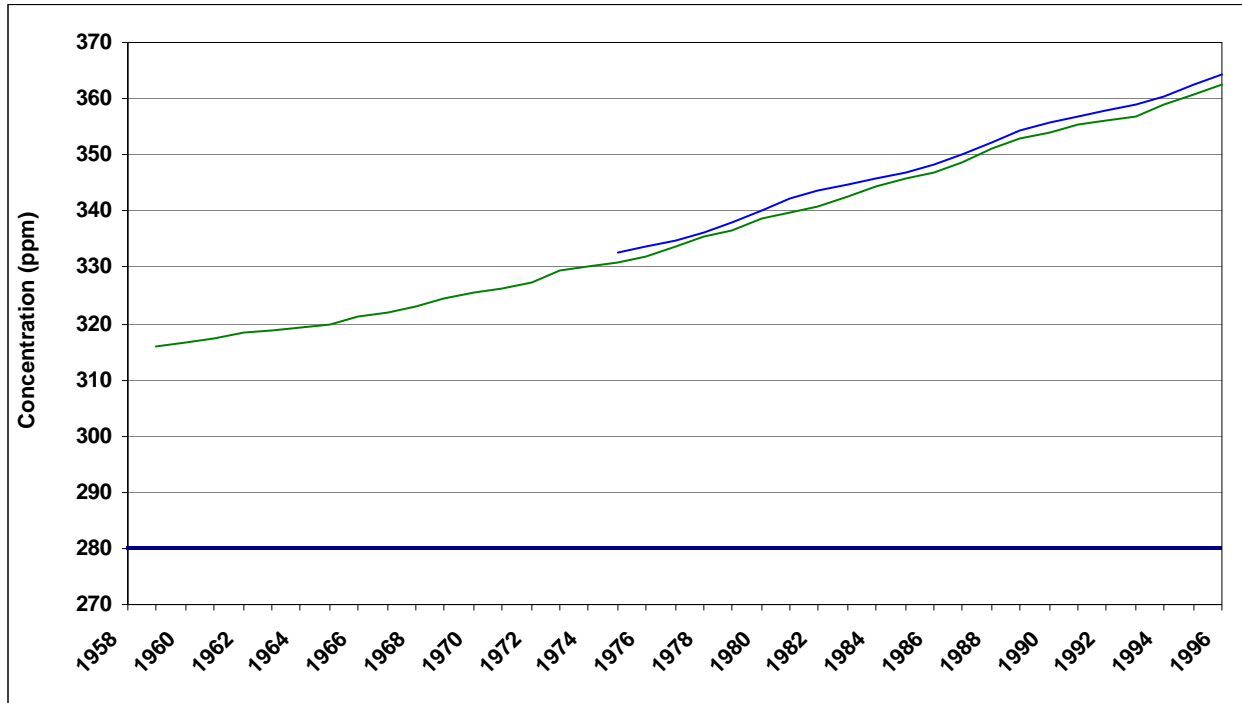


Ozone Depleting Substances

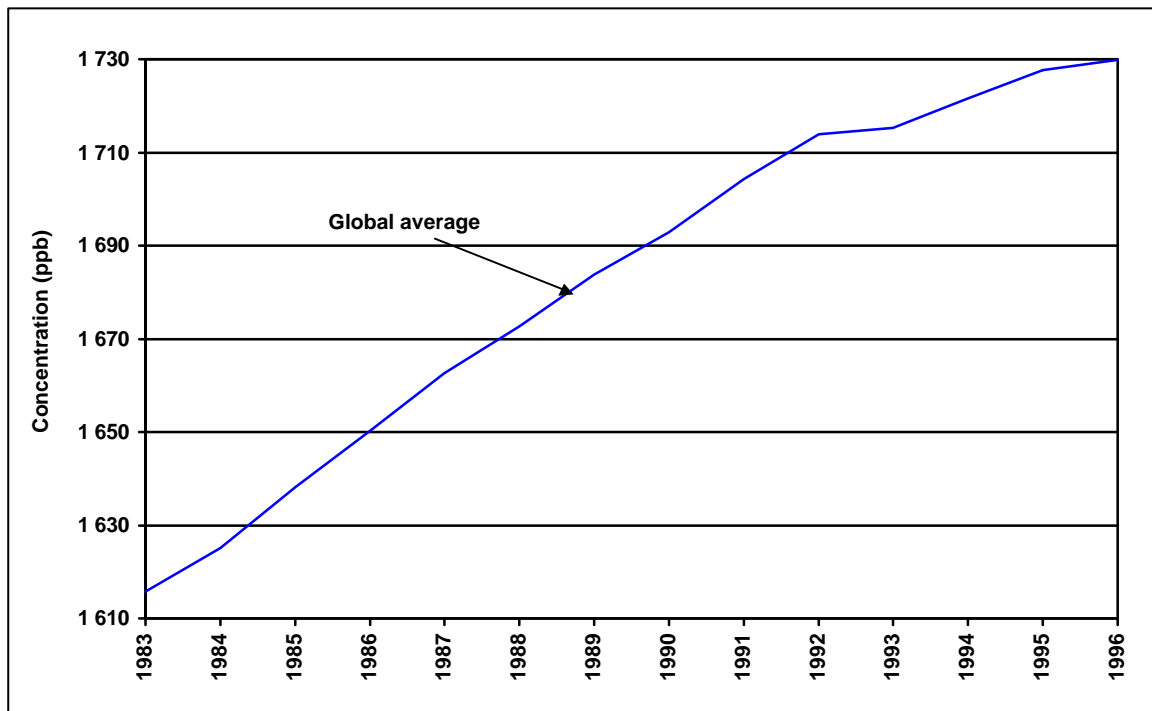
Greenhouse Gases



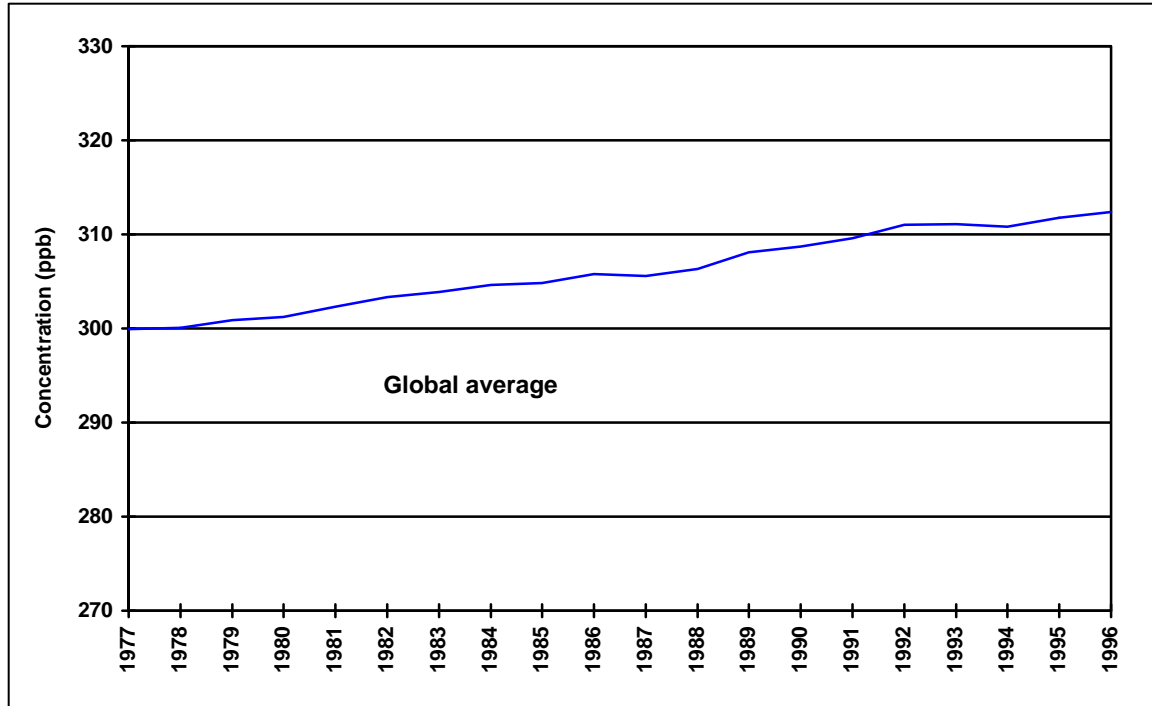
CO2



Methane



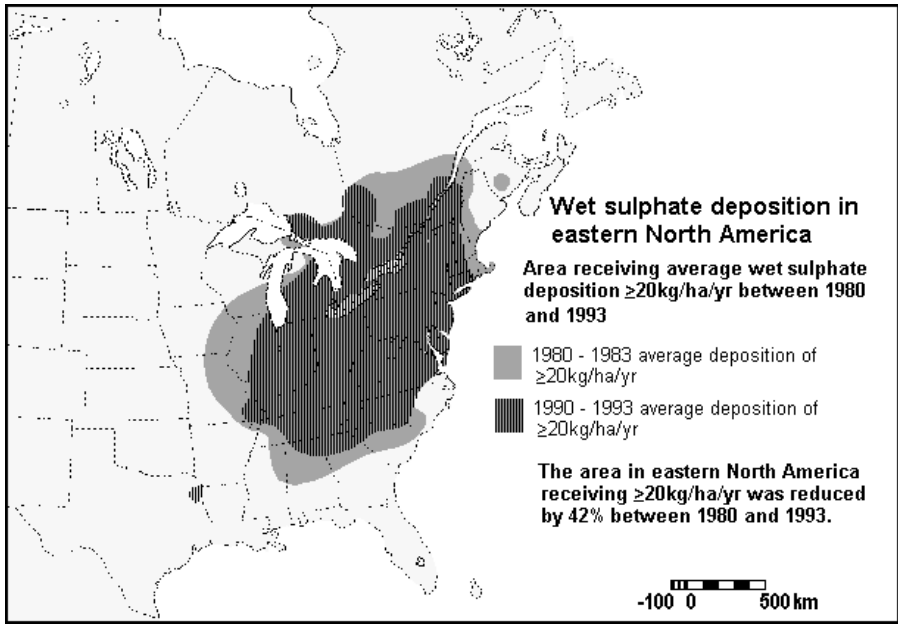
N₂O (Nitrous Oxide)



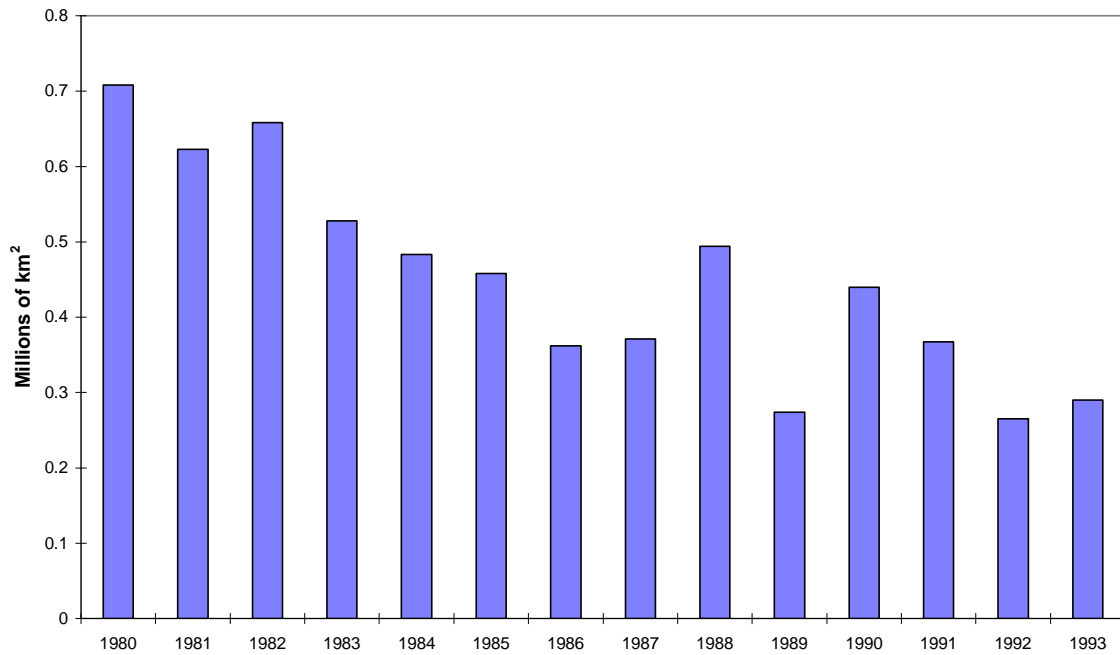
A3.3 Ecosystem and Biosphere Conditions

Acid Deposition

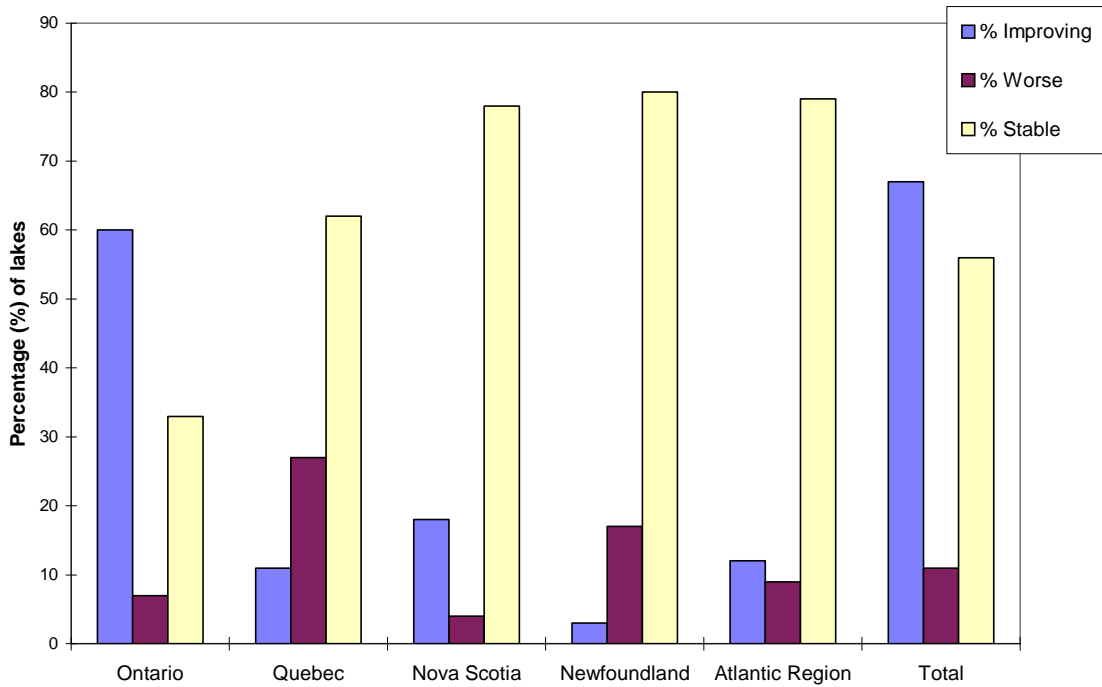
Wet Sulfate Deposition



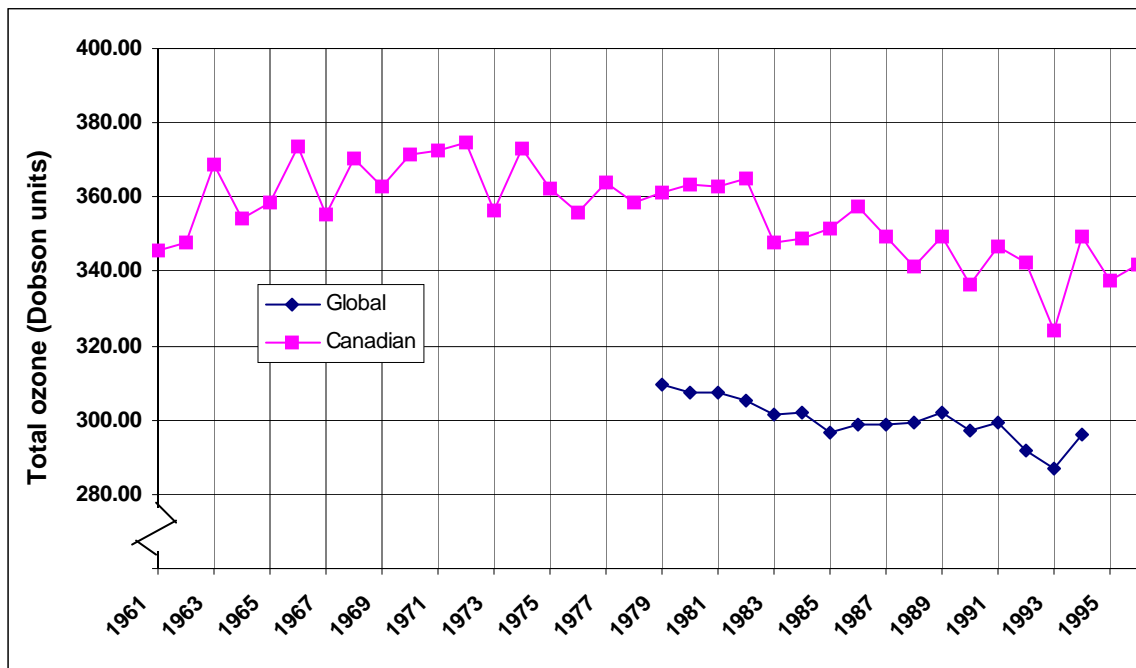
Eastern Canada - area receiving greater than or equal to 20 kg/ha/yr of wet sulphate (1980-1993)



Trends in lake acidity by region (1981-1994)



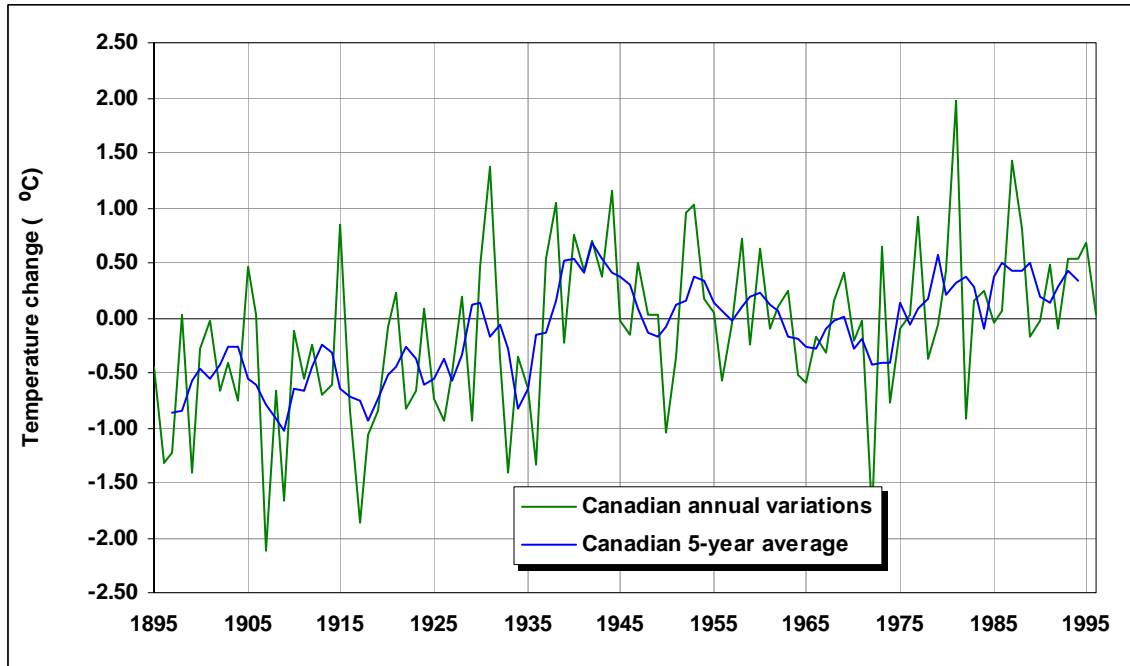
Stratospheric Ozone Depletion



Stratospheric Ozone Levels

Global Climate Change

Temperature Variations



Annex 4 – US / Canada Implementation Chronologies

(i) Acid Deposition

United States	Canada
1970 The 1970 Clean Air Act Amendments require NO _x emissions to be cut 90% from 1971 levels by 1976.	
1977 CAAA require EPA promulgation of new source performance standards for NO _x and SO _x .	
1978 National Atmospheric Deposition Program begins.	1978 Threat of acid rain in Muskoka Lakes provokes public outcry in Ontario
1978 Foreign Relations Reauthorization Act urges US-CAN concern over SO ₂ emissions from CAN power plant.	
1978 US-CAN Great Lakes Water Quality Act renewed establishing a Bilateral Research Consultation Group on LRTAP.	
1979 Canada and US sign statement of principles on transboundary air quality	
1979 LRTAP convention signed by 31 European countries, US and Canada	
1979 Pres. Carter's initiative calling for a 10-year, \$10 million/year interagency program of research on acid rain.	
1980 Canada, US sign Memorandum of Intent (MOI) on transboundary pollution	
1980 The Acid Precipitation Act establishes National Acid Precipitation Assessment Program (NAPAP).	1980 Council of Canadian Resource and Environment Ministers established (later split into separate Energy and Environment Councils)
1981 Ontario and Quebec intervene in proposed EPA State Implementation Plan relaxations.	
1982 New York and Quebec sign a five-point agreement to coordinate efforts to combat acid rain.	
1983 MOI Work Groups release final reports. Negotiations effectively end with no agreement.	
1983 New England (NE) governors meet premiers of eastern Canadian provinces and discuss acid rain.	
	1984 Federal and provincial governments agree on 50% emissions reductions target
1984 New York State requires reduction of SO ₂ emissions by 12% before 1988 and by 30% before 1991.	
1984 Congress authorizes Clean Coal Demonstration Program providing \$400 million for DoE.	
	1985 Federal-provincial accord on emission controls and finances
1985 Mulroney and Reagan appoint Special Envoys on acid rain	
1985 LRTAP Protocol on SO ₂ signed by Europeans and Canada, not US	
1985 Plan to cut SO ₂ 32% from 1980 levels by 1995 adopted by NE governors and eastern CAN premiers.	
1985 US and Mexico sign agreement to clean up smelter emissions causing acid rain.	
1986 Wisconsin sets emission standard of 1.2 lbs SO ₂ /mBtu for five major utilities and NO _x emissions cap.	

1986	Special Envoys' report: acid rain is a serious environmental problem. Mulroney and Reagan endorse Envoys' findings and conclusions. Reagan promises to consider Canadian proposal to negotiate acid rain accord
1988	US and Canada sign the LRTAP NO _x Protocol to freeze emissions at 1987 levels (1978 for U.S.).
1988	Congressionally sanctioned Project 88 endorses tradable-permit scheme.
1990	CAAA require SO ₂ cuts to 8.95 million tons/yr in two phases by 2000 (including 50% cut by utilities).
1991	US-Canada Air Quality Agreement signed committing to SO ₂ and NO _x emissions

(ii) Ozone Depletion

1971	Congress authorizes Climatic Impact Assessment Program to determine whether SSTs affect ozone layer.	
	1973 AES Advisory Committee on Stratospheric Pollution established	
1974	Molina and Rowland publish theory that CFCs can destroy stratospheric ozone in Nature.	
1974	Ann Arbor (Michigan) passes voluntary ban of CFC aerosols.	
1975	NRDC sues the Consumer Product Safety Commission for a ban on CFCs used in aerosol spray cans.	
1975	Oregon bans CFCs in aerosol cans.	
1976	NAS report says government action on CFC regulations should be postponed.	1976 AES Advisory Committee report: time to regulate ODS. Minister says he will.
1976	Food and Drug Administration and EPA propose a phase-out of CFCs used in aerosols.	
1977 UNEP World Plan of Action on the Ozone Layer and Coordinating Committee on the Ozone Layer.		
1977	Several government agencies announce joint plans to limit the uses of CFCs in aerosols.	
1978	CFCs used in aerosols are banned in the United States (regulation not law).	
1979	EPA announces the United States' intention to freeze all CFC production at 1979 levels.	1979 Federal regulations ban CFC aerosols in three largest uses
1980	EPA releases Advanced Notice of Proposed Rulemaking with plans for more CFC regulations	
1982 First UNEP Ad Hoc Working Group meeting to prepare for a Convention for Protection of Ozone Layer.		
1984	NRDC sues EPA for failing to provide Phase Two regulations on CFCs as specified by the CAAA.	
1985 The Vienna Convention adopted		

1986 DuPont calls for limits on worldwide CFC production. Announces in 1988 that it will cease manufacture of the chemicals as substitutes become available.	
1987 Montreal Protocol on Substances that Deplete the Ozone Layer adopted.	
1988 Vienna Convention enters into force.	
1988 US ratifies Montreal Protocol.	1988 Canadian Environmental Protection Act enacted (allows for ratification of Montreal Protocol)
1989 Montreal Protocol enters into force.	
1989 CFC excise tax passed.	1989 Environment Canada Minister says Canada will cut CFCs in 10 years 1989 Federal regulations implement Protocol and forbid certain specific uses
1989 Helsinki Declaration calls for phaseout of CFCs and halons.	
1990 CAAA require CFC recycling, CFC excise tax, and limit time that CFC replacements can be used.	1990 December, Green Plan promotes recycling, more monitoring, publishing UV levels
1990 London Amendments to Montreal Protocol.	
1992 Copenhagen Amendments to Montreal Protocol adopted; London Amendments enter into force.	
1992 Bush announces US will phaseout ozone depleting substances by 1996.	1992 Environment Canada establishes "Ozone Watch" and "UV Index" Programs

(iii) Climate Change

1966 Congressional hearings discuss CO ₂ problem, climate change, and development of nuclear power.	1966 Science Council of Canada cites risk of climate change
1972 US-USSR Environmental Agreement – first gov't to gov't discussion on climate change.	1975 "Living with Climate Change" meetings consider climate variability and food security
1976 Energy Research and Dev. Admn. Establishes CO ₂ and Climate Office. Holds 1977 conference on "Environmental Impacts of Fossil Fuel CO ₂ ."	
1978 National Climate Program Act establishes National Climate Program Office.	1978 Canadian Climate Program established
1979 First World Climate Conference.	
1980 WMO/UNEP/ICSU meeting on CO ₂ induced climate change held in Villach.	
1980 Energy Security Act calls for OSTP study of climatic effects of CO ₂ .	
	1981-82 CO ₂ Advisor and CO ₂ Program established in Environment Canada
1985 WMO, UNEP, and ICSU meeting in Villach, Austria. Advisory Group for Greenhouse Gases formed.	
1986 Congress calls for federal action to address climate change.	
1988 Heat wave and drought during summer in North America	
1988 Toronto Conference, "Changing Atmosphere", calls for 20% CO ₂ reduction by 2005	
1989 Noordwijk, Netherlands, Ministerial Conference. US rejects targets and timetables called for, Canada signs declaration to stabilize GHGs and adopt the precautionary principle	
1989 Hague Conference calls for international action even in the absence of unanimity	
1990 Three Intergovernmental Panel on Climate Change (IPCC) reports released.	
1990 Global Change Research Act	1990 Bergen Conference: Environment

establishes 10-year research program.	minister supports CO ₂ controls
1990 EPA report "Policy Options for Stabilizing Global Climate."	1990 Environmental Committee recommends Canada adopt Toronto target; Government rejects.
1990 Global Climate Change Prevention Act & America the Beautiful Act focus on forestry efforts.	1990 National Action Strategy: stabilize CO ₂ , other GHGs at 1990 levels by 2000.
1990 Global Warming Initiative requires AID funding of \$15 million and MDBs to promote initiatives.	1990 Green Plan repeats Action Strategy's stabilization commitment.
1990 Second World Climate Conference held in Geneva; Canada commits stabilize GHGs.	
1991 INC negotiations begin.	
	1992 Green Plan commits \$85 M for climate change research, later reduced.
1992 Framework Convention on Climate Change at UNCED signed at Rio.	
	1992 Quickstart Agenda; National Air Issues Coordinating Committee established

Annex 5 – Possible Policy and Regulatory Approaches for Reducing Greenhouse Gas Emissions

- *Carbon Taxes:* A carbon tax varies in direct proportion to the average carbon content of the fossil fuel (e.g., if the carbon tax for natural gas is \$1 per gigajoule, it would be \$1.30 for oil and \$1.95 for coal).¹⁰⁴ Five countries – Denmark, Finland, the Netherlands, Norway and Sweden – have introduced taxes on emissions of carbon dioxide from burning coal, oil and natural gas. The Dutch tax, which exempts renewable energy, is cutting carbon emissions 2 per cent annually. Sweden's levy has increased biomass use, mainly for co-generation, by 71 per cent. In Norway, where good alternatives to fossil fuel use exist, the tax has contributed to carbon reductions of up to 21 per cent per year and by 2 to 3 per cent per year from household motor vehicles.¹⁰⁵ According to the OECD, the main reason a European Union carbon/energy tax was not adopted was strong opposition from industrial sectors, based on arguments concerning competitiveness. Member states did not want to apply a tax that would increase costs so long as the EU's principal competitors were not applying similar measures.
- *Emissions Trading:* Either credit trading (where companies can earn credits for reducing emissions below regulatory or voluntary standards, and then sell the credits to other companies) or emission allowance trading (total allowable emissions permits are distributed – and can be traded – and over time the number of allowances in circulation are reduced). Trading programs have been in place in the United States since 1976 when the U.S. EPA established the first emissions credit trading program.¹⁰⁶ The 1990 Clean Air Act Amendments (Title IV Acid Rain Program) established a more comprehensive emissions trading scheme that has exhibited very positive results.¹⁰⁷ Canada has had limited experience with emissions trading schemes.¹⁰⁸
- *Electricity Grid Competition:* Allowing small independent power producers to sell electricity on the existing transmission grid might result in more efficient, cheaper and cleaner electricity production employing a range of electricity generating sources.¹⁰⁹ Many American states (including California, New York, New Hampshire, Massachusetts and Maine) and five Canadian provinces (Alberta, British Columbia, Quebec, Manitoba and New Brunswick) have opened their grids for wholesale competition with Alberta and Ontario currently moving towards full competition at a retail level. When instituted simultaneously with a range of policy instruments¹¹⁰ deregulating of the electricity sector can result in lower pollution emissions¹¹¹ and lower electricity prices.¹¹²
- *Buyer Incentives:* A price signal to encourage car buyers to purchase more fuel-efficient car models. In the U.S. at the federal level, a gas guzzler tax has been in place since 1980, and was tightened in 1986. A related scheme to encourage more fuel efficient car purchases exists in Ontario, established in 1989 and expanded in 1991.
- *Building Codes:* Used by governments to set standards for insulation, heating, windows, lighting, air conditioning, general electrical consumption and other matters. Natural Resources Canada (NRCan) estimates that heating now accounts for 60 per cent of Canadian residential energy use, and that the residential sector accounts for 17 per cent of all CO₂ emissions. NRCan also estimates that space heating accounts

for about 55 per cent of commercial energy use and that the commercial sector produces 12 per cent of all CO₂ emissions.

- *Energy Efficiency Standards:* Many governments set minimum energy efficiency standards for new appliances and equipment, from refrigerators to industrial motors. Energy efficient appliances and equipment use less energy, reducing emissions of greenhouse gases. NRCan estimates that new 1996 lighting regulations alone will result in an annual net reduction in CO₂ of 5.3 megatonnes by the year 2000 – equivalent to the annual CO₂ emissions of one million cars.

Endnotes

¹ Two notes before proceeding: first, though this paper attempts to offer a balanced comparison between Canada and the United States in addressing global atmospheric risks, we are much better able to observe and comment on the Canadian context; this paper reflects that orientation. Second, a great deal of tangential material is contained in the annexes and endnotes, but we hope that the thrust of the arguments developed in the paper is reasonably captured in the main text.

² These three risks are sketched briefly in Annex 1.

³ The Canadian federal Commissioner of the Environment and Sustainable Development (CESD) noted in 1998 that Canada is a party to or has endorsed over 230 binding international agreements and non-binding instruments dealing with environmental issues – many of which are shared with the United States. A time line showing when Canada signed or endorsed key international environmental agreements and instruments is available at <http://www.oag-bvg.gc.ca/domino/reports.nsf/html/c802xe06.html>. And a graph of the number of international environmental agreements and instruments negotiated per decade during the 20th century shows the accelerating pace of Canada's involvement in environmental diplomacy since the turn of the century. (See <http://www.oag-bvg.gc.ca/domino/reports.nsf/html/c802xe07.html>).

⁴ See Levy (1995) for a detailed account of the LRTAP process.

⁵ Entered into force in 1988, 34 ECE countries and the European Community are currently Parties to this Protocol. It is an instrument for international cost-sharing of a monitoring program for review and assessment of relevant air pollution in Europe in the light of later protocols on emission reduction. EMEP has three main components: collection of emission data for SO₂, NO_x, VOCs and other air pollutants; measurement of air and precipitation quality; and modeling of atmospheric dispersion. At present, about 100 monitoring stations in 24 ECE countries participate in the program.

⁶ Some have argued that, since the United States has never signed either sulfur protocol, in the context of the LRTAP the British spelling (preferred, in any event, by the ECE) should be used in place of the American. Note that the 1998 Progress Report on the Canada-U.S. Air Quality Agreement notes that "Canadian spelling is used throughout. Future reports will alternate the use of Canadian and American spelling."

⁷ Entered into force in 1987, 21 ECE countries are Parties to this Protocol. Taken as a whole, the 21 Parties to this Protocol have reduced 1980 sulphur emissions by more than 50% by 1993 – the target year. All Parties to the Protocol have reached the reduction target, with 11 Parties having achieved reductions of at least 60%.

⁸ This Protocol requires emissions of nitrogen oxides or their transboundary fluxes to be stabilized at 1987 levels (with the exception of the United States that chose to relate its emission target to 1978). Taking the sum of emissions of Parties to the NO_x Protocol in 1994 (or a previous year, where no recent data are available), also a reduction of 9% compared to 1987 can be noted. Nineteen of the 25 Parties to the 1988 NO_x Protocol have reached the target and stabilized emissions at 1987 (or in the case of the United States 1978) levels or reduced emissions below that level according to the latest emission data reported.

⁹ Volatile Organic Compounds (VOCs, i.e. hydrocarbons) are the second major air pollutant responsible for the formation of ground level ozone. This Protocol specifies three options for emission reduction targets:

(i) 30% reduction in emissions of VOCs by 1999 using a year between 1984 and 1990 as a basis. (Austria, Belgium, Denmark, Finland, France, Germany, Italy, Liechtenstein, Luxembourg, Netherlands, Portugal, Spain, Sweden, Switzerland, United Kingdom, and the United States);

(ii) The same reduction as for (i) within a Tropospheric Ozone Management Area (TOMA) specified in annex I to the Protocol and ensuring that by 1999 total national emissions do not exceed 1988 levels. (Norway and Canada);

(iii) Finally, where emissions in 1988 did not exceed certain specified levels, Parties may opt for a stabilization at that level of emission by 1999. (Bulgaria, Greece, and Hungary).

¹⁰ Entered into force on 5 August 1998, this Protocol adopts an effects-based approach, the critical load concept, best available technology, energy savings, the application of economic instruments and other considerations, leading to a differentiation of emission reduction obligations of Parties to the Protocol. The effects-based approach, which aims at gradually attaining critical loads, sets long-term targets for reductions in sulphur emissions, although it has been recognized that critical loads will not be reached in one single step. The Protocol establishes an Implementation Committee as well as procedures for its review of compliance.

¹¹ This Protocol targets three particularly harmful metals: cadmium, lead and mercury. As one of the basic obligations, Parties will have to reduce their emissions for these three metals below their levels in 1990 (or an alternative year between 1985 and 1995). The Protocol aims to cut emissions from industrial sources (iron and steel industry, non-ferrous metal industry), combustion processes (power generation, road transport) and waste incineration. It lays down stringent limit values for emissions from stationary sources and suggests best available techniques (BAT) for these sources, such as special filters or scrubbers for combustion sources or mercury-free processes. The Protocol requires Parties to phase out leaded petrol. It also introduces measures to lower heavy metal emissions from other products and proposes the introduction of management measures for other mercury-containing products.

¹² This Protocol focuses on a list of 16 substances that have been singled out according to agreed risk criteria. The substances comprise eleven pesticides, two industrial chemicals and three by-products/contaminants. The ultimate objective is to eliminate any discharges, emissions and losses of POPs. The Protocol bans the production and use of some products outright (aldrin, chlordane, chlordecone, dieldrin, endrin, hexabromobiphenyl, mirex and toxaphene), while others are scheduled for elimination at a later stage (DDT, heptachlor, hexachlorobenzene, PCBs). Finally, the Protocol severely restricts the use of DDT, HCH and PCBs. The Protocol includes provisions for dealing with the wastes of products that will be banned. It also obliges Parties to reduce their emissions of dioxins, furans, PAHs and HCB below their levels in 1990 (or an alternative year between 1985 and 1995). And for the incineration of municipal, hazardous and medical waste, it lays down specific limit values.

¹³ Information on the LRTAP Convention (including the text of the agreement and its Protocols, and the status of ratification) is available at http://www.unece.org/env/lrtap_h1.htm

¹⁴ All international agreements – whether called a treaty, convention, protocol, etc. – create some obligations on countries that become party to them. They are agreements between states or between states and international organizations, and are governed by international law. The Vienna Convention on the Law of Treaties requires that treaty commitments be carried out in good faith; in theory, if a nation fails to abide by its commitments, other parties to an agreement can hold it to account. But while the traditional view of such agreements is that they should be seen as analogous to contracts and treated as binding promises (e.g., state-to-state commercial, investment or similar instruments), Johnson (1997) identifies “bindingness” as a less formal concept in the context of intergovernmentally negotiated commitments surrounding non-market objectives (e.g., the environmental agreements studied in this paper). To distinguish the degree to which an agreement is legally enforceable, Johnson suggests a threefold operational framework for treaties based on the following categories: *treaty obligations*, *treaty-generated legal obligations* and *principled expectations*. As such, only treaty obligations are enforceable through adjudication. In the context of global environmental risks, the LRTAP, Vienna and UN FCCC conventions could be classified as entailing principled expectations, whereas the emanating protocols are legal obligations generated under the agreement; neither is adjudicable in international law. For Johnson, the basis of the distinction comes down to the type of consent exercised in acceding to the agreement: “consent to be juridically accountable in a court of law, consent to be held operationally answerable in the diplomatic arena, and consent to be morally bound in the eyes of progressive public opinion” (p.276).

International agreements adopt varying methods for enforcing compliance. For example, the recently suspended negotiations to conclude a Multilateral Agreement on Investment (MAI) at the Organisation for Economic Co-operation and Development (OECD) contained provisions for dispute settlement procedures that would be legally binding, enforceable and applicable to all levels of government. Enforcement proposals would have enabled investors or their home governments to seek remedies directly against foreign governments through international arbitration or domestic courts. Few international environmental agreements contain enforcement provisions (GAO, 1999), and tend to rely, more

informally, on the good faith efforts of nations to comply with the terms of the agreement, while others seek a middle ground in which parties may elect to use various sanctions in order to invite compliance. Also, the international community uses a variety of non-binding instruments to encourage nations to work toward common goals. These include international declarations of principle, codes of conduct, guidelines, and resolutions of international bodies such as the United Nations General Assembly. Prominent examples of non-binding environmental instruments are the 1992 Rio Declaration on Environment and Development and the associated Agenda 21. Both set out general principles of environmental protection and sustainable development to guide the conduct of nations, yet neither is legally binding. Many international environmental agreements include dispute settlement provisions that require parties to negotiate in good faith when disputes arise over the interpretation or application of the agreement. Some agreements also contain non-compulsory dispute settlement mechanisms, such as arbitration or hearings before the International Court of Justice. In practice, action to enforce international environmental obligations is rarely initiated. Instead, countries are held accountable in large part through the force of peer pressure and domestic and international public opinion. The risks associated with non-compliance, including erosion of a country's reputation both at home and abroad, are perceived by some as persuasive elements to promote the fulfillment of treaty obligations.

¹⁵ A federal-provincial SO₂ reduction plan negotiated before 1991 had placed a 2.3 million tonne emissions limit on the seven easternmost provinces but no limits, other than regulations related to ambient standards, on the three western provinces (Saskatchewan, Alberta and British Columbia). With the federal leadership exhibited through the signing of the Air Quality Agreement, the provinces agreed to a national SO₂ program cap of 3.2 million tonnes involving all provinces.

¹⁶ See Parson (1995) for a detailed account of the Vienna process.

¹⁷ The Meeting of the Parties convened in Vienna in 1995 resulted in an *adjustment* to the Montreal Protocol, but it was not, technically speaking, amended. Thus, the ratification data in section 1.3 (below) tracks only the London, Copenhagen and Montreal Amendments since there was no ratification process for the Vienna adjustments.

¹⁸ The current text of the Montreal Protocol, incorporating the four amendments/adjustments, is available at http://www.unep.ch/ozone/mont_t.htm

¹⁹ See Mintzer and Leonard (1994) for a detailed account of the UN FCCC process.

²⁰ COP1 also witnessed a long and tedious debate over the selection of the site of the Permanent Secretariat for the climate convention. While Bonn was eventually chosen, Canada mounted a vigorous defense of its nominated city of Toronto. That the government of Canada seemed more committed to the location of the convention's Secretariat than to the ultimate impact on emissions and global climate change relates to some themes which are explored below.

²¹ Carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride

²² This multi-year commitment period is a condition of U.S support for the Protocol, under its "when" flexibility criteria. Emissions reduction targets in the Kyoto Protocol are not stated in terms of a particular year but are rather for an average over a five year period (2008 – 2012) in order to allow for uncertainty and to smooth out fluctuations in emissions based on short-term effects like business cycles or extreme climatic variations (e.g., very hot summers or cold winters).

²³ From Annex B to the Kyoto Protocol, the quantified emission limitation or reduction commitment for UN FCCC Annex 1 Parties (expressed as a percentage of base year or period) are:

Australia	108	Finland	92	Liechtenstein	92	Russian Fed.*	100
Austria	92	France	92	Lithuania*	92	Slovakia*	92
Belgium	92	Germany	92	Luxembourg	92	Slovenia*	92
Bulgaria*	92	Greece	92	Monaco	92	Spain	92

Canada	94	Hungary*	94	Netherlands	92	Sweden	92
Croatia*	95	Iceland	110	New Zealand	100	Switzerland	92
Czech Republic*	92	Ireland	92	Norway	101	Ukraine*	100
Denmark	92	Italy	92	Poland*	94	United Kingdom	92
Estonia*	92	Japan	94	Portugal	92	United States	93
EC	92	Latvia*	92	Romania*	92		

* Countries that are undergoing the process of transition to a market economy.

²⁴ Article 25 of the Protocol provides that it will enter into force 90 days after at least 55 countries, accounting for at least 55 per cent of the total carbon dioxide emissions of the Annex I Parties for 1990 (as stated in their first national communication), have deposited their instruments of ratification, acceptance, approval or accession.

²⁵ At the Group of Eight Summit in Germany in June 1999, the final communiqué affirmed that the countries would “work towards timely progress in implementing the Buenos Aires Plan of Action with a view of early entry into force of the Kyoto Protocol.” (Final Communiqué, G8 Summit available at <http://www.usia.gov/topical/econ/g8koln/20commun.htm>).

COP5, to be held in Bonn October 25 - November 5 1999, will centre on the Kyoto Protocol's three flexibility mechanisms – the clean development mechanism (CDM), joint implementation (JI), and an international emissions trading regime. Delegates will also begin to set out an agenda for a compliance regime for the Protocol. The *Buenos Aires Plan of Action* calls for these issues to be resolved before the end of 2000 (at COP6).

²⁶ See note 14, above, on the nature of “bindingness” in international law.

²⁷ Signatures data is not presented for the amendments to the Montreal Protocol nor for the LRTAP Convention or its Protocols either because Parties are deemed to have signed those documents on the date of their negotiation by virtue of their membership in the negotiation process, or there does not exist a formal signature process. Ratification data is not presented for two of the Protocols to the LRTAP Convention (the HM and POPs Protocols) since there is, as of the time of the writing of this paper, only one Party to the Protocols (Canada).

²⁸ The ratification and signature events for the separate instruments should not be interpreted as occurring contemporaneously; instead, the time measurement of the x-axis represents the comparative time-lag across all instruments with the origin of the axis occurring at day zero for each particular instrument.

²⁹ In any event, the remaining data “off the scale” to the right reveals generally similar patterns to the data for the first five years, except that in the Vienna Convention and Montreal Protocol cases, ratification rates accelerated during 1992 and 1993 (perhaps coinciding with the enthusiasm surrounding the UNCED Conference and the UN FCCC).

³⁰ Currently, the total number of Parties to the basic instrument in each case is: LRTAP = 43; Vienna = 169; UN FCCC = 176.

³¹ Note in the four cases where a one-year signature window existed that all instruments reveal a last-minute flurry of signatures as countries seemingly waited until the closing days of the signing period to register their acceptance.

³² In both the Vienna / Montreal case, and the FCCC case, no country that signed the original documents has failed to ratify them. Only the LRTAP signatories of San Marino and the Vatican have not ratified the original Convention, both for reasons other than a lack of commitment to the treaty's objectives.

³³ Note that, to date, only eight small countries have ratified the Kyoto Protocol, and none of these is an Annex-B country (listed in endnote 23, above) – the ones that would be committing to a reduction commitment under the terms of the Protocol. (Recall that Article 25 of the Protocol provides that it will

enter into force 90 days after at least 55 countries, accounting for at least 55 per cent of the total carbon dioxide emissions of the Annex I Parties for 1990 ratify the Protocol.) In comparison, at this point (approximately one and a half years after being opened for signature) in the Montreal Protocol ratification process, thirty-four countries had ratified the agreement – and included in that number were many “non-Article 5” states, the developed countries committing to the more stringent reduction schedules.

³⁴ It must be said, however, that while the FCCC commitments entailed ‘soft’ undertakings to hold 2000 emissions at 1990 levels, the terms of the FCCC were much more specific than the general principles and intentions enunciated in the LRTAP.

³⁵ Ratification rates were steady for the period following that presented in the chart, with a significant number of additional Parties joining the Vienna / Montreal regime in 1992 and 1993. See endnote 29, above.

³⁶ London Conference, 1999 as described in the *Globe and Mail*, June xx, 1999, p. xx)

³⁷ As a final note, the ratification record for Canada and the U.S. is contrasted in the following table. We see here that Canada was the first country to ratify the Vienna Convention (with the U.S. being the fifth Party), while the U.S. was the second to ratify the Montreal Protocol (and Canada was fifth). Both countries were early ratifiers of the FCCC (the U.S. was the fourth to ratify the Convention, and Canada was eighth). For LRTAP the record is mixed: early action on some Protocols, long delays for others and no ratification in some cases.

Convention / Protocol / Amendment	United States Ratification Delay	Canada Ratification Delay	All Parties Average Delay to Ratification
<i>LRTAP Convention</i>	737	752	2133
<i>LRTAP Geneva Protocol (EMEP)</i>	31	426	1250
<i>LRTAP Helsinki Protocol (Sulphur)</i>	NP	145	650
<i>LRTAP Sofia Protocol (NOx)</i>	252	804	937
<i>LRTAP Geneva Protocol (VOC)</i>	NP	NP	1124
<i>LRTAP Oslo Protocol (Sulphur II)</i>	NP	1104	1081
<i>LRTAP Aarhus Protocol (HM)</i>	NP	174	**
<i>LRTAP Aarhus Protocol (POP)</i>	NP	174	**
<i>Vienna Convention</i>	515	432	2366
<i>Vienna – Montreal Protocol</i>	215	284	1602
<i>Montreal – London Amendments</i>	529	8	1306
<i>Montreal – Copenhagen Amendments</i>	457	471	1055
<i>Montreal – Montreal Amendments</i>	NP	190	**
<i>UN FCCC</i>	131	180	849
<i>FCCC – Kyoto Protocol</i>	NP	NP	**

Delays to Signature and Ratification, in days. N.B.: The ratification delay is measured as the number of days between the date the Convention, Protocol or Amendment was completed and/or open signature and the date the agreement was ratified. NP = the country has not ratified the agreement and is not a Party; ** = too few ratifications to present a meaningful value for average delay.

³⁸ See annex 2 in this document for a table containing comparative statistics for Canada and the United States.

³⁹ Canada's population density is 3.3 people per km². Source: <http://www.overpopulation.com/density.html>

⁴⁰ Nearly 90% of the Canadian population is concentrated within 160 km of the US/Canada border (see annex 2).

⁴¹ Defined in Part VI, sections 91 to 95, Constitution Act, 1867. Jurisdiction for environmental protection is shared by both orders of government, with provinces wielding most powers. Section 91 of the Constitution Act assigns to the federal government jurisdiction in 29 areas as well as a residual power to act in matters that have not been explicitly granted to one of the two orders of government. Parliament has the power to deal with environmental matters through its authority over taxation (s. 91 (3)); navigation and shipping (s. 91 (10)); sea coast and inland fisheries (s. 91 (12)); criminal law (s. 91 (27)); and peace, order and good government (s.91, opening words). Sections 92 and 93 enumerate 17 areas of provincial jurisdiction, with the most relevant to the environment being: taxation (s. 92 (2)); management and sale of the public lands belonging to the province (s. 92 (5)); municipal institutions (s. 92 (8)); local works and undertakings (s. 92 (10)); property and civil rights (s. 92 (13)); generally, all matters of a merely local or private nature in the province (s. 92 (16)); exploration for non-renewable natural resources in the province (s. 92a (1)(a)); development, conservation and management of non-renewable natural resources and forestry resources in the province (s. 92a (1)(b)); and, development, conservation and management of sites and facilities in the province for the generation and production of electrical energy (s. 92a (1)(c)). See [http://canada.justice.gc.ca/cgi-bin/folioisa.dll/const_e.nfo/query=\[jump!3A!27constitution91!27\]/doc/{@157}?](http://canada.justice.gc.ca/cgi-bin/folioisa.dll/const_e.nfo/query=[jump!3A!27constitution91!27]/doc/{@157}?)

⁴² Much has been lamented about the lack of clarity in the division of powers with respect to environmental protection – a subject not of cognitive immediacy to the framers of the Constitution (see, e.g., VanderZwaag and Duncan, 1992). There exists in Canada, as in many other jurisdictions, a debate as to whether responsibility for environmental protection is best vested in central governments or in more local entities. For example, the *Canada-wide Accord on Environmental Harmonization* (see endnote 53, below) was challenged by the Canadian Environment Law Foundation (Canadian Environmental Law Assn. v. Canada [Minister of the Environment] T-337-98, Federal Court of Canada) on the grounds that the accord would “establish a structure which ... will obligate the federal government to refuse to exercise some of its jurisdiction in environmental matters, and thus lead to a diminution in environmental protection for Canadians.” The court, while not debating the merits of the case but rather the constitutionality of the Accord, denied the challenge on April 27, 1999 (see judgement at <http://www.fja.gc.ca/en/cf/1999/orig/html/1999fca24443.o.en.html>).

⁴³ Other than in instances where the federal government uses the spending power at its disposal (by virtue of its broader taxation powers) to intervene in areas formally allocated to the provinces (e.g., in matters respecting education [section 93, Constitution Act, 1867], where the federal government often provides funding directly to institutions and individuals), it is typically the “two-level games” – between agreements made in international forums (a clear federal responsibility) and implementation on the ground (often of mixed jurisdiction) – that often cause the most friction between the federal and provincial governments.

⁴⁴ While all provinces and territories have departments responsible for environmental issues, they are not all named ministries of environment. The following is current as of June, 1999:

Alberta	Alberta Environment
British Columbia	Ministry of Environment, Lands and Parks
Canada	Environment Canada
Manitoba	Department of Environment
New Brunswick	Department of the Environment
Newfoundland and Labrador	Department of Environment and Labour
Northwest Territories	Department of Resources, Wildlife and Economic Development
Nova Scotia	Department of the Environment

Nunavut	Department of Sustainable Development
Ontario	Ministry of the Environment
Prince Edward Island	Department of Technology and Environment
Quebec	Department of Environment
Saskatchewan	Environment and Resource Management
Yukon	Department of Renewable Resources

⁴⁵ Indications that the federal government has less interest in the environment field center on the disproportionate hit Environment Canada took (in terms of budget and personnel) during the program and budget review in the early 1990s. It has also witnessed a progressive diminishment in its cabinet rank: once the portfolio of the Deputy Prime Minister, the position is now considered a junior cabinet post. And the harmonization initiative (see endnote 42, above) illustrates further withdrawal from the field. In response to this, Environment Canada has refocused its energy on providing sound environmental science to decision makers, further removing itself from policy and enforcement activities.

⁴⁶ In 1993, after a few years of increasing activity, the mandate of CCME was narrowed to the priority issue of national harmonization of programs and policies. The new mandate was a reflection of the general "re-inventing government" wave of the early 1990s, with the aims being the reduction of duplication and overlap between the two orders of government and increased efficiency. The *Canada-wide Accord on Environmental Harmonization* (a commitment from the federal government, nine provinces and the territories to cooperate on action to protect the environment) was signed in early 1998.

⁴⁷ Thus making it a GONGO, or government organized non-governmental organization.

⁴⁸ The Rio Way has three defining characteristics:

- *Transparency*: This means that how decisions are made and how goals are set are visible and understood and that the decisions themselves are clear and understandable.
- *Accountability*: This means that responsibilities for finding solutions and achieving goals are clearly defined and that everyone knows where responsibility rests.
- *Inclusion*: This means that everyone who wants to be involved and has an interest has the opportunity to be involved, and above all, that we can see our input in the outcomes.

In its report following the 1992 UNCED meeting in Rio, the House of Commons Standing Committee on the Environment recommended that "as Canada embarks upon the transition to sustainable development, the Rio Way become established as the fundamental basis for decision-making and policy development" (Canada, 1993).

⁴⁹ The strong central government created in the U.S. constitution and through various Supreme Court rulings (with respect to civil rights and interstate commerce, especially) has been weakened in recent years both through high court decisions and the emergence of the subsidiarity rationale in favor of more local decision making (as in the Canadian context). Further evolution occurred on June 22, 1999 (as this paper was being prepared) as the United States Supreme Court handed down three decisions that altered the balance of federal and state powers in favor of states rights. According to the high court, state governments cannot be sued – without their consent – in state courts by people seeking to enforce some federally legislated right (see <http://supct.law.cornell.edu/supct/html/98-531.ZS.html> and <http://supct.law.cornell.edu/supct/html/98-149.ZS.html>). And in a 5-to-4 vote, the justices dismissed a state court lawsuit by dozens of state probation officers seeking to enforce a federal labor law and collect overtime pay from Maine (<http://supct.law.cornell.edu/supct/html/98-436.ZS.html>). (See also *Seminole Tribe of Fla. v. Florida*, 517 U.S. 44 at <http://caselaw.findlaw.com/us/000/u10198.html> in which the Supreme Court decided that Congress lacks power under Article I of the Constitution to abrogate a State's sovereign immunity in federal court). For a summary of the decisions, see <http://www.npr.org/ramfiles/me/19990624.me.10.ram>

Some commentators contend that these rulings represent a dramatic shift in the federal / state relationship. But on July 6, 1999, an alternative view stressed that the decisions represented a modest adjustment protecting state's rights in commercial matters, with federally guaranteed civil rights still protected (see <http://www.npr.org/ramfiles/me/19990706.me.09.ram>). Federal expansion, it was contended, has been in general decline since the mid 1970s and is more a response to the logic of state and local delivery of most government functions than as a result of court decisions. In any event, while the decisions do not have an immediate impact on the capacity of the federal government to legislate in key areas, the general thrust of the court's majority opinion indicates its inclination as it enters its next century.

⁵⁰ This situation often holds in the case of international trade agreements, but where the U.S. government seeks to require that the Canadian federal government bind the provinces to any agreement (for example in the case of the negotiations leading up to the North American Free Trade Agreement or the soon to re-emerge Multilateral Agreement on Investment negotiations), the Canadian government remains loath to do so without the clear constitutional authority to make such a commitment (as less ambiguously exists in the U.S. setting), often to the frustration of U.S. negotiators.

⁵¹ Canada has a strong tradition of a professional career civil service with little political interference in the promotions and appointments of senior personnel. This tradition remains largely intact, yet the institutional knowledge represented by career civil servants is under pressure as reductions in the numbers of civil servants and their remuneration have contributed to high rates of turnover generally and early retirements from the very senior ranks (for the greener pastures of private industry).

⁵² While our exposition suggests that the implementation process be viewed as starting from the identification of an intention or strategy, moving on to the development of sharply defined policies, operational measures and the exercise of discretion by line staff and "street-level bureaucrats" (Lipsky, 1971), there is overwhelming evidence that implementation significantly influences policy outcomes through its effect on the entire policy cycle (Calista, 1994). Issues raised through previous implementation experience, as well as strategic forward thinking about potential implementation problems, greatly affect the formation of policy (Bardach, 1980). And policy implementation undergoes continuous design interventions and adaptations because it is difficult to determine what the desired policy outcome actually is until we see its effect – and even then it is not always clear (Wildavsky, 1980). Policy is also affected through the "politics of implementation" – i.e., who does what, and what they are trying to achieve by doing it – for it is in this forum that the policy formation battles drag on (Majone and Wildavsky, 1979; Nakamura and Smallwood, 1980).

⁵³ In this particular study, these collective goals are a response to commitments made at the international level to comply with an international agreement.

⁵⁴ See Annex 3 in this document.

⁵⁵ A lack of both compliance information and compliance mechanisms presents serious constraints to enforcing compliance. Many international environmental agreements require parties to report on their progress in implementing the agreement. However, the effectiveness of reporting mechanisms has been called into question. A 1999 study carried out by the General Accounting Office concluded that, for the international agreements it examined, information was reported late, incompletely or not at all, making it impossible to gain a comprehensive view of compliance. Although, under many agreements, secretariats have provided parties with standardized formats to facilitate and encourage reporting, poor reporting in developing countries is often related to a lack of financial and technical resources to gather data.

⁵⁶ Clean Development Mechanism and Joint Implementation:

⁵⁷ Dobell (2000) cites the 1991 *Pollution Prevention Act* in New Jersey which gave the state Pollution Prevention Office authority to negotiate with selected firms an integrated permit focussed on the production process as a whole; a pilot program was launched in 1992; and Rabe (1995) describes the flexible permit issued to 3M for all VOC emissions from a single facility which was proposed by the company and approved by the Minnesota Pollution Control Agency, conditional on 3M accepting enforceable limits on all VOC emissions at less than half the aggregate level previously permitted, and developing an approved procedure for continuous emissions monitoring and reporting. Flexibility for the company to change product lines and processes – hence emissions – was assured, provided the overall

cap was not exceeded. The innovation in this flexible or integrated permit lies in the possibility of extending a single facility permit to cover a wide range of emissions and media, and thus ultimately to deal with interaction among air issues.

⁵⁸ The voluntary commitments approach said to prevail in the Netherlands is representative of a general orientation toward such arrangements which have become widespread: "Since the drafting of the first environmental policy plan [in 1988], the government has offered to hold discussions with the various sectors to decide what contributions should be made by specific industries to meet the national environmental targets. The government is making centralized agreements (covenants) with almost every sector to cover the whole of a particular industry. These agreements give highly detailed quantified targets for the years 2000 and 2010. If the companies abide by these agreements, they can count on a good relationship with the government. If they don't, the government will re-impose its mandatory environmental licensing requirements." [Netherlands, 1995]

N.B.: at the UN FCCC COP4, the language of "voluntary commitments" has become tainted by a contentious debate between the Umbrella Group (JUSSCANNZ [Japan, U.S. Switzerland, Canada, Australia, Norway and New Zealand] and Russia) and the G77/China group over developing country commitments, leading to suspicion on the part of developing countries. Some argue that the concept may have to be recast in another guise if it is to become part of the Kyoto Protocol.

⁵⁹ Title IV of the United States 1990 Clean Air Act Amendments has been described as a "major policy innovation: the first broad-scale use of a market for pollution" (Hausker 1992). Its introduction of tradable SO₂ allowances is widely characterized as the "the largest test to date of the concept of 'market solutions' to environmental problems."

⁶⁰ E.g., liming of water supplies or lakes to counter acid rain; ozone adaptation efforts like UV-B watch, sun hats and sun blocks; and climate change responses such as coastal defenses and zoning changes around vulnerable coastal areas. The reason that the Organisation of Small Island States (OASIS) has so strenuously advocated an international response to the problem of global climate change is the realization that the potential impacts from rising sea levels will be much more costly for them than the costs of emissions reduction would be.

⁶¹ See annex 4 for risks specific chronologies of action taken by each country. Also refer to annex 3 for comparative data on pollution emissions and system conditions.

⁶² For information on the Trail Smelter case, consult http://www.jura.uni-muenchen.de/tel/cases/Trail_Smelter.html

⁶³ For the 1907 U.S. Supreme Court ruling in *State of Georgia v. Tennessee Copper Company*, see <http://laws.findlaw.com/US/206/230.html>

⁶⁴ See endnote 7, above.

⁶⁵ See endnote 10, above.

⁶⁶ In 1996, national SO₂ emissions were estimated to be 2.6 million tonnes, or 19 percent below the agreed-upon national cap of 3.2 million tonnes. Emissions in southeastern Canada, referred to as the Sulphur Oxide Management Area, were estimated to be 1.25 million tonnes, or 29% below the cap set at 1.75 million tonnes for the year 2000. These emissions reductions were largely achieved as a result of the Eastern Canada Acid Rain Program, which capped provincial SO₂ emissions in the seven eastern most provinces. Provincial regulations have ensured that the caps were met on time. Some western provinces also set stringent emission requirements on certain major new sources, such as natural gas plants, to minimize the growth in emissions.

⁶⁷ Title IV of the Clean Air Act sets as its primary goal the reduction of annual SO₂ emissions by 10 million tons below 1980 levels. To achieve these reductions, the law requires a two-phase tightening of the restrictions placed on fossil fuel-fired power plants. Phase I began in 1995 and affects 445 mostly coal-burning electric utility plants located in 21 eastern and midwestern states. Phase II, which begins in the year 2000, tightens the annual emissions limits imposed on these large, higher emitting plants and also sets restrictions on smaller, cleaner plants fired by coal, oil, and gas, encompassing over 2,000 units in all. The Act also calls for a 2 million ton reduction in NO_x emissions by the year 2000. A significant portion

of this reduction will be achieved by coal-fired utility boilers that will be required to install low NO_x burner technologies and to meet new emissions standards. The amendments can be found at <http://www.epa.gov/acidrain/lawsregs/caaa.html>

⁶⁸ See endnote 8, above.

⁶⁹ See endnote 9, above.

⁷⁰ Provincial smog management plans incorporate substantial reductions of NO_x and VOC emissions in the Windsor–Quebec City corridor, the Southern Atlantic Region, and the Lower Fraser Valley. The Greater Vancouver Regional District has enacted a stringent program of regulatory limits for VOC and NO_x emissions for a wide range of industrial and commercial point sources as well as Canada's first mandatory vehicle inspection and maintenance program ("Air Care"). Ontario recently published a smog plan in January 1998 that includes a wide range of specific industrial commitments to reduce NO_x and VOC emissions and particulates, along with its own mandatory vehicle inspection and maintenance program ("Drive Clean"), which includes heavy-duty vehicles.

⁷¹ Work has begun on a Phase 3 Federal smog management program, which will include an increased focus on inhalable particles as an important component of smog, and will link measures more strongly with other air quality programs, including the acid rain program.

⁷² *Study of Volatile Organic Compound Emissions from Consumer and Commercial Products*. The US-EPA is required, under section 183(e) of the Clean Air Act, to: study emissions of VOC from consumer and commercial products; list the most important categories of products that account VOC emissions; and divide the list into four groups, and regulate one group every two years using best available controls, as defined by the Clean Air Act.

⁷³ The 1998 *Aarhus Protocol on Persistent Organic Pollutants (POPs)* (see endnote 12, above).

⁷⁴ The 1998 *Aarhus Protocol on Heavy Metals* (see endnote 11, above).

⁷⁵ Preparations are currently underway to begin negotiations on a legally binding global agreement on POPs under UNEP. Canada's objective is to build on the success of the regional UN-ECE agreement by obtaining a global commitment from countries to undertake appropriate control actions on POPs, focusing initially on 12 substances of concern.

⁷⁶ Data as of June 5, 1999.

⁷⁷ The critical load is a measure of how much pollution an ecosystem can tolerate – the threshold above which pollutant load harms (sensitive elements of) the environment. Because the nitrogen cycle is very complex, nitrogen critical loads have not been established for all parts of Canada, however, critical loads for sulfate deposition are well known for eastern Canada and were mapped in the 1990 *Canadian Long Range Transport of Air Pollutants and Acid Deposition Report*. These critical loads were calculated for wet sulfate deposition to aquatic ecosystems, as aquatic ecosystems were thought to be the most sensitive ecosystem to acid deposition. As a result, critical loads for sulfate deposition are defined as the amount of sulfate that can be deposited on the area and still maintain 95% of the lakes in the region at or above a pH of 6. Critical loads for wet sulfate deposition in eastern Canada range from 8 to over 20 kilograms of wet sulfate per hectare per year.

⁷⁸ Through the 1970s, Canadian attention to stratospheric ozone depletion closely paralleled the American debate. In 1973, the federal government created the *Advisory Committee on Stratospheric Pollution* within the Atmospheric Environment Service (AES) of Environment Canada. Within a week of the Committee's 1976 report (Environment Canada, 1976a) calling for the control of ozone depleting substances, the minister of the environment announced the government's intention to regulate CFCs in aerosol sprays (Environment Canada, 1976b). Enacted in 1979, the regulations banned CFC propellants in aerosol deodorant, antiperspirant, and hair spray, but did not broaden the restrictions to include "non-essential uses" as in the American restrictions.

⁷⁹ Under the Clean Air Act, EPA has created several regulatory programs to address numerous issues, including: ending the production of ozone-depleting substances; ensuring that refrigerants and halon fire extinguishing agents are recycled properly; identifying safe and effective alternatives to ozone-depleting

substances; banning the release of ozone-depleting refrigerants during the service, maintenance, and disposal of air conditioners and other refrigeration equipment; requiring that manufacturers label products either containing or made with the most harmful ODS.

⁸⁰ The *Ozone-depleting Substances Regulations* ensure Canada is in compliance with the Montreal Protocol regarding ODS consumption. Amendments are made as required to reflect changes in reduction and phase-out schedules adopted by the Parties to the Montreal Protocol. At present, only HCFCs and methyl bromide consumption are still allowed. Both substances are controlled under regulations by a system of allowances and permits that is similar to the systems that were used for other ozone-depleting substances before they were phased-out. A second set of regulations, the *Ozone-depleting Substances Products Regulations*, which deal with the control of certain manufactured products containing ODSs, such as small pressurized CFC containers, aerosols, and plastic foam food packaging, were brought together with the *Ozone-depleting Substances Regulations* in the fall of 1998 into a single set of regulations.

⁸¹ 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 ODS 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, and emission controls under provincial regulations. A Federal/Provincial Working Group on Controls Harmonization (Ozone-depleting Substances) was established in 1989. The major focus of the Working Group has been to facilitate the introduction of harmonized regulations to reduce emissions of CFCs and other ozone-depleting substances. The Working Group developed the *National Action Plan for Recovery, Recycling and Reclamation of CFCs* – approved by the CCME in 1992 – which provides a national framework for a harmonized approach by the federal, provincial and territorial implementation of an ozone layer protection program.

⁸² This commitment, made during the tenure of the then-ruling Progressive–Conservative government, has been reconfirmed by the now-ruling Liberal government in both its 1993 and 1997 election platforms. Given the re-election of the Liberals in 1997, one can safely say that the somewhat dubious 1997 election promise that the government would reduce ghg emissions to 1990 levels within three years – when 1995 levels were already 9% above 1990 levels – did not have a major impact on electoral sentiments.

⁸³ In 1997, the U.S. Senate adopted the Byrd-Hagel Resolution (passed by a vote of 95-0) which stated that the United States should not sign any climate change protocol which excludes developing countries from legally binding commitments or that causes serious harm to the domestic economy. What is unclear is whether the Argentine voluntary commitment represents the kind of “meaningful commitment” by a developing country that is a precondition for U.S. ratification of the Kyoto Protocol.

⁸⁴ In 1994, Congress provided less than half the amount requested by the President for the first year of activities under the CCAP, and funding for several pre-CCAP programs (e.g., 1992 Energy Policy Act; ghg emission reduction activities under the Department of Energy) was reduced.

⁸⁵ The program featured the following highlights: a national climate change Voluntary Challenge and Registry (VCR), for firms willing to develop action plans to reduce greenhouse gas emissions; a number of energy efficiency and alternative energy initiatives underway; and an update of the *20% Club*, where member municipalities commit to reduce local greenhouse gas emissions by 20% from 1990 levels. Two federal departments co-lead the program, but their leadership role is unclear. Environment Canada and Natural Resources Canada (NRCan) have many activities under their own mandates that support Canada's domestic and international response to climate change by helping to reduce greenhouse gas emissions, improving scientific understanding of the issue, and adapting to potential climate change. In general, Environment Canada holds primary responsibility for the development of overall environmental policy on climate change, including climate science and public education. NRCan is more involved in developing and coordinating Canada's domestic implementation strategy, including dealing with the industrial sectors. The two departments also share responsibility for developing new policy options and measures to deal with climate change, and for leading the federal government's efforts to reduce its own greenhouse gas emissions.

⁸⁶ Following the NAPCC, environment and energy ministries sought to better manage federal – provincial coordination on atmospheric issues and established a “Comprehensive Air Quality Management Framework.” The *National Air Issues Coordinating Committee* (NAICC) was created under that framework, composed of deputy ministers of environment and energy (the National Air Issues Steering Committee – NAISC – is the Cabinet level version), with responsibility for scientific and policy questions related to six major atmospheric issues – acid deposition, ozone depletion, climate change, urban smog, hazardous air pollutants, and fine particulates. The mandate of the NAICC is to develop coordinated air issue management plans and strategies, track progress in achieving targets to reduce air pollutants, facilitate national stakeholder consultations, and advise the federal government regarding negotiations on international air quality agreements. Currently, the NAICC is split into two groups: one dealing with climate change and another dealing with the remaining air issues. The Climate Change–NAICC is responsible for the National Climate Change Process (NCCP; see below).

⁸⁷ Since the April 1997 projection was made, a development occurred that could have a further significant impact on Canada's ability to meet its stabilization goal. In August 1997, Ontario Hydro announced that it would be temporarily laying up some of its nuclear generating capacity and replacing it with fossil fuel generation. If this proposed shift to fossil fuels occurs, it will temporarily increase the amount of greenhouse gases emitted by Ontario Hydro when compared with the projections included in the report, *Canada's Energy Outlook: 1996-2020*. Based on this temporary increase in fossil fuel generation, NRCan estimates that Canada's greenhouse gas emissions could increase to about 11 percent above 1990 levels in 2000. Ontario Hydro, however, has stated that it is committed to stabilizing its net greenhouse gas emissions at 1990 levels by the year 2000 and plans to honor this commitment even during the period of reduced nuclear generation.

⁸⁸ For more information on the issue tables and their recent reports, please consult the National Climate Change Process web-site at <http://www.nccp.ca>

⁸⁹ On a sectoral basis, the growth rates for petroleum and coal, non-metal mining, chemicals, and utilities other than electrical power would decline, while rates for the services sector, food, beverage and tobacco, and transportation equipment sectors would increase. S&P used their macroeconomic model to test the impact of a carbon tax set at a level that would stabilize emissions at 1990 levels by the year 2010. The application of the tax was coupled with a lowering of other taxes to make the policy revenue neutral. According to S&P's model, the economy would grow at a lower rate between the years 2000 and 2010 with the tax than without the tax but would grow at a higher rate after 2010 with the tax. Household spending would drive the economic growth after 2010 because of higher disposable income from cuts to direct personal taxes.

⁹⁰ In September, 1998, the federal environment minister announced that Environment Canada was investigating a domestic emissions trading system for reducing greenhouse gas emissions, thus requiring a national emissions cap. Details on this proposal will hopefully emerge when the National Implementation Strategy is developed.

⁹¹ The VCR Program issued a challenge to Canadian companies and organizations and all levels of government to develop action plans to voluntarily limit or reduce their greenhouse gas emissions. It maintains a public registry that records commitments, plans and progress. In October 1997, it became a stand-alone not-for-profit corporation. The board of directors of this corporation includes representatives from the private sector, two federal departments (Environment Canada and NRCan) and three provincial governments.

⁹² See Holmes and Sunstein (1998) on the relationship between regulation and the establishment of property rights regimes.

⁹³ Such an approach highlights one important complication that arises when closed negotiating sessions lead to commitments made by negotiators. In the mix of networked obligations that characterizes such negotiations, national governments make decisions that are difficult to justify when returned to the domestic political scene. For example, the Canadian federal government's pre-Kyoto commitment was for a 3% reduction (of 1990 levels) in ghg emissions, while the provinces had agreed to a 1990 freeze. At Kyoto, Canada committed to a 6% reduction, apparently in response to the prevailing atmosphere of the Conference. There is no indication that the federal government made this commitment in the “game”

sense suggested in the text (i.e., in order to put pressure on the national negotiating process), but the effect of Canada's Kyoto commitment has been to increase the urgency to develop a national ghg emissions reduction strategy that can meet the new commitment as well as to further strain the federal-provincial relationship on issues surrounding international agreements and domestic implementation.

⁹⁴ Note, however, that the changing nature of the federal union (see endnote 49, above) and the greater use of federal-state administrative arrangements means that more links are being added to the implementation chain, thus increasing the complexity of the process. See EPA audit of delegated state enforcement responsibilities and questions about their effectiveness.

⁹⁵ See Barber (1995) for a discussion of the extreme version of this tension.

⁹⁶ Note the links between social capital / community integration and the size of a community which, while not always predictive, have strong correlations (see also Dahl and Tufte, 1974).

⁹⁷ For one example, see <http://www.envisiontools.com/estprojects.htm>

⁹⁸ Three-level games metaphors have been advanced in the literature, but applied to the interaction of international, multilateral and domestic forums, most notably with respect to European Union negotiations involving the member governments and various international institutions. See, e.g., Patterson, 1997.

⁹⁹ Individuals may intend to act rationally, but their rationality is bounded by routines, habits, protocols and their own cognitive capacity and knowledge. As well, the values and ideals of civil servants affect the way they approach implementation – whether they are aware of it or not.

¹⁰⁰ Note how the acid deposition case, which was addressed primarily through focused efforts on large emitters, could enter a more difficult implementation realm as the number of electricity generating units seems set to increase both under deregulation efforts and other market forces. Deregulation can lead to lower emissions, but it depends on the generating sources used before and after deregulation (see annex 5). Another potential problem arises when, either through a lack of competition or because regulations (either pollution-oriented or otherwise) increase the price of commercial electricity, individual electricity consumers decide to leave the commercial grid for lower-cost on-site private generators. (See National Public Radio, June 16, 1999 [<http://www.npr.org/ramfiles/me/19990616.me.08.ram>]: commercial customers of Niagara Mohawk Power in New York State are leaving the high priced grid in favor of on-site diesel and natural gas generators which are dramatically less expensive (even when accounting for the capital and operating costs) than buying power from the grid.)

¹⁰¹ The hoped for emergence of a significant technological solution to growing ghgs emissions is analogous with the general view towards Y2K problems held in the early part of the 1990s. Most policy advice at the time (if it acknowledged the potential problem at all) argued that investments in manually addressing the problem would be wasted, as a low-cost technological solution would surely be developed long before the deadline. That solution did not emerge and a massive investment, in the later part of the decade, has been undertaken in order to meet the crucial December 31, 1999 deadline.

¹⁰² When the Kyoto Protocol enters into force, it will give rise to yearly Meetings of the Parties (MOPs) that, in all likelihood, will be held coterminously with the UN FCCC Conferences of the Parties (COPs).

¹⁰³ While much theoretical work on taxation measures has been undertaken on both sides of the border, two publications in the Canadian context point to a slightly more hospitable environment in Canada. First, a major study by Standard and Poor's has been prepared for the federal Finance Ministry which highlighted key benefits for the Canadian economy in the long run from the adoption of a carbon tax. And the federally-struck Technical Committee on Business Taxation devoted an entire chapter to the idea of shifting taxation away from income towards structures designed to reduce energy use and waste. Also, the National Climate Change Process (NCCP) has begun to formally investigate "green tax-shifting", out of income and general consumption taxes towards charges aimed at reducing certain consumption patterns.

Contrast this with the statement of the President's Senior Economic Advisor Gene Sperling during a White House briefing to introduce the President's Climate Change Action Plan (CCAP) proposals for the 1999 budget (see http://www.epa.gov/globalwarming/actions/global/us/wh_brief_013198.html). When

asked: “Why did the administration not take a consumption tax approach, basing a tax on how much individual fuel contributes to air pollution or climate change?” he replied:

We have always balanced what's best for the economy with our goals for reducing greenhouse gas emissions, and we think this is the right strategy. We're not interested in using tax increases. That's not an option that we spend any time considering. We said from the beginning that our focus was going to be on providing incentives; we are still having a price incentive, but we're doing it by giving people a positive price incentive to both produce and purchase and consume products that people use that are efficient and would reduce greenhouse gas emissions.

¹⁰⁴ According to a survey of five economic models done by the Energy Modeling Forum at Stanford University, if the price of carbon emissions started at \$22.50 per tonne and gradually climbed over 50 years to \$250 a tonne, the growth of global emissions would roughly stabilize through the middle of the 21st century and growth would nearly halt by 2100. A \$250 per tonne tax would add 18¢ to the pump price of a litre of gasoline if the tax were fully passed on to consumers. It would double the price of natural gas, and increase that of coal sixfold. Meanwhile, the prices for wind, solar, geothermal, and biomass energy sources would change insignificantly. Overall, the carbon tax would probably squeeze coal out of the global energy economy, encourage efficient use of gas and oil, and stoke demand for renewable energy sources.

¹⁰⁵ Carbon/Energy Taxes, 1997

Country	Date Introduced	Current Rate (price per ton of carbon in \$US)	Exemptions
Finland	1990	\$1.90	Industrial raw materials and overseas transport fuels
Norway	1991	\$4.60 – \$15.30	Onshore natural gas use and fuels for fishing, air and freight transport
Sweden	1991	\$13.10 \$6.50 for industry	Electricity and some bio-mass use
Netherlands	1992	\$1.20 – \$1.60	Large-scale natural gas use and renewable energy
Denmark	1996	\$2.10 – \$24.30 \$1 – \$3.70 for industry	Electricity use

Source: Baron (1996)

¹⁰⁶ The EPA allowed firms to build new facilities in areas that did not meet EPA air quality standards under two conditions. First, the new facility had to meet all regulatory standards, and second, the new emissions had to be offset with emissions reductions achieved at other facilities owned by the firm.

¹⁰⁷ The U.S. Acid Rain Program has led to both reduced emissions and reduced costs. Emissions were below 1995 and 1996 target levels by 3.4 and 2.9 million tons respectively. In addition acidity in rainfall in the north-east declined by 10 to 25 per cent in 1995. In terms of cost savings, the EPA estimates that trading under the Acid Rain Program will save utilities as much as \$1.7 billion annually after 2000.

¹⁰⁸ The credit trading program known as Pilot Emissions Reduction Trading (PERT) has been designed to assess the potential environmental and economic benefits of emission reduction trading in Ontario and to identify the elements of an effective trading system design. PERT is an industry led, multi-stakeholder environmental initiative that is evaluating emission reduction trading as a tool to assist in the reduction of smog and other air pollutants in the Windsor-Quebec corridor. The PERT project is developing principles and program elements for creating, recognizing and trading Emission Reduction Credits (ERCs) as a commodity, readily marketable and applicable toward certain regulatory or voluntary emissions limits in Ontario and adjoining airsheds. The implementation of emission reduction trading between companies is intended to both complement existing legislation and help shape future legislation and commitments on emissions. Emission reduction credits are created when a source reduces its emissions below either the

actual emission level or the level required by regulation, whichever is lower. Credits must be real, surplus, quantifiable and verifiable. All credits are posted to a registry on an electronic bulletin board system to provide access to the public and any potential purchaser. An environmental benefit has been incorporated by retiring 10 per cent of any credits earned. To encourage and reward participants in the PERT project, MOE has signed a Letter of Understanding with PERT participants, which assures them of recognition of early reductions. No cap, other than limits established in regulation, has been set.

In 1996, British Columbia, along with Environment Canada's Fraser River Action Plan and the Greater Vancouver Regional District, funded a design study for an emission reduction trading pilot. The Greenhouse Gas Emission Reduction Pilot (GERT) was established along lines similar to the PERT program. The pilot project will run until the end of 1999.

¹⁰⁹ E.g., wind, hydro, solar, nuclear, geothermal, biomass, landfill gas, municipal solid waste, fuel cells, natural gas plants, and coal and oil-fired plants retrofitted with more efficient engines.

¹¹⁰ For example, emission cap and trading systems, renewable energy portfolio standards, generation efficiency performance standards, generation source disclosure or labeling; green power marketing; taxes or subsidies; and research and development funding

¹¹¹ One potential problem, however, is in systems that are largely non-fossil (i.e., hydro- and nuclear-based) to begin with, as competition threatens to increase CO₂, SO_x and NO_x emissions since most smaller producers tend to rely more on natural gas.

¹¹² Comparison of Costs and CO₂ Emissions of Fossil vs. Renewable Energy in Ontario (ECO, 1999)

Electricity Source	Costs (Est., in CND ¢/kWh)	CO ₂ Emissions (kg/KWh)
Existing coal-fired (not incl. capital costs)	3.8 ¢/kWh	975-1400
New gas-fired co-generation	4.5 – 5 ¢/kWh	373-500
Landfill gas capture	3.6 – 4.3 ¢/kWh	minor
New small-scale hydro	4.1 – 7.1 ¢/kWh	none
New wind	5.4 – 9.4 ¢/kWh	none
New solar	65.1 – 113.9 ¢/kWh	none