North American Acid Rain and International Law

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The ongoing negotiations between the United States and Canada over the issue of acidic deposition highlight the international nature of environmental problems. The following article examines the causes and characteristics of transboundary acidic deposition, discusses the U.S.-Canadian negotiations towards an agreement on North American air quality, and analyzes the role of developing principles and practices of international environmental law in support of these efforts.

Acidic deposition — acid rain — is the direct, global result of the long range transport of air pollutants. The phenomenon has become a significant issue of international environmental, political and legal concern, for the atmospheric transport of acidic precursors can be transboundary and the subsequent extraterritorial acidification threatens the viability of ecosystems and economies.

Initially a European concern, acidic deposition is now bringing the United States and Canada together in bilaterial negotiations over a cooperative agreement on transboundary air pollution. These negotiations are especially significant; they directly address as relevant the principles and practices of international environmental law that, in concert with the precept of equitable use of a commonly shared atmosphere, impose limitations on sovereign state conduct. While not without problems, these negotiations on abatement and prevention of North American transboundary acidic deposition have promise. This article first reviews the sources, properties and impacts of acidic deposition, then describes its implications for international relations. A discussion of U.S.-Canadian negotiations and their consideration of international environmental law follows. The article then concludes with an assessment of the bounds and barriers to implementation, and the implications for the global environment of a successfully ratified bilateral agreement.

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ECOPOLITICAL ISSUES

Acidic deposition has widespread and damaging impacts on both the United States and Canada. This environmental problem has stimulated the negotiation of a unique bilateral agreement on continental air quality.

Sources and Properties of Acidic Deposition

Acidic deposition is the process by which pollutant precursors to acidic compounds are precipitated or dry-deposited from the atmosphere onto the surface of the Earth.[1] The connection between the emissions of sulfur and nitrogen oxide compounds as air pollutants and the incidence of acidic deposition has been well-documented.[2] Sulfur oxides (SO_x) are primarily emitted from stationary sources such as oil and coal-fired electric power plants and ore smelters. Nitrogen oxides (NO_x) are created through most fossil fuel combustion processes, including the burning of gasoline in internal combustion engines.[3] Once the SO_x and NO_x compounds are injected into the atmosphere, air currents carry the pollutants aloft where they are oxidized to form sulfates and nitrates.

The subsequent deposition of these acidic precursors is either wet or dry. Wet acidic deposition occurs when the airborne sulfates and nitrates combine with atmospheric water vapor, creating sulfuric acid (H_2SO_4) and nitric acid (HNO_3) that precipitates in the form of acidic rain, snow, hail or fog.[4] Less widely known is the occurrence of dry acidic deposition, a process where sulfate and nitrate particles independently float down and drift along the surface of the Earth, settling on water, vegetation and soil.

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1. Acidic deposition is a part of the general ongoing process of *atmospheric deposition*. A large amount of naturally occurring and human-produced substances — water vapor, soil and volcanic dust, biologic and geologic gases, biogenic particles and particulate matter — are continually being removed from the atmosphere and deposited onto terrestrial vegetation, soils and surface waters. Cowling and Linthurst, *The Acidic Precipitation Phenomenon and its Ecological Consequences*, 31 BIOSCIENCE 9 (October 1981).
2. Ferenbaugh, *Acid Rain: Biological Effects and Implications*, 4 ENVT'L AFF. 745 (1975) cited in Gallogly, *Acid Precipitation: Can the Clean Air Act Handle It?*, 9 B.C. ENV'TL AFF. L. REV. 3 (Summer 1981-1982); Kramer, *Acid Precipitation*, in SULFUR IN THE ENVIRONMENT 328 (J. Nriagu, ed. 1978) cited in Brown, *International-United States Air Pollution Control and the Acid Rain Phenomenon*, 21 NAT. RES. J. 3 (July 1981); *Science Watch: Volcanic Dust Spreads Afar*, NEW YORK TIMES (17 August 1982). J. Zanetti, THE SIGNIFICANCE OF NITROGEN 5 (1931) cited in Gallogly, *op. cit.* Office of Research and Development, U.S. Envt'l Prot. Ag. (October 1978) RESEARCH SUMMARY: ACID RAIN. *See* Likens, Wright, Galloway and Butler, *Acid Rain*, 241 SCI. AMER. 43 (October 1979); Glass, *Mounting Acid Rain*, 5 EPA J. 7 (July/August 1979).
3. ACID RAIN, Office of Research and Development, U.S. Envt'l Prot. Ag. (July 1980).
4. ACID RAIN, *supra* note 3. *See also*, 11 ENV. REP. (BNA) 1860 (1980-1981) and Stevens, *Los Angeles' Famous Smog Carries Hidden Bite*, CHRISTIAN SCIENCE MONITOR (December 3, 1979) at 3, cited in Snipes, *Acid Rain: Causes, Effects and Remedies*, 3 STAN. ENVT'L L. ANN. (1980-1981).

Once these dry particles are in place, any moisture present (such as rain, dew or frost) becomes acidic upon contact with the particles.[5]

Impacts on Natural Systems and the Human Environment

Precipitation falling on the eastern United States, eastern Canada and most of western Europe has become increasingly acidic during the past quarter century.[6] Acidic deposition was first noted in Belgium, the Netherlands and Luxembourg in the late 1950s;[7] by the late 1960s, its incidence had extended to Germany, northern France, the eastern British Isles and southern Scandinavia. Between 1955 and 1956, acidic precipitation was recorded in twelve northeastern states of the U.S., and was initially studied in the 1960s at an experimental station in New Hampshire.[8]

The destructive nature of acidic deposition has become increasingly evident over the past decade. The addition of acidic compounds to aquatic and terrestrial ecosystems affects plants and animals by disrupting the delicate life-supporting chemical balance of their environment.[9] Early awareness of its damaging effects began with the discovery of the death of large percentages of fish populations in lakes in southwestern Norway, the American Adirondack Mountains and eastern Canada.[10] Recent assessments indicate that acidic deposition has a more extensive impact, affecting entire ecosystems, including the human environment. Because fresh water aquatic ecosystems, such as streams and lakes, lack an alkaline buffering capacity, they are dramatically susceptible to cumulative acidic deposition. Increased acidity has been shown to interfere with the physiological and reproductive processes of fish, altering normal behavior and killing spawned eggs and hatched larvae so that entire populations die out. The acidity can also eventually eliminate other aquatic life forms such as amphibians, invertebrates and algae plants, and can cause higher order animals to leave the area. When these effects have occurred — and acidity has also inhibited bacterial decomposition, blocked nutrient cycling,

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5. Ten to fifty percent of acids deposited may result from the process of dry deposition. Techniques for accurate monitoring are still developing. Kerr, *There Is More to Acid Rain Than Rain*, 211 SCIENCE 4483 (13 February 1981).
6. Babich, et al., *Acid Precipitation*, 22 ENVIRONMENT 4 (May 1980).
7. Oden, 6 WATER AND SOIL POLL. (1976).
8. Babich, et al., *supra* note 6.
9. The ecological impact of acidic deposition depends on the capability of the receiving water, vegetation and soil to neutralize the acidic content of precipitation and dry deposits. Naturally alkaline bedrock and soil can better chemically neutralize acids, while bedrock components of granite, quartzite and quartz sandstone cannot. See Babitch, et al., *supra* note 8, and Likens, et al., *supra* note 2.
10. THE GLOBAL 2000 REPORT TO THE PRESIDENT, TECHNICAL VOLUME, *The Water Projections and the Environment*. Washington: USGPO (1980), at 336.

and chemically released toxic heavy metals — the stream or lake can be considered "dead."[11]

Effects on terrestrial ecosystems are equally insidious. Acidic deposition onto soil reduces its productivity by slowing the decomposition of nutritive organic matter, inhibiting nitrogen-fixing bacteria, releasing heavy metals and promoting the leaching of essential minerals from soil particles. Direct deposition onto agricultural crops damages leaves and stems and interferes with normal growth. The rate of growth of trees also appears to be affected by acidic deposition through damage to foliage, the germination of conifer seeds and the establishment of seedlings.[12]

Acidic deposition damages man-made objects as well. The weathering of stone is greatly accelerated by the atmospheric presence of SO_x and NO_x. Wet or dry deposition results in a crusting/sloughing-off cycle that causes stone to lose detail and structural integrity. Steel, galvanized metal, oil-based paints and automobile finishes have also been shown to be vulnerable to acidic deposition.[13]

The effects of topical acidic deposition on human health have yet to be established definitively. However, the potential for the release of heavy metals by acidic deposition could pose a threat to human health through contamination of drinking water supplies. Acidified sources of drinking water could mobilize and concentrate toxic heavy metal ions that might not be reduced by conventional water treatment processes, and acidified water — when coming into contact with public distribution and household plumbing systems — could corrode and mobilize lead and other metals in concentrations exceeding currently recommended levels.[14]

Implications for International Relations

Acidic deposition is part of the "long range transport" of air pollutants. Long range transport involves other pollutant contaminants that are of concern. Besides acidic compounds, the atmosphere is known to carry a

11. Patrick, et al., *Acid Lakes from Natural and Anthropogenic Causes*. 211 SCIENCE 4481 (30 January 1981); THE LONG RANGE TRANSPORT OF AIR POLLUTANTS PROBLEM IN NORTH AMERICA: A PRELIMINARY OVERVIEW, U.S.-Canada Research Consultation Group on the Long Range Transport of Air Pollutants (15 October 1979) (hereinafter cited as the LRTAP PROBLEM IN NORTH AMERICA); SECOND REPORT OF THE U.S.-CANADA RESEARCH CONSULTATION GROUP ON THE LONG RANGE TRANSPORT OF AIR POLLUTANTS (November 1980) (hereinafter cited as SECOND REPORT); Cowling and Linthurst, *supra* note 1; Babich, et al., *supra* note 6.
12. Likens and Borman, *Acid Rain: A Serious Regional Problem*. 184 SCIENCE 1176 (1974); Glass, et al., *Effects of Acid Precipitation*, 13 ENVT'L SCI. AND TECH. 1350, 1354 (1979); *supra* notes 1, 6, 9, 10.
13. ACID RAIN, *supra* note 3.
14. *Ibid.*; SECOND REPORT OF THE U.S.-CANADA RESEARCH CONSULTATION GROUP, *supra* note 11.

variety of oxidants, synthetic organics and heavy metals, all of which — whether deposited or suspended to affect atmospheric chemistry — have an adverse effect on Earth ecosystems.[15] It was formerly believed that most air pollutants, including acidic precursors, were removed from the atmosphere close to their source of emission. However, it is now recognized that wet and dry deposition is the final stage of a process of travel and transformation that occurs over great distances. The use of tall smokestacks to disperse emissions locally has only enhanced long range transport by releasing greater quantities of pollutants higher in the air.[16] Depending on the local wind direction and prevailing air currents, sulfur and nitrogen oxides can be transported thousands of miles and acidify distant ecosystems.[17]

Due to the long-range character of air pollutant transport, the accompanying problem of acidic deposition can also be *transboundary* in scope — both nationally within federated states and internationally between sovereign States. Monitoring and analyses of acidic deposition in Europe indicate that nearly 40 percent of deposited acids can originate from outside each individual country. The Scandinavian nations of Sweden and Norway appear to bear the brunt of northern industrial activity, receiving between 56 and 70 percent of their acid deposition from England, and other continental sources.[18]

North America's acidic deposition is also a transboundary problem. Industrial sources primarily in the midwestern United States have been connected with the severe deposition that is now occurring in the Northeast and across the border in southeastern Canada.[19] Although some of the

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15. SECOND REPORT OF THE U.S.-CANADA RESEARCH CONSULTATION GROUP, *supra* note 11; Lindberg, et al., *Atmospheric Deposition of Metals to Forest Vegetation,* 215 SCIENCE (26 March 1982).
16. Wetstone, *Air Pollution Laws in North America and the Problem of Acid Rain and Snow,* 10 ENVT'L L. REV. 50010, 50014 (1980).
17. Hidy, et al., INTERNATIONAL ASPECTS OF THE LONG RANGE TRANSPORT OF AIR POLLUTANTS, U.S. Department of State Doc. P-5252, Washington (September 1978); RESEARCH SUMMARY: ACID RAIN, *supra* note 2. Atmospheric transport of air pollutants is global in scope; the pollution of the arctic atmosphere from industrial sources in Europe, Asia and possibly North America has been confirmed, and acidic deposition is occurring in removed Earth areas such as the Hawaiian Islands, Amsterdam Island in the central Indian Ocean, and the islands of Bermuda in the western Atlantic Ocean. Kerr, *Global Pollution: Is the Arctic Haze Actually Industrial Smog?* 205 SCIENCE (20 July 1979); Kerr, *Pollution of the Arctic Atmosphere Confirmed,* 212 SCIENCE (29 May 1981); *Acid Rain on Bermuda,* BOSTON GLOBE (30 September 1981).
18. Rosencranz, *The Problem of Transboundary Pollution,* 22 ENVIRONMENT 5 (June 1980); Oden, *The Acidity Problem — An Outline of Concepts,* 6 J. WATER, AIR AND SOIL POLL. 137 (1976); ACID RAIN, *supra* note 4; Homer, *Controlling Acid Rain: The Challenge Facing the United States and Canada,* 15 TEX. INT'L L. J. 1 (Winter 1980).
19. THE LONG RANGE TRANSPORT OF AIR POLLUTANTS PROBLEM IN NORTH AMERICA, *supra* note 11; SECOND REPORT, *supra* note 11; Kerr, *Tracing Sources of Acid Rain Causes Big Stir,* 215 SCIENCE (12 February 1982); Brezonik, et al., *Acid Precipitation and Sulfate Deposition*

acidic deposition occurring in Canada does have domestic sources, the net flux of sulfur compounds is from south to north across the frontier. The first report of the U.S.-Canada Research Consultation Group on the Long Range Transport of Air Pollutants stated that while "the greater portion of total sulfur deposition in each country is probably the result of domestic emissions . . . the contribution of neighbor country emissions is relatively greater in the case of United States emissions being deposited in Canada."[20] In its second report, the Group confirmed the results of the first report, adding that recent mathematical models of atmospheric transport, transformation and deposition have determined that "deposition in eastern Canada originates approximately equally from Canada and the United States, whereas the *bulk* of sulfur deposition in the United States originates there."[21]

A national consciousness on either side of the border has been aroused by the increasing potential for serious environmental and economic damage wrought by air pollutant emissions.[22] Declines in soil productivity and the stunting of valuable food crops have been linked to acid loading. In addition, evidence of the effects of acidic deposition on forests, although inconclusive, suggests that the air pollution will "sooner or later lead to a reduction in site productivity that would be very costly in socioeconomic terms *and not feasible to remedy.*"[23]

Insidious degradation of the ecological base of North America will have an economic effect in the medium to long term. Assessments of the economic impact of acidic deposition are now under way. Quantifying the stress on an ecosystem means attempting the difficult task of measuring the damage directly attributable to acidic deposition, and then placing a monetary value on the loss of natural systems productivity.[24] However,

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in Florida, 208 SCIENCE 4447, (30 May 1980); Lewis and Grant, *Acid Precipitation in the Western United States,* 207 SCIENCE (11 January 1980).

20. Predominant regions of Canadian emissions are an industrial area on Lake Ontario from Niagara Falls to Oshawa, a group of smelters in northwest and central Ontario, and the city of Montreal. Johnston and Finkle, *Acid Precipitation in North America: The Case for Transboundary Cooperation,* 14 VAND. J. TRANSNAT'L L. (Fall 1981). Canadian sulfur emissions are about one-fifth those of the United States: forty-five percent of total sulfur emissions are from several non-ferrous smelters, ten percent from power plants, and the other forty-five percent from other industrial and combustion sources. The smelter at Sudbury, Ontario has been the largest single sulfur dioxide source in North America, and is responsible for twenty percent of Canadian sulfur emissions! THE LRTAP PROBLEM IN NORTH AMERICA, *supra* note 11.
21. SECOND REPORT, *supra* note 11. See also Giniger, *Canada Blames Itself for Half of its Acid Rain,* NEW YORK TIMES (9 October 1981) at A9.
22. *See,* for example, Dumanowski, *In the Path of Acid Rain: Canadians Blame U.S., Seek Relief.* BOSTON GLOBE (5 April 1981); Kihss, *Carey Urges Plan to Limit Acid Rain,* NEW YORK TIMES (10 March 1982).
23. SECOND REPORT, *supra* note 11 (emphasis added).
24. Center for Policy Alternatives at the Massachusetts Institute of Technology for the Senate Committee on Government Affairs, 96th Congress, 2nd Session, BENEFITS OF ENVIRON-

existing estimates of the loss of revenue from damaged fisheries, forests and recreational amenities (as well as the costs of preventative measures and monitoring programs) are significant, and imply even greater costs as pollutant levels increase.[25]

Acidic deposition is an environmental problem that involves the nexus of global ecosystems and international relations. Nations are becoming increasingly cognizant of the need to manage resources and environmental quality rigorously, for it is the ecological stability of the natural world that provides the economic base supporting governments. Ecosystems are not invulnerable: undue stress results in a decline in resource availability or productivity and can ultimately contribute to the disruption of social systems. The effects of environmental degradation have immediate and longer term implications for issues of economic viability, political power and national security.

The problem of acidic deposition has created a serious ecopolitical issue between the United States and Canada. Growing concern has made transnational management and regulation of air quality a major focus of interest in intergovernmental relations. A bilateral U.S.-Canadian agreement to limit and control long range transport of air pollutants between the two countries is currently being negotiated. Inherent in these negotiations are important considerations of the principles and practices of developing international environmental law.

Precedents for Cooperation and Innovation

Relations between the United States and Canada in matters concerning environmental quality management are well established. Bilateral relations have been marked by a notable cooperative attitude, and the resulting successes have created precedent-setting international legal and institutional arrangements. The consultative, non-litigious approach to problem resolution practiced by the Canadians and the Americans has been supported by a shared perception of the need for environmental quality and a readiness to discuss and defuse complaints before they escalate to damaging levels. In the recent past, bilateral governmental activities have concerned themselves with a broad range of transboundary environmental issues, including the

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MENTAL, HEALTH AND SAFETY REGULATION 12, 16-17 (1980) in Gallogly, *supra* note 2.

25. Homer, *supra* note 18; Gallogly, *supra* note 2. Present estimates for the growth of North American SO_2 emissions — given no further regulation of allowable emission rates — indicate a potential increase of up to fifteeen percent in the next twenty years. This significant increase would be primarily due to greater coal burning in power plants and industrial processes. Total emissions of NO_2 could rise between fifteen and thirty-five percent, again due to an increase in fossil fuel combustion. SECOND REPORT, *supra* note 11.

environmental quality of coastal ecosystems, the utilization and pollution of inland lakes and waterways, and the localized transboundary transport of air pollutants.[26]

Treaties concluded between the United States and Canada ensuring the equitable utilization of shared water resources are singular in that, over time, they seem to have reflected a "state-of-the-art" cooperative development of international environmental law and resource management principles. The Boundary Waters Treaty of 1909[27] was "the first, and perhaps the most famous, bilateral boundary arrangement" for the management of water resources.[28] Although concluded and observed mainly for the purpose of equitably managing the utilization, obstruction and diversion of waters at the boundary, the Treaty mandated a bilateral attitude toward pollution, stating that boundary waters are not to be polluted by either party to the detriment of the other.[29]

More recently, the 1972 Great Lakes Water Quality Agreement[30] was one of the more "detailed and technical"[31] agreements controlling pollution in transboundary waters. Developed to provide joint regulatory control of a shared regional resource, the 1972 Agreement states general water quality objectives, describes in technical detail the specifics of those objectives, provides that each Government's standards must be adequate for attainment of desired water quality, and initiates programs for pollution abatement and control.[32] The 1972 accord was superseded in 1978 by an expanded convention that significantly identifies atmospheric deposition as a source of pollution of regional drainage basins and water bodies, and provides for possible bilateral remedies.[33]

Concluding resource management treaties and resolving environmental issues have not been without obstacles. The bridge between an agreement in principle and the implementation of an action plan has often been the International Joint Commission (IJC),[34] an intergovernmental organization

26. Lemarquand and Scott, *Canada-United States Environmental Relations*. 32 ACAD. POL. SCI., PROC. 2 (1975-1977).
27. TREATY RELATING TO BOUNDARY WATERS AND QUESTIONS ARISING WITH CANADA, United States-Great Britain, 11 January 1909, U.S.T. 548 36 Stat. 2448 (1911), (effective 13 May 1910). (Hereinafter cited as BOUNDARY WATERS TREATY.)
28. Johnston and Finkle, *supra* note 18.
29. BOUNDARY WATERS TREATY, Article IV, *supra* note 27.
30. AGREEMENT BETWEEN THE UNITED STATES OF AMERICA AND CANADA ON GREAT LAKES WATER QUALITY, 1972; 23 U.S.T. 301, TIAS 7312 (entry into force 15 April 1972). (Hereinafter cited as 1972 AGREEMENT.)
31. Johnston and Finkle, *supra* note 20.
32. 1972 AGREEMENT, *supra* note 30.
33. AGREEMENT BETWEEN THE UNITED STATES OF AMERICA AND CANADA ON GREAT LAKES WATER QUALITY, 1978; 30 U.S.T. 1382, TIAS 9257 (entry into force 22 November 1978).
34. Lemarquand and Scott, *supra* note 26.

established as part of the Boundary Waters Treaty of 1909. At the time of the inception of the IJC, the aim of the Treaty was to create a bilateral body with powers to manage questions concerning transboundary water utilization and navigation and "any other questions or matters of difference"[35] between the United States and Canada. In the intervening years, the IJC has been eminently successful in resolving issues involving the utilization of shared natural resources.[36]

References to the IJC are not restricted solely to primary questions of water pollution; the aegis of the IJC extends to issues of transboundary air pollution as well. Since 1949 the IJC has been involved in the management of air pollution in the Detroit-St. Clair border regions. As a result of IJC findings and recommendations, Michigan and Ontario have established an Integrated Cooperative Air Pollution Control Programme and have formed the International Michigan-Ontario Air Pollution Board, both of which promote cooperation in and enforcement of air pollution standards.[37] The IJC itself maintains permanent air pollution monitoring services in the Detroit-Windsor and Port Huron–Sarnia metropolitan areas.[38]

The IJC has undertaken a bilateral, impartial and technically expert approach toward water quality regulation. By utilizing anticipatory rather than reactive channels,[39] the IJC has also helped keep intergovernmental confrontation at manageable levels. The organization and successes of the IJC have led to at least one proposal that it have a part in the implementation of any future bilateral regulation of continental air quality.[40]

Negotiations on Transboundary Air Pollution

Increasing knowledge about the long range transport of air pollutants (LRTAP) and the damaging effects of resulting acidic deposition has caused concern at the highest government levels. Following the development of scientific consciousness of the transboundary nature of acidic deposition, the existence of the problem and its effects evolved into a policy issue as well. Bilateral discussions have culminated in a Memorandum of Intent

35. *Ibid.*
36. *See* Maxwell Cohen, Q.C., *The Regime of Boundary Waters — The Canadian-United States Experience*, in Academie de Droit International, RECUEIL DES COURS 1975-III, Leyde: Sijthoff, 1976, for an authoritative analysis of the record of the International Joint Commission at work.
37. Bilder, *Controlling Great Lakes Pollution: A Study in United States-Canadian Environmental Cooperation*, in LAW, INSTITUTIONS AND THE GLOBAL ENVIRONMENT, Hargrove, ed., Oceana (1972) at 294-308; Cohen, *supra* note 36.
38. Beaupre, *A Survey of Water and Air Pollution Cases Involving the International Joint Commission (Canada-United States)*, in OECD, ENVIRONMENTAL PROTECTION IN FRONTIER REGIONS 439, 445 (1979), in Johnston and Finkle, *supra* note 20.
39. Bilder, *The Settlement of Disputes in the Field of the International Law of the Environment*, in Academie de Droit International, RECUEIL DES COURS 1975-I, Leyde: Sijthoff, (1976) at 176-179.
40. Homer, *supra* note 18.

concerning transboundary air pollution. This declaration served as a precursor to a formal agreement with interim measures currently in the process of being implemented.

The scientific community in the United States and Canada was aware of the nature and potential scope of transboundary air pollution by 1975. It is claimed that Canadian Government concern for acidic deposition was raised to a policy level at that time, while U.S. Government acceptance — influenced by a number of factors — was slower and more circuitous. Cooperative action to manage and regulate transboundary air pollution began with the June 1978 Exchange of Notes establishing the U.S.-Canada Research Consultation Group on the Long Range Transport of Air Pollutants.[41] The Group, whose purpose in response to mutual interests and concerns was ". . . to aid in the coordination of research studies and the exchange of scientific information between the two countries,"[42] met first in July 1978, and since that time has issued two authoritative reports on LRTAP in North America.[43]

In May 1978, Unites States concern about the potential short-range polluting effects of several Canadian power plants under construction contributed to a Congressional resolution that the Department of State initiate negotiations toward a formal air quality agreement with Canada.[44] To this end, an Exchange of Notes took place on November 16 and 17, 1978, resulting in informal preparatory meetings between government officials on December 15, 1978, and June 20, 1979. On July 26, 1979, the two governments released a Joint Statement on Transboundary Air Quality, the first formal expression of "a common determination to reduce or prevent transboundary air pollution which injures health and property on the other side of the boundary."[45] The Statement outlines the "substantial basis of obligation, commitment and cooperative practice in existing environmental relations," and sets out "principles and practices [that] should be addressed in the development of a bilateral agreement on transboundary air quality." The Statement calls for: the prevention and reduction of transboundary air pollution, negotiations to consider pollution control strategies, expanded notification and consultation, expanded scientific information exchange, expanded monitoring and evaluation efforts, and

41. Johnston and Finkle, *supra* note 20.
42. THE LRTRAP PROBLEM IN NORTH AMERICA, *supra* note 11.
43. *Ibid.;* and SECOND REPORT, *supra* note 11.
44. S. Resolution 465, 95th Congress, 2nd Session, 124 CONG. REC. S8223 (daily ed. 24 May 1978); Johnston and Finkle, *supra* note 20.
45. JOINT STATEMENT ON TRANSBOUNDARY AIR QUALITY BY THE GOVERNMENT OF CANADA AND THE GOVERNMENT OF THE UNITED STATES OF AMERICA, 26 July 1979, reprinted in DEPARTMENT OF STATE BULLETIN, November 1979, at 26-27. (Hereinafter cited as JOINT STATEMENT.)

cooperative assessment of long-term environmental trends. Consideration is also to be directed to legal matters of equal access, non-discrimination, and liability and compensation as relevant to an agreement.[46]

Memorandum of Intent

The Joint Statement of 1979 established the basis for negotiation of a bilateral air quality agreement. One year later its expressions of increasing concern and an awareness of the need for continued cooperation were expanded in a Memorandum of Intent (MOI)[47] between the two Governments. Through the MOI, the United States and Canada reiterated their "common determination to combat transboundary air pollution in keeping with their existing international rights, obligations, commitments and cooperative practices,"[48] specifying a number of treaties, conventions and declarations subscribed to by the two nations.

Significantly, the MOI discusses the grave — and still growing — ecological implications of the situation by stating the existence of a "concern about actual and potential damage resulting from transboundary air pollution . . . including the already serious problem of acid rain," noting:

> Scientific findings which indicate that continued pollutant loadings will result in extensive acidification in geologically sensitive areas during the coming years, and that increased pollutant loadings will accelerate this process

and that:

> environmental stress could be increased if action is not taken to reduce transboundary air pollution.[49]

With these concerns identified, the MOI expresses the Governments' joint intention to develop and facilitate the conclusion of a bilateral cooperative agreement on transboundary air quality. To this end, a detailed plan of interim actions is established that both aids negotiations and advances efforts at controlling current pollution. These interim actions include the creation of a Coordinating Committee to effect preparations for the conduct of negotiations, and a resolution to apply enhanced pollution control and management measures. The long-standing practice of bilateral

46. *Ibid.*
47. MEMORANDUM OF INTENT BETWEEN THE GOVERNMENT OF THE UNITED STATES OF AMERICA AND THE GOVERNMENT OF CANADA CONCERNING TRANSBOUNDARY AIR POLLUTION, Washington, 5 August 1980, rep. in INT. ENV. REP., 13 August 1980, at 391-393. (Hereinafter cited as MEMORANDUM OF INTENT or MOI.)
48. *Ibid.*
49. *Ibid.*

notification and consultation on proposed industrial development and policy changes is also to be expanded, as is the exchange and coordinated development of pertinent scientific information and research.

The MOI interim actions provide for the establishment of technical and scientific Work Groups to assist the Coordinating Committee in its negotiations. The Work Groups are to function in five general areas: Impact Assessment; Atmospheric Modelling; Strategies Development and Implementation; Emissions, Costs and Engineering; and Legal, Institutional Arrangements and Drafting. The Work Groups' terms of reference provide for reports in each of their respective subject areas to serve as a basis for proposals for inclusion in a transboundary air pollution agreement. The specific tasks of the Work Groups are described in the MOI, including the mandate of the Legal, Institutional and Drafting Work Group to "develop the legal elements of an agreement such as notification and consultation, equal access, non-discrimination, liability and compensation."[50]

The Legal, Institutional and Drafting Work Group submitted its report in the summer of 1981, presenting "an initial effort to draw together available information on international and domestic legal matters which may pertain to the negotiation of a cooperative agreement to deal with transboundary air pollution."[51] The report's contents include a review of multilateral principles and practices, bilateral obligations and their implementation, and an overview of domestic authorities (both U.S. and Canadian) in the field of air pollution.

The Joint Statement, the MOI and its interim actions, and the Work Group Reports set the course toward the desired conclusion of a U.S.-Canadian air quality agreement. The bilateral documents express the importance of the problem and the urgency of its resolution and give a clear indication of basic principles and practices the two countries consider relevant to negotiations.

International Legal Considerations

The reciprocal long range transboundary air pollution of Canada and the United States is a problem that involves the equitable utilization of a commonly shared atmospheric resource. While not without enormous economic and political barriers, controlling the transport of transboundary air pollution (and its attendant acidic deposition) is amenable to an eventual solution on a diplomatic level: the ecological implications demanding a reduction or cessation of continental acidification are supported by existing

50. *Ibid.*
51. REPORT OF LEGAL, INSTITUTIONAL AND DRAFTING WORK GROUP (WORK GROUP 4), 31 July 1981, for the Canada/United States MEMORANDUM OF INTENT ON TRANSBOUNDARY AIR POLLUTION. (Hereinafter cited as DRAFTING GROUP REPORT.)

or developing international legal inducements for management or abatement. The United States and Canada have resolved to address their regional air quality dilemma, and the expressions of intent to negotiate an agreement on transboundary air quality are auspicious in their phraseology. By specifying relevant customary or developing principles and practices of international law to be addressed in these negotiations, the bilateral statements, memoranda and reports both reflect the evolution and applicability of existing international environmental law, and harden organizational declarations on environmental quality goals regarded as having "soft law" characteristics. Once concluded, an agreement will codify international environmental legal principles and practices as applied by the two nations, and further influence and advance their acceptance and development in pollution prevention and control programs elsewhere in the world community.

The Legal Implications of a Commonly Shared Atmosphere

Since the beginning of the Industrial Revolution, the use of the assimilative and dispersive properties of the atmosphere for disposal of waste gases of fossil fuel combustion has been the sovereign concern of each individual nation. If and when recognized, effects of a state's atmospheric pollution were contained within domestic boundaries or were localized in discrete border areas. Over the past ten years it has become evident that the environmental impacts of a nation's air pollution can be transcontinental as well as territorial. The atmosphere is now recognized as a component of the planetary ecosphere, a circulating transport mechanism linking terrestrial and marine systems, and interacting with the biochemical processes of life on Earth. As such, international interest in the use of the atmosphere as a pollutant dump not only involves its subjacent states, but also states adjacent to — and far removed from — the source of pollution.

International environmental law has, to date, developed in response to localized or regional pollution or spoliation of environmental quality. Yet human ability to degrade the Earth's ecosystems has progressed to the point where the territorial activities of one country can ultimately affect all nations. An impact of such global scope can be described as involving the degradation or destruction of "systemic resources" — those resources, living or non-living, that are vital macro-components of the Earth's ecosystems and essential to life on the planet. As the consequences of global ecodestruction become apparent, nations and their governments must now resolve that they have a sovereign right to the optimum benefits of intact systemic resources (as well as those resources within individual domestic territories or shared with adjacent states). The community of nations must also recognize both the scope of its duty to prevent and abate atmospheric

degradation, and the persuasiveness of prohibitions against continued long range transboundary air pollution.

The atmosphere is regarded as a global *res communis*. Because its physical properties preclude its capture and private control, the atmosphere has been accepted as incapable of possession and, thus, common property.[52] Early codifiers of civil law designated air (the corpus of the atmosphere) as "common to all, as a matter of natural law."[53] Given its status as a *res communis*, the atmosphere is a natural resource common to two or more states and, hence, an internationally shared natural resource, "the utilization of which in one national jurisdiction carries a significant risk of affecting other utilizations of that or other natural resources outside that area of jurisdiction."[54]

Long range, transboundary transport of air pollutants and the resulting acidic deposition shows that the current utilization of the atmosphere in U.S. and Canadian jurisdictions both carries the risk of and generates detrimental environmental impacts on each other's territory, as well as on the territory of other sovereign nations on the planet. A tragedy of the atmospheric commons[55] — through mismanagement and "competitive overexploitation"[56] by individual state beneficiaries — must be avoided. Nations sharing the common resource should eschew "mutual ecological ruin"[57] and recognize their ultimate environmental interdependence.

International law provides guidance for states in their individual utilization of the commonly shared atmosphere. The analogy existing between international rivers and the Earth's atmosphere illustrates their similarity in transboundary flow, influences the determination of their international status by criteria of common utilization, and encourages the applicability

52. Mirfendereski, *An International Law of Weather Modification*, 2 FLETCHER FORUM 1, (January 1978) at 51.

53. *Ibid.* A distinction exists between the concepts of *air* (the corpus of the atmosphere) and *airspace*. Air, considered *res extra commercium* by the Romans, is understood to be the naturally present and circulating gases and particulates that make up the body of the atmosphere. Airspace, *res commercium*, is the physical area above the Earth's atmosphere.

54. Although this term usually refers to resources shared by a limited number of States, the atmosphere — given scientific knowledge and "the state of evident environmental interdependence among nation-states" — may be considered a globally shared natural resource. Handl, *The Principle of Equitable Use As Applied to Internationally Shared Natural Resources: Its Role in Resolving Potential International Disputes Over Transfrontier Pollution*, 1978-1979 REV. BELGE DE DR. INT'L, at 41 (1979.)

55. *See* Garrett Hardin's explanation of the commons syndrome, its international environmental implications and a recommended solution in *The Tragedy of the Commons*, 162 SCIENCE 1243 (1968). *See* also Hardin and Baden, MANAGING THE COMMONS, San Francisco: Freeman 1977 and Hardin, *Political Requirements for Preserving Our Common Heritage*, Ch. 20 in Council on Environmental Quality, WILDLIFE IN AMERICA, Washington: USGPO 1979.

56. Ophuls, ECOLOGY AND THE POLITICS OF SCARCITY, San Francisco: Freeman, 1977, at 147.

57. *Ibid.*

of legal rules of riparian usage.[58] Most importantly, as with the running water of rivers, the inherent community of interest in internationally shared natural resources forms the basis of a common legal right in use of the atmosphere, requiring equality of use for all and preferential privilege in use for none.[59] The principle of perfect equality of right in use arises from the basic principle of sovereign equality of states:

> . . . given an interdependence of resource utilization in different national jurisdictions, territorial sovereignty-based claims concerning the exploitation of natural resources within one jurisdiction must be consonant with the respect due to the sovereignty of other States within whose territory the repercussions of the former's conduct will be felt.[60]

As a result, in order to achieve and maintain a situation of equality of right in use, individual states benefiting from an internationally shared resource must, by necessity, temper their utilization by applying the Helsinki Rules' standard of reasonable and equitable use of the resource.[61]

The standard of equitable use essentially places limitations on state conduct when that conduct involves the exercise of the common legal right in use of the atmosphere. These limitations — the responsibility not to pollute, the requisite of advance notification and consultation, and requests for non-discrimination and equal access — are recognized in the U.S. and Canadian documents establishing the basis for negotiation of a bilateral agreement on transboundary air pollution. The negotiating documents illustrate the "state-of-the-art" evolution of international envi-

58. The Helsinki Rules on the Uses of the Waters of International Rivers — adopted by the International Law Association at its Fifty-second Conference at Helsinki in 1966 — are non-binding and therefore sometimes ignored. However, they are the most comprehensive and persuasive codification of what and where the international law of shared natural resources should be. Bourne, *International Law and Pollution of International Rivers and Lakes,* 6 U. BRIT. COL. L. REV. 115 (1971).

59. *See* the decision of the Permanent Court of International Justice in the Oder River Commission Case, PCIJ Ser. A, No. 23, 27 (1929).

60. Handl, *supra* note 54. This has not always been the case in American practice. In 1895, U.S. Attorney General Harmon — responding to a Mexican Government complaint that irrigation in Colorado and New Mexico with water from the Rio Grande River had severely diminished the River's flow within Mexico — advised that comity did not pertain to his Department, that international law imposed no liability or.obligation on the United States, and that national sovereignty allowed unrestricted use of Rio Grande water while the river was inside American territorial limits even if the utilization created scarcity in Mexico. *Case of the Rio Grande,* Moore, 1 DIGEST INT'L L. (Washington: GPO 1906) at 653-657. Handl summarizes the concept of equitable use as a maxim which implies "that the use of common resource by each country, while arriving in principle at optimum exploitation, *must be compatible with the safeguard of the interests of other countries concerned,* on the basis of the conjunction of a series of criteria which vary according to the particular situation." Handl, *supra* note 54.

61. ILA REPORTS 1966: HELSINKI RULES ON THE USES OF THE WATERS OF INTERNATIONAL RIVERS, Articles IV, V at 9-14. (Hereinafter cited as HELSINKI RULES.)

ronmental law principles and practices from the "effects doctrine" of absolute liability and compensation for material damage, to the precepts of equitable use, prior restraint, and the avoidance of risk in utilization.

The Responsibility Not To Pollute

The notion of state responsibility not to pollute the common atmosphere[62] has its origin in doctrines of international law that concern the prohibition of the abuse of sovereign rights, the existence of state servitudes and inducements of an apprehension of reciprocity.[63]

To avoid the abuse of rights means that whatever one's sovereign rights are, "they must not be used in such a manner that [their] anti-social effects outweigh the legitimate interests of the owner of the right."[64] In the case of the atmosphere, a sovereign right in use would be prohibitively abused if, in the act of exercising that right, a state polluted the territory of other states and thereby detrimentally affected the community of interests in the global commons, i.e., internationally shared resources.

The responsibility not to pollute the common atmosphere also has a basis in state servitudes — "those exceptional restrictions made by treaty on the territorial supremacy of a State by which a part or whole of its territory is in a limited way made perpetually to serve a certain purpose or interest of another State."[65] By requiring that United States and Canadian state conduct incorporate the principles of reasonable and equitable use of the shared atmospheric resource, one might assume that individual compliance would constitute a reciprocal state servitude by reason of its necessary restrictions on atmospheric pollution taking place in sovereign territory. Such servitude could be categorized as a negative economic state servitude, a restriction requiring a reduction of or abstention from commercial activity that pollutes. These limitations, however, on conduct could also be considered a general, "natural" restriction on the exercise of sovereign utilization which is applicable to all nations.[66] In any case, a servitude of some sort is implied, as the common utilization of a shared atmosphere places restrictions on polluting activities within a sovereign territory in the interest of other states.

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62. For a discussion of the broad concept of pollution, *see* Springer, *Towards a Meaningful Concept of Pollution in International Law*, 26 I.C.L.Q. 531 (1977), and Van Heijnsbergen, *The "Pollution" Concept in International Law*, 5 ENV'L POL. L. 1 (1979), at 11-13.
63. Lester, *River Pollution in International Law*, 57 AJIL 838 (1968).
64. FRIEDMANN, THE CHANGING STRUCTURE OF INTERNATIONAL LAW, New York: Columbia U. Press, 1964 at 198.
65. OPPENHEIM, INTERNATIONAL LAW: A TREATISE, VOL. 1, PEACE, London: Longmans, Green and Co., (1955) at 535.
66. *Ibid.*, at 536-541.

Finally, the fear of reciprocity discourages the abuse of rights and encourages the acceptance of mutual servitudes. In most cases, consideration of interdependent rights and expectations facilitates cooperation between nations in environmental relations. On those occasions when interference in sovereign affairs through polluting the environment might be contemplated, the apprehension of a reciprocal action by an affected state may reinforce the obligation to refrain from such actions.[67] Thus, fear of reciprocity encourages states to accept with good grace the responsibility to practice good neighborliness and take reasonable care in their utilization of shared resources.

A maxim of customary international law supporting the state responsibility not to pollute is the principle *sic utere tuo ut alterum non laedas,*[68] "use your own property in such a manner as not to injure that of another."[69] The concept of *sic utere tuo* has been confirmed as a common general principle of law a number of times in the recent past, perhaps most notably in the *Corfu Channel Case.* In that judgment, the International Court of Justice held that it is "every State's obligation not to allow knowingly its territory to be used for acts contrary to the rights of other States."[70] *Sic utere tuo* establishes a principle of self-restraint on states, limiting sovereign conduct to that which does not cause injury to other states,[71] and suggests that state responsibility may be incurred for extraterritorial damage.

When applied to transboundary air pollution, the principle of self-restraint contained in *sic utere tuo* is complemented by the limitation of usufructuary rights — non-injurious use of the internationally shared atmosphere. The concept of *ferae naturae* has been advanced to illustrate the existence of usufructuary rights in atmospheric use.[72] Animals, *ferae naturae,* are transient in sovereign territory and are not the property of a sovereign unless captured and physically possessed in that territory. While the right in use to attempt to capture and possess *ferae naturae* in sovereign airspace does exist, it only exists insofar as it does not trespass another's property.[73] The same can be said of the right in use of the atmosphere: Sovereign subjacent utilization is a tenet of natural law, but the use must

67. Dupuy, *Due Diligence in the International Law of Liability,* in OECD, LEGAL ASPECTS OF TRANSFRONTIER POLLUTION (1977).
68. OPPENHEIM, *supra* note 65 at 346.
69. BLACK'S LAW DICTIONARY 1238 (5th ed. 1979).
70. Corfu Channel Case, Judgment of 9 April 1949, ICJ REPORTS, 1949, at 22.
71. Mirfendereski, *supra* note 52.
72. *Ibid.*
73. "The closest *ferae naturae* analogy to the corpus of the atmosphere is birds which are both airborne and transient." Assertion to title to birds simply on the basis of their presence — and not possession — in a jurisdiction was rejected by Justice Holmes in *Missouri v. Holland,* 252 U.S. 416 (1920). *Ibid.* at 52.

be usufructuary and not injurious to rights and property of another state.

The Roman precept of *sic utere tuo* took North American form in the U.S.-Canadian Boundary Waters Treaty of 1909, Article IV of which states:

> . . . boundary waters and waters flowing across the boundary shall not be polluted on either side to the injury of health or property on the other.[74]

This provision of the Treaty is the earliest specific assertion by the two countries of their "fundamental obligation"[75] to use their common environment equitably and therefore not to pollute their shared natural resources. As the Treaty is considered in the recent U.S.-Canadian Joint Statement, MOI and Report of the Legal Working Group[76] as one of a number of "existing international rights, obligations, commitments and cooperative practices,"[77] the responsibility implied in Article IV should be a legal cornerstone influencing the current negotiation of an agreement on transboundary air pollution.

The United States and Canada extended the concept of *sic utere tuo* and its attendant obligation not to pollute the shared atmosphere in the *Trail Smelter Arbitration.*[78] In 1928 the United States referred a question to the International Joint Commission (IJC) having to do with damage to property in the state of Washington by sulfur and other fumes drifting over the frontier from a smelter at Trail, British Columbia. Following an IJC Report on the situation in 1931, the United States and Canada signed a Convention in April 1935,[79] the terms of which had Canada pay the United States $350,000 for damage prior to 1932. The Convention also provided for the establishment of an ad hoc Arbitral Tribunal to determine whether further damage had occurred subsequent to 1932 and, if so, at what cost.

The Tribunal held in 1938 that another indemnity of $78,000 was to be paid for damage caused between 1932 and October 1937.[80] The final decision of the Tribunal concluded that no injury had occurred since October 1937 and recommended a pollution control regime to avoid any future damage.[81] In this often-cited and now controversial decision,[82] the

74. BOUNDARY WATERS TREATY, *supra* note 27.
75. DRAFTING GROUP REPORT, *supra* note 51, at 2.
76. JOINT STATEMENT, MOI, and DRAFTING GROUP REPORT, *supra* notes 45, 47, and 51, respectively (hereinafter referred to as the *U.S.-Canadian negotiating documents*).
77. MEMORANDUM OF INTENT, *supra* note 47.
78. 3 R. INT'L ARB. AWARDS 1911 (1938). (Hereinafter referred to as TRAIL SMELTER CASE.)
79. U.S.T.S. 893; 49 STAT 3245.
80. TRAIL SMELTER CASE, *supra* note 78.
81. Read, *The Trail Smelter Dispute,* 1 CANADIAN YB. INT'L L. 213 (1963).
82. *See* Rubin, *Pollution by Analogy: The Trail Smelter Arbitration,* 50 OREGON L. REV. 259 (1971).

Arbitral Tribunal held that:

> Under the principles of international law, as well as the law of the United States, no state has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the property or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence.[83]

It is not only the assertion of responsibility for pollution that makes the *Trail Smelter Arbitration* extraordinary, but also its specification of the threshold at which liability for pollution injury is reached. The Tribunal's decision determined state liability was incurred when injury was done that allowed the award of monetary damages. The Court rejected U.S. claims for intangible injury, and considered as pertinent only damage "for which pecuniary loss could be proved."[84]

The *Trail Smelter* decision created an "effects doctrine" of liability for material damage. While the decision prohibits pollution causing recoverable monetary damages, it *permits* polluting activities to continue as long as and up to the point of not causing damage "in the sense of direct injury measurable in money terms to the industrial or agricultural production of a second state."[85] Moreover, the decision has had the effect of tightening state responsibility so that pecuniary injury means automatic responsibility and strict liability without consideration of negligence. Finally, the decision has loosened the absolute rule of physical trespass by permitting physical trespass in the form of pollution until injury is sustained.[86]

Several proclamations of international organizations having the force of *opinio iuris* support the *Trail Smelter* principle responsibility for pollution and its accompanying effects doctrine. For example, the Helsinki Rules for riparian usage — based on the concept of equitable use of shared natural resources and often considered applicable to the management of regional airsheds — stipulate that states must present any new or increased levels of pollution, and take all reasonable measures to prevent and abate any existing pollution that would cause substantial injury to a sharing state. Furthermore, the Rules state that liability can be incurred on the occasion of failure to act reasonably, that reparations are called for when appropriate to the situation, and that pecuniary compensation is due when the injury is of a physical nature.[87]

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83. 3 R. INT'L ARB. AWARDS 1905 (1941).
84. Rubin, *supra* note 82 at 261.
85. *Ibid.*, at 272.
86. *Ibid.*
87. HELSINKI RULES, Articles X and XI, *supra* note 61.

Principle 21 of the 1972 Stockholm Declaration on the Human Environment[88] (of which the United States and Canada are signatories, and to which the two governments give their support and assign the status of one of "their existing international rights, obligations, commitments and cooperative practices"[89]) reaffirmed a state's sovereign right to exploit its own resources. In so doing, however, the principle also assigned the responsibility not to damage the environment of other states:

> States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.[90]

Handl asserts that "in the light of the object and purpose of the whole Declaration and the history of the drafting of the above principle, it is obvious that Principle 21 can only be understood as referring to material damage alone . . . ."[91] It is important to note that the responsibility rule applies not only to damage to other states but also to detrimental use and degradation of areas outside the limits of national jurisdiction such as the high seas, the Antarctic,[92] and, by conceivable extension, the Earth's atmosphere.

Principle 22 of the Stockholm Declaration also called for the cooperative development of rules of liability and compensation, suggesting that the formulating delegates considered the pecuniary damage statement of the *Trail Smelter* effects doctrine either insufficient or useless:

> States shall co-operate to develop further the international law regarding liability and compensation for victims of pollution and other environmental damage caused by activities within the jurisdiction or control of such States to areas beyond their jurisdiction.[93]

88. FINAL DOCUMENTS: REPORT OF THE U.N. CONFERENCE ON THE HUMAN ENVIRONMENT, Stockholm, 5-16 June 1972, 1 UN GAOR, UN Doc. A/Conf. 48/14 (and Corr. 1) of 16 June 1972, reprinted in 11(6) ILM 1416-1469. (Hereinafter cited as STOCKHOLM DECLARATION.)
89. JOINT STATEMENT and MOI, *supra* note 45 and 47, respectively.
90. STOCKHOLM DECLARATION, Principle 21, *supra* note 88.
91. Handl, *Territorial Sovereignty and the Problem of Transnational Pollution*. 69 AJIL 50 (1975) at 67.
92. Sohn, *The Stockholm Declaration on the Human Environment*. 14(3) HARVARD INT'L L. J. 485-493 (1973).
93. STOCKHOLM DECLARATION, Principle 22, *supra*, note 88.

A third non-binding declaration of recommended principles was the United Nation's ECE Convention on Long Range Transboundary Air Pollution.[94] This Convention also forms part of the body of relevant principles and practices influencing current U.S.-Canadian negotiations. Its signatories' resolution to "endeavor to limit and, as far as possible, gradually reduce and prevent air pollution . . . considering the pertinent provisions of the Declaration of the U.N. Conference on the Human Environment, and in particular Principle 21 . . ."[95], implied a tacit acceptance of the responsibility not to pollute and liability for material damage.

The U.S.-Canadian negotiating documents specified "consideration of such matters"[96] as liability and compensation as "legal elements of an agreement"[97] on transboundary air pollution. As current thought and practice now stands, liability and compensation become relevant at the convincing appearance of material damage, and not for intangible injury through a violation of sovereignty. Handl argues that the characteristic of an award or indemnity for violation of territorial sovereignty is possible "only in respect to a state activity per se, where the conduct is prohibited by a specific rule of international law."[98] Handl would assert that, as "pollution generating conduct is not governed by a specific rule of international law,"[99] the moral injury of pollution short of material damage is not illegal or compensable. However, the unique characteristics of pollution by acidic deposition may necessarily alter this customary view.

Acidic deposition is a phenomenon of long-range, transcontinental and transboundary transport of pollutants — distinctly different from air quality problems "confined to a regional context of highly industrialized border areas . . . ."[100] As such, the pollutant, its sources and its impacts must affect traditional criteria for assigning liability and compensation after determining responsibility for injury. Whereas liability and compensation in the *Trail Smelter Arbitration* were determined by pecuniary assessment of material damage from fumes originating at a specific locale, designating individual points of origin of acidic precursors would be absurd; sources of SO_x and NO_x emissions are ubiquitous.

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94. UN-ECE CONVENTION ON LONG RANGE TRANSBOUNDARY AIR POLLUTION, done at Geneva, on 13 November 1979, UN Doc. ECE/GE 79-42960 (1979), reprinted in 18 ILM 1442 (1979).
95. *Ibid.*
96. JOINT STATEMENT, *supra* note 45.
97. MOI, *supra* note 47.
98. Handl, *supra* note 91 at 65.
99. *Ibid.*, at 60.
100. *Ibid.*, at 69.

Despite scientific irrefutability of the existence of acidic deposition and its sources, the wide impact of its effects raises the problem of how to define and quantify material damage to the integrity of natural systems. Extended experimentation with environmental economics would mean allowing the situation to progress until damage is blatant, thereby defeating the goal of "maximization of aggregate utility" of the shared resource.[101] Escalating environmental impacts in the interim would elevate the growing nuisance of acidic deposition to a condition of virtually immutable destruction. The characteristics of transboundary acidic deposition, disruptive of existing legal precedent and procedure, foster political reluctance to accept state responsibility and to provide relief for extraterritorial pollution, especially since the pollution is a by-product of macroeconomic activity strategically important to sovereign independence and national security.

Obviously, responsibility and liability for material damage cannot be hard and fast. The *Trail Smelter* precedent is *sui generis*[102] and may be outmoded and overshadowed by the global scope of transboundary pollution. Allowing acidic deposition from the atmosphere to continue means damage to planetary ecosystems and disruptive effects on interdependent economies.[103] The current concept of liability for material damage should now be regarded not as a procedural avenue but as a substantive rule that both illustrates the potential for environmental disaster and stresses the importance of exercising prior restraint and equitable use in global affairs. The definition of pollution in the U.S.-Canadian negotiating documents is quite clear:

> . . . pollution which results in deleterious effects of such a nature as to endanger human health, harm living resources and ecosystems, and impair or interfere with amenities and other legitimate uses of the environment.[104]

The definition envisages the wide potential impacts of air pollution, implying the difficulty of applying traditional mechanisms of relief, and

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101. Handl, *supra* note 54.
102. Rosencranz, *The International Law and Politics of Acid Rain*, 10 DEN. J. INT'L L. POL. 3 (Spring 1981).
103. As such, it seems that acidic deposition — given the analogous Helsinki Rules' criteria of equitable use — may well conflict with "the fundamental stipulation that the overall resource use be efficient." Handl, *supra* note 54 at 52.
104. The U.S.-Canadian definition, found in the July 1979 JOINT STATEMENT, is exactly the same as the one appearing in the *OECD Council Recommendation on Principles Concerning Transfrontier Pollution* of November 1974. It is interesting to note that the subsequent ECE Convention on Long Range Transboundary Air Pollution of November 1979 contains the U.S.-Canadian-OECD form, but with a significant addition: ". . . harm living resources and ecosystems *and material property* and impair or interfere . . ." (emphasis added). However, the U.S.-Canadian MOI specifies the same ECE Convention as one of the "existing . . . commitments." One wonders what form will survive to be included in an eventual bilateral agreement.

leaves the door open for the development of more anticipatory means of cooperative management of transboundary acidic deposition.

Advance Notification and Consultation

Although states are responsible and liable for damage resulting from their extraterritorial pollution, the characteristics of acidic deposition and the implications of its continued material environmental damage demand preventive action that will avert ecologic, economic and political disruptions. The concept of equitable use of a shared natural resource puts an appropriate limitation on state conduct through requisite advance notification and consultation — a principle practiced by the United States and Canada. Handl considers notification and consultation a general legal consequence of equitable use and an integral part of the fundamental state obligation, given equal rights in use, to reconcile individual interests in a commonly shared resource such as the atmosphere. The mutual concessions accompanying reconciliation require prior restraint in utilization and, of necessity, a prior assessment of potential extraterritorial environmental impacts.[105]

The duty of notification and consultation consists of advance notification of contemplated activities that could expose other states to a significant risk of transboundary pollution. Appropriate technical information pertinent to impact assessment should be supplied concurrently, and notification generally also includes the exchange of scientific and technical data arrived at through cooperative research and monitoring. The time allowed for response is crucial to the principle of notification: a potentially affected state must be assured sufficient opportunity to reply in consultation with the acting state before the contemplated activity is scheduled to progress. Although requests for more information are to be honored if made in good faith, they must not unreasonably delay or postpone the joint examination of environmental risk submitted to by the acting state. Overall, notification and consultation provide for mutual review of potentially harmful activities and can help avoid disputes arising out of unexpected or unintended impacts.[106]

The duty of notification and consultation is consistent with the pattern of state practice, and an essential feature of both United Nations' resolutions and bilateral and multilateral agreements on weather modification, nuclear activities in frontier areas, and the utilization of shared fresh water resources

105. Handl, *supra* note 54 at 56, 57, 60.

106. Bilder concludes that while international law does not presently impose any general obligation on states to avoid disputes, in the special field of international environmental law a principle of dispute avoidance incorporating the duty of notification and consultation does appear to be developing. Bilder, *supra* note 39.

and the marine environment.[107] The finding of the *Lake Lanoux Arbitration*[108] is the model for the practice of notification and consultation as it upholds the obligation to consult as a rule of general international law and calls on states both to take into account potentially affected interests and to show genuine concern for a compatible reconciliation.

The Organization for Economic Cooperation and Development (OECD), of which the United States and Canada are members addressed the applicability of the principle of notification and consultation. In its "Council Recommendation on Principles Concerning Transfrontier Pollution," the OECD recommended states' notification of activity creating a significant risk of transfrontier pollution, the provision of information, and prior consultation on existing or foreseeable pollution problems. The document also recommended the exchange of all relevant scientific data and information on the pollution, cooperation in scientific and technical research programs, and the joint establishment of monitoring systems.[109] To implement the principles of notification and consultation, the OECD also recommended public dissemination of information, the conduct of bilateral environmental impact studies, scientific information exchange and the standardization of pollution measuring and assessment methods.[110] Although these OECD recommendations have no binding legislative power, they are statements of concern for environmental policy by important industrialized nations,[111] and, as such, express the position of members with respect to the development of the most desirable principles of environmental law.

The ECE Convention on Long Range Transboundary Air Pollution contained a clear expression of the duties and conduct expected of signatories (the United States and Canada included) when applying the principle of notification and consultation. The Fundamental Principles contained in Articles 3, 4 and 5 of the Convention specified agreement to apply information exchange, consultation, research and monitoring, both to reinforce in-

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107. Handl, *supra* note 64 at 58, 59. On a broader scale, the *U.N. Charter of Economic Rights and Duties of States* provides that: "In the exploitation of natural resources shared by two or more countries, each State must cooperate on the basis of a system of information and prior consultations in order to achieve optimum use of such resources without causing damage to the legitimate interests of others." UNGAR No. 3281 (xxix) 14 ILM 251 (1975), Art. III.

108. 12 UNRIAA 281, 53 AJIL 156 (1959).

109. OECD Doc. C (74) 224, Titles E and G, adopted 21 November 1974, reprinted in 14 ILM 242 (1975). (Hereinafter cited as OECD Doc. C.)

110. RECOMMENDATION OF THE COUNCIL FOR STRENGTHENING INTERNATIONAL COOPERATION ON ENVIRONMENTAL PROTECTION IN FRONTIER REGIONS, OECD Doc. C (78) 77, adopted 21 September 1978.

111. Stein, *The OECD Guiding Principles on Transfrontier Pollution*. 6 GEO. J. INT'L COMP. L. (Winter 1976) at 251. Another regional expression of the applicability of notification and consultation is found in the *Scandinavian Convention on the Protection of the Environment*. 19 February 1974, 13(3) ILM 591-597 (1974).

ternational cooperation in developing appropriate national policies and to coordinate national action for combatting transboundary air pollution. The existence of significant risk of long range transboundary air pollution was expressly stated as a condition for consultations between affected and acting states. Article 7 required contracting parties to initiate and cooperate in conducting research and development in the fields of air pollution control technologies, pollutant impacts and social, environmental and economic assessments of alternatives. Article 8 called for the exchange of available scientific, technological and policy information on national pollutant generation, impacts and management.[112]

The United States and Canada have observed the requisite limitations of notification and consultation in their bilateral environmental affairs. However, as the principle of notification and consultation has traditionally been applied to situations involving individual point sources of pollution near the frontier, the two countries realize that transboundary air pollution and acidic deposition will require that the practice "cover a wider geographic area and range of activities."[113] The United States and Canada also recognize the inseparability of prior assessment and the practice of notification and consultation:

> Effective implementation of the practice also depends in the first instance on recognition of the potential environmental impact which a particular action can have on another country. In this respect notification and consultation are closely related to the allied practice of examining the environmental impact of an activity before it is authorized.[114]

The two nations' commitment to the principle of notification and consultation "may be taken as a given" in their environmental relations,[115] and the U.S.-Canadian negotiating documents show their intention to maintain and further expand this anticipatory practice.

The Joint Statement mentioned the previous implementation of "the principles of notification and consultation on activities and projects with potential transboundary impact . . .", and the promotion of "exchanges of scientific and technical information."[116] The Joint Statement agreed that, among others, four principles and practices relating to notification and consultation should be addressed in the development of a bilateral agreement on transboundary air quality:

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112. UN-ECE CONVENTION, *supra* note 94.
113. DRAFTING GROUP REPORT, *supra* note 51 at 8.
114. *Ibid.*
115. *Ibid.*, at 4.
116. JOINT STATEMENT, *supra* note 45.

1. expanded notification and consultation on matters involving a risk or potential risk of transboundary air pollution
2. expanded exchange of scientific information and increased cooperation in research and development concerning transboundary air pollution processes, effects and emission control technologies
3. expanded monitoring and evaluation efforts
4. cooperative assessment of long term environmental trends and of the implications of these trends for transboundary air pollution problems[117]

The MOI between the United States and Canada called for the practice of notification and consultation to be applied in the development of interim domestic pollution control measures. It also expressly stated their commitment to continue and expand notification and consultation on proposed industrial development or other actions which may cause significant increases in transboundary air pollution, as well as on proposed changes of policy or regulations which may "significantly affect" transboundary air pollution.[118] The MOI provided for an accompanying exchange of scientific information and the coordination of research and development. The mandates of the Working Groups established in the MOI and their subsequent reports upheld the bilateral resolution to inform, consult and cooperate in conducting research and monitoring air quality conditions and impacts. The Report of the Legal, Institutional and Drafting Work Group 4 reaffirmed this commitment to notification and consultation, describing the concept and its consideration as both a multilateral principle and practice and as a bilateral obligation.[119]

Non-Discrimination and Equal Access

Standards of conduct prescribing non-discrimination and equal access are the final limitations imposed on states by the principle of equitable use. Taken together, the practices of non-discrimination and equal access entail the application of legal measures which stipulate that the populace of a state affected by pollution from an extraterritorial source are dealt with no less favorably than they would be under the laws of the acting state.

Non-discrimination flows from a state's duty to reconcile sovereign interests in resource utilization with the potentially conflicting interests of other states by not externalizing the environmental costs of a polluting

117. *Ibid.*
118. MOI, *supra* note 47.
119. DRAFTING GROUP REPORT, *supra* note 51.

activity. In the case of utilization of a shared resource such as the atmosphere, non-discrimination means that states "should be held to their own standards of environmental protection, if under those standards the negative transnational environmental impact could be avoided."[120] Attempting to formalize such desirable state conduct, the OECD Recommendation on Principles Concerning Transfrontier Pollution adjured:

> a. polluters causing transfrontier pollution should be subject to legal or statutory provisions no less severe than those which would apply for any equivalent pollution occurring within their country . . .
> b. in particular . . . the levels of transfrontier pollution entering into the zones liable to be affected by such pollution should not exceed those considered acceptable under comparable conditions and in comparable zones inside the country in which it originates . . .[121]

Furthermore, one country's criteria for the acceptance of risk is not necessarily the standard by which transboundary pollution should be evaluated. An affected state should be able to demand the application of even stricter standards since the principle of non-discrimination "contributes to the establishment of a minimum standard of behavior and in no way prejudices stricter obligations . . . between the countries concerned."[122]

Application of the principle of equal access was also addressed by the OECD's "Recommendation on Principles . . . ." Its Principle of Equal Right of Hearing recommended that citizens in one country who may be affected by the environmental impacts of proposed projects should have the same rights of standing in judicial or administrative proceedings as do citizens of the acting state.[123] The same rule was to apply when damage has already been done. The so-called "Nordic Convention on the Environment" had a similar provision that states:

> A person who is affected or may be affected by a nuisance caused by environmentally harmful activities in another contracting state shall have the right to bring before the appropriate Court or Administrative Authority of that state the question of the permissibility of such activities . . . .[124]

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120. Handl, *supra* note 64 at 55.
121. OECD Doc. C, *supra* note 109, Title C.
122. *Note on Implementation of a Regime of Equal Right of Access and Non-Discrimination in Relation to Transfrontier Pollution*, in Handl, HAZARDOUS ECONOMIC ACTIVITIES IN FRONTIER REGIONS, OECD Doc. ENV/TFP/78.14, 12-14 (1979).
123. OECD Doc. C, *supra* note 109, Title D.
124. *Scandinavian Convention*, *supra* note 111.

The OECD also recommended that states have the responsibility to ensure the availability of adequate and practical legal remedies against individual polluters via local, private procedures. This articulation of the desirability of equal access through local remedies should be regarded as progressive development of international law, and seems feasible for locale-specific polluting sources and impacts. However, the principle of equal access to local remedies would be difficult to apply to transboundary air pollution problems (such as acidic deposition) that have transcontinental sources and impacts. The OECD, possibly anticipating the difficulties inherent in attempting to identify the sources of such environmental problems, further recommends that there need not be a rigid, legalistic adherence to the normal international law rules requiring exhaustion of local remedies.

> There are cases where widespread injury is caused by pollution emanating from such a multiplicity of sources that lawsuits against individual pollutors would be impractical. Such problems can only be dealt with at the intergovernmental level, normally by the negotiation of concrete, practical abatement programs on a co-operative basis. Moreover, problems of the magnitude contemplated here do not readily lend themselves to judicial solution.[125]

Considerations of the practice of equal access and non-discrimination were sequentially identified in the U.S.-Canadian negotiating documents: first as a matter "relevant to an agreement,"[126] next as comprising "legal elements of an agreement,"[127] and finally as "important elements which OECD countries believe should guide their conduct."[128] Yet, in their Report of the Legal, Institutional and Drafting Work Group the two countries also recognized the potential inapplicability of the principles of equal access and non-discrimination in certain cases of transboundary pollution, stating that they should not be regarded as a substitute for "implementation of substantive state-to-state responsibilities relative to prevention of transboundary pollution damage, which has been the traditional focus of environmental relations between states, including the United States and Canada."[129]

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125. Canadian delegation, *Liability and Compensation*, OECD-LEGAL ASPECTS OF TRANSFRONTIER POLLUTION, OECD Doc. AEV/TFP/ENV/74.3, at 283 (1977) in Homer, supra note 18 at 507, 508. *See* Kumin, *Transfrontier Environmental Disputes and National Courts: An Approach for Western Europe*, 3 FLETCHER FORUM 1 (1979) at 24-26.
126. JOINT STATEMENT, *supra* note 45.
127. MOI, *supra* note 47.
128. DRAFTING GROUP REPORT, *supra* note 51.
129. *Ibid.*, at 5.

CONCLUSIONS

International utilization of the commonly shared atmosphere must be equitable; this principle imposes, in turn, limitations on the sovereign conduct of states. United States and Canadian recognition of these limitations in their negotiating documents is encouraging as a first step toward successful abatement and prevention of transboundary air pollution and acidic deposition.

However, despite preliminary commitments, there are bounds to the efficacy of international law that are inherent in the current world order. These bounds combine with other political and economic factors to act as barriers to the implementation of a cooperative bilateral air quality agreement. The persuasiveness of legal principles and practices regarding the use of shared international resources and the outcome of current efforts to surmount domestic barriers to cooperation will have implications not only for the future of environmental quality in North America, but also for the ecological integrity of the entire planet.

Bounds of International Law

Current international legal doctrines embody criteria that present problems when considering extraterritorial pollution, especially in the case of environmental damage caused by acidic deposition from transboundary sources.

Reliance on the effects doctrine, dependent on material damage, to determine responsibility and assign liability and compensation virtually excludes transboundary acidification from consideration for legal remedy. While current principles may help allocate pecuniary expenses when a localized impact is clearly from a specific source, they will "do little to avoid the permanent environmental damage that can be expected from acid rain"[130] created by the ubiquitous air pollutant emissions of industrial nations. Inapplicability of traditional criteria emphasizes the timeliness of the development of principles defining state responsibility for equitable use and prior restraint. Instead of making post-impact environmental assessments to determine responsibility for damage, it will be more efficient to take preventative, anticipatory measures so as to avoid degradation and infringement of rights in use.

State practice sets precedents and ultimately determines the development of international environmental law. In the absence of binding agreements between acquiescing states, there is no clear international mechanism to enforce the limitations on conduct imposed by the principle of equitable use short of a mutually agreed upon reference to some tribunal, such as

130. Rosencranz, *supra* note 102.

the International Court of Justice. For this reason, a U.S.-Canadian cooperative agreement on transboundary air pollution will serve to establish a persuasive codification that will help avoid confrontation and promote anticipatory techniques of environmental management and, by so doing, further the cause of the application of international legal guidelines.

Barriers to Implementation

The differing legislative standards regulating air quality in the United States and Canada form one barrier to eventual implementation of a cooperative regime to manage North American atmospheric pollution.

In the United States, air quality is regulated nationwide by the provisions of the Clean Air Act.[131] Although the states have wide discretion in formulating individual programs to achieve these national standards, in the final analysis, the U.S. Environmental Protection Agency (EPA) approves, monitors and enforces the states' compliance. It has become apparent, however, that air quality regulation through the Clean Air Act does not address the occurrence of long range transport of air pollutants and the resulting acidic deposition. For example, while the Clean Air Act provides for the designation of interstate air quality regions, the regions are not responsible for setting or enforcing specific standards. Also, emission control compliance standards concentrate on ground level rather than higher altitude pollutant concentrations. As a result, the combined accumulation of emissions from any number of air quality regions create the polluted high altitude air masses that subsequently figure in transboundary acidic deposition.[132]

In addition, a seemingly encouraging section of the Clean Air Act that provides for consideration of international air pollution has its own particular problems. Section 115 of the Act allows the EPA to order special emission limitations for any pollutant if it endangers the health or welfare of a foreign country, but only if the endangered country provides a reciprocal agreement concerning emissions that might harm the United States.[133]

In contrast to United States federal air quality mandates and oversight, the Canadian federal role is more one of guidance and recommendation to the independent provinces. Objectives formulated by the Ministry of Environment have no binding force on the provinces unless specifically incorporated into formal federal or provincial air quality regulations. The

131. 42 U.S.C. secs. 7401-7642, ELR. STAT. REG. 42201. Attempts over the past year and a half to revise the Clean Air Act — to the probable detriment of air quality — have only recently been stalemated.

132. *See* generally Wetstone, supra note 16. *Also see* Brown, *supra* note 2 at 638; Homer, *supra* note 18 at 502.

133. Brown, *supra* note 2 at 642-43.

provinces essentially have been free to adopt and enforce their own air pollution standards, and their practices determine the level of Canadian national air quality. Provincial government control programs use a minimum of formal legal measures, and emphasize government-industry cooperation in the development of emission standards. It should be noted that due to the disaggregated nature of Canadian industrial development, the provinces have resorted to pollutant dispersion techniques rather than controls at the source of emissions. Canadian practice, like that of the United States, has been ultimately conducive to the creation of conditions that generate the phenomenon of long range, transboundary transport of acidic air pollutants.[134]

Canadian provisions for international air pollution problems could be effective in realizing and enforcing a future bilateral agreement. National standards may be prescribed by the Canadian federal government in circumstances when national emissions "constitute a significant danger to the health of persons . . ." or are "likely to result in the violation of a term or terms of any international obligation entered into by the Government of Canada relating to the control or abatement of air pollution in regions adjacent to any international boundary or throughout the world."[135]

Beyond the barriers imposed by legislative standards, U.S. political efforts do not satisfy Canadian desires for more immediate attention to the problem of acidic deposition. The policy of the current administration is characterized by the testimony of Kathleen M. Bennett, assistant administrator of the EPA, at a 1981 hearing of the House Subcommittee on Energy and Commerce:

> Acid deposition exists, and varying effects do occur, but there is considerable debate over the circumstances of its formation and the feasibility of potential controls.[136]

As a result, more scientific study is believed necessary before the U.S. Government will impose costly rules to reduce the occurrence of acidic deposition.

The Canadian Government, on the other hand, feels that the United States "does not share our sense of urgency"[137] about the need to deal with acidic deposition, and that the American wait-and-study policy[138]

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134. Wetstone, *supra* note 16; Homer, *supra* note 18 at 499; Johnston and Finkle, *supra* note 20 at 818.
135. CAN. STAT. 19-20 ELIZ II, c. 47, sec. 7(1) (a)-(b) in Johnston and Finkle, *supra* note 20 at 817.
136. Shabecoff, *Canadian, U.S. Witnesses Differ on Acid Rain*, NEW YORK TIMES, 7 October 1981.
137. *Canadian Deplores U.S. Policy on Acid Rain*, NEW YORK TIMES, 14 May 1982.
138. The Acid Precipitation Act of 1980 (Title VII of the Energy Security Act of 1980 — P.L.

is a stalling action, not based on a lack of scientific knowledge but on other political and economic considerations. Canadian Environment Minister John Roberts recently stated that ". . . we do have enough information to act. It's not a matter of science any longer, it's a matter of political will."[139] Mentioning that earlier strategies and plans of attack have been blunted by repeated U.S. calls for more study, Roberts declared that "many Canadians have come to wonder if there is not really a lack of willingness on the part of the U.S. to negotiate."[140]

In a period when general bilateral relations are full of tensions and "saber rattling,"[141] the issue of acidic deposition could be yet another factor contributing to bad blood between the two countries. Canadian discomfiture has even taken on a geopolitical tone. Roberts has gone so far as to state that the problem of acidic deposition

> is without a doubt the single most important awkwardness in Canadian-American relations from a Canadian point of view . . . . *It is not good and not healthy for the U.S. to have on its northern borders, between itself and the Soviet Union, a good friend and ally that feels badly on this issue.*[142]

96-294) created the Interagency Task Force on Acid Precipitation. The mandate of the Task Force is to develop and implement a comprehensive *ten year* National Acid Precipitation Assessment Program to increase the "understanding of the causes and effects of acidic precipitation. The National Program includes research, monitoring and assessment activities that emphasize the *timely development of a firmer scientific basis for decision making.*" (Emphasis added.) NATIONAL ACID PRECIPITATION ASSESSMENT PLAN, prepared by the Interagency Task Force on Acid Precipitation, June 1982.

139. Slayton, *Canadian Blasts Reagan on Acid Rain*, BOSTON GLOBE, 12 September 1982. In the face of the recent 25 percent cuts in Canadian sulfurous emissions, a February 1982 Canadian proposal to reduce bilaterally sulfur emissions by 50 percent over the next decade, and the "scientifically unimpeachable assessment" of the causes and effects of acidic deposition presented in a November 1982 report commissioned by the U.S. Government, the current U.S. administration still contends uncertainty over the sources and levels of acidification. Kihss, *supra* note 22; Kaufman, *Canada Seeks Allies in Fight on Acid Rain*, NEW YORK TIMES, 18 October 1982 at A12; *Acid Rain is Caused Mostly by Pollution at Coal-Fired Midwest Plants, Study Says*, WALL STREET JOURNAL, 2 November 1982 at 2.

140. Slayton, *ibid.* Unconfirmed CBS radio news reports in late October 1982 mentioned that the ongoing issue of transboundary acidic deposition was discussed during the visit to Canada by U.S. Secretary of State George Schultz, and that new diplomatic memoranda on the subject would be passed between the two nations at the beginning of 1983. U.S. Government sensitivities about the problem of acidic deposition extend to the Europeans and Japanese as well. The current administration — through the EPA — recently withheld approval for publication of an OECD report on the global environment because it objected to the report's proposals for governmental action to solve — among others — the problem of acidic deposition. Shabecoff, *U.S. Holds Up Report on Global Environment*, NEW YORK TIMES, 28 March 1982 at 4.

141. Giniger, *Canada Ties: Storm Signs*, NEW YORK TIMES, 21 September 1981.

142. Slayton, *supra* note 139 (emphasis added).

Implications for Global Environmental Affairs

The issues inherent in transboundary acidic deposition are momentous. By allowing long range transport of air pollutants to continue, states are knowingly polluting the global atmospheric commons and degrading ecosystems sovereign to or shared by individual nations. The impact of transboundary acidic deposition demonstrates the important interconnection of economies and ecosystems. One of the many problems making up what Aurelio Peccei (the founder of the Club of Rome) calls the *problematique,*[143] acidic deposition — a product of the rapid growth of energy and resource consumption spurred by expanding human populations — will surely receive increasing attention and concern. The essential question is *when* will acidic deposition be positively addressed?

Dealing positively with acidic deposition will pose unprecedented problems. U.S.-Canadian relations suggest that partisan positions on the characteristics of acidic deposition may continue to frustrate progress toward a timely solution. "There are now no widely accepted international mechanisms for resolving disputes as to scientific facts . . . ."[144] The seating of an objective international "Science Court"[145] might help surmount this barrier to agreement.

Coordination of air quality criteria will perhaps be the greatest problem, for it will entail surmounting inevitable economic and political disruptions. Yet, current and future governments must accept this complex burden and attempt to manage it as well as possible, for should they fail to do so, the international problems created by environmental degradation through acidic deposition will ultimately be far worse. The problem of developing a system of reparations for environmental damage need not be insurmountable. As the award of pecuniary damages for the destruction of specific things is impractical, compensation can take the form of redoubled cooperative programs of research into existing impacts, attempts to rehabilitate degraded ecosystems, and mandated prevention of future deterioration.

The benefits of a positive approach outweigh the problems. The principles and practices of developing international environmental law incorporated in the current negotiations between the U.S. and Canada indicate that an attitude of prior restraint and equitable utilization of the internationally shared atmosphere is emerging as a norm guiding states' coexistence.

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143. Peccei, THE HUMAN QUALITY, Oxford: Pergamon, 1977 at 61. *See also* Ophuls, *supra* note 56.

144. Taubenfeld, *The Atmosphere: Change, Politics and World Law.* 10 DEN. J. INT'L L. POL. 3 (Spring 1981) at 481.

145. Kantrowitz, *Proposal for an Institution for Scientific Judgment.* 156 SCIENCE 763-4, 12 May 1967; Kantrowitz, *The Science Court Experiment: An Interim Report.* 193 SCIENCE, 20 August 1976.

Successful conclusion of an agreement on transboundary air pollution — before immutable damage has been done — would be to the distinguished credit of both countries and serve as a model for the rest of the world community. An agreement would indicate that North America had recognized the serious environmental impact of air pollution and acknowledged its global scope. It would also mean that international coordination of complex legal and economic systems is possible in a time of increasing stresses, and that a positive evolution of basic social attitudes toward the quality of life on the planet had occurred.

The successful conclusion of an agreement between the United States and Canada would illustrate to the world that joint solutions to environmental problems involving internationally shared resources are possible, would emphasize the importance of cooperative interdependence, and would promote the ultimate goal of the steady state.[146] The capital, finances, technology and managerial infrastructure available to these countries should encourage positive attention and a successful outcome. This example could help guide other nations and regions soon to face a similar dilemma away from the self-defeat of national aggrandizement and toward a new era in Earth management.

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146. Ophuls defines a steady-state society as one "that has acheived a basic long-term balance between the demands of a population and the environment that supplies its wants." Implicitly, this definition would include "the preservation of a healthy biosphere, the careful husbanding of resources, self-imposed limitations on consumption, long-term goals to guide short-term choices, and a general attitude of trusteeship toward future generations." Ophuls, *supra* note 57.