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Armin Rosencranz

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The International Law and Politics of Acid Rain

ARMIN ROSENCRANZ

I. INTRODUCTION

The Environmental Law Institute, headquartered in Washington, D.C., has conducted an international comparative study of transboundary air pollution since early 1979. This study focuses on sulfur oxides (SO_x) and acid rain. Its findings and conclusions, however, may also apply to carbon dioxide CO₂,¹ another airborne pollutant which crosses national boundaries, even though sulfur dioxides are primarily regional pollutants,² whereas carbon dioxide envelops the entire globe. But CO₂ and SO_x both have been unamenable to abatement primarily for scientific and economic reasons.³ This article will be limited to a discussion of transboundary air pollution by SO_x and acid rain,⁴ and will leave to

Armin Rosencranz directed the International Comparative Study of Transboundary Air Pollution, Environmental Law Institute, Washington, D.C. A.B., 1958, Princeton University; J.D., 1962, Ph.D., 1970, Stanford University. The research for this article was supported by the German Marshall Fund of the United States.

1. CO₂ is the most likely cause of world climate change in the next century, and SO_x is the main cause of acid rain. Both enter the atmosphere and can be carried across national boundaries. The continuing increase of both compounds is due largely to the increased combustion of coal and oil to produce electric power in industrial countries. Coal and oil are carbon-based and contain significant quantities of sulfur. The Secretariat of the United Nations Economic Commission for Europe (ECE) estimates that energy consumption in Europe and North America will increase 70% by 1990 and will triple by 2020. *See* [1980] 3 INT'L ENVIR. REP. (BNA) 101. Even if this demand were to stabilize at current levels, the environmental changes are likely to be both irreversible and irremediable. To protect the environment and maintain current levels and patterns of agricultural productivity, future power must be generated from renewable, sulfur-free and carbon-free energy sources, such as solar, wind, geothermal, or tidal sources. Otherwise, our only hope is that natural homeostatic processes will somehow buffer and neutralize the effects of sulfur and carbon compounds.

2. Sulfur oxides originating in the United States may travel to Canada and those originating in Britain or Germany may travel to Scandinavia. Sulfur oxides generally travel hundreds of miles, although some scientists conjecture that the Arctic haze may consist of sulfates (SO₄) originating two thousand miles away in the United States.

3. Both CO₂ and SO_x have not been amenable to abatement for several reasons. First, scientists have been uncertain about the nature and extent of their effects. Second, the general public has been largely complacent about CO₂ and SO_x increases and their supposed effects. Third, with the exception of sportfishing communities in acid-sensitive regions, no vocal economic interest group yet perceives a sufficient economic disadvantage from increased CO₂ and SO_x to compel governmental abatement action. Fourth, utilities have persistently minimized the danger of increased CO₂ and SO_x and have steadfastly resisted costly and energy-intensive abatement pressures.

4. The Convention on Long-Range Transboundary Air Pollution is not, on its face, limited to acid rain, but that is what the proposers, Norway and Sweden, and the signatories,

others to draw any comparisons with CO₂.

The major thesis of the article is that, notwithstanding the legal doctrines clearly recognized by the *Trail Smelter Arbitration*⁵ and Principle 21 of the 1972 United Nations Conference on the Human Environment in Stockholm,⁶ international law is ineffective in the field of transboundary air pollution, and invariably gives way to considerations of national and international politics. Nations control pollution only if and when it is in their national interest to do so, and not because of any obligation under international law to do so.

II. INTERNATIONAL LAW AND TRANSBOUNDARY POLLUTION

At the 1972 Stockholm Conference on the Human Environment, the problem of Scandinavian lake acidification from airborne sulfur compounds originating outside Scandinavia was first brought to international attention. The Conference produced a Declaration of Principles: Principle 21, the most pertinent to this discussion, provides that "States have, in accordance with the Charter of the United Nations and the principles of international law . . . the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States. . . ."

This principle has impressive antecedents. In 1949, the International Court of Justice held in *The Corfu Channel Case*⁸ that Albania had an obligation to warn British users of its waters that those waters contained minefields. The Court recognized "every State's obligation not to allow knowingly its territory to be used for acts contrary to the rights of other States."⁹

With respect to transboundary pollution, the *Trail Smelter Arbitration*,¹⁰ which helped to resolve a protracted air pollution dispute in the 1920's and 1930's between Canada and the United States, is particularly

had in mind. The Convention was drawn up and adopted by the United Nations Economic Commission for Europe. Done Nov. 13, 1979, 1 U.N. ECE, Annex I, U.N. Doc. E/ECE/HLM.1/2 (1979), reprinted in 18 INT'L LEGAL MAT. 1442 (1979) [hereinafter cited as ECE Convention]. For a more exact definition of "acid rain," see note 51 *infra*.

5. The Tribunal gave a preliminary award on April 16, 1938, and the final award on March 11, 1941. *Trail Smelter Arbitration (United States v. Canada)*, 3 R. Int'l Arb. Awards 1911 (1938); *id.* at 1905 (1941). The decisions of the Trail Smelter Arbitral Tribunal are also reported in 33 AM. J. INT'L L. 182 (1939) and 35 AM. J. INT'L L. 684 (1941). For an indepth discussion of the case, see Rubin, *Pollution by Analogy: The Trail Smelter Arbitration*, 50 OR. L. REV. 259 (1971).

6. Report of the United Nations Conference on the Human Environment (Stockholm, 5-16 June 1972), 1 U.N. GAOR (21st plen. mtg.), U.N. Doc. A/CONF.48/14 Rev.1 (1972), reprinted in 11 INT'L LEGAL MAT. 1416 (1972) [hereinafter cited as Stockholm Declaration].

7. *Id.* For a general discussion of other principles of the Stockholm Declaration dealing more specifically with transboundary pollution, see J. BARROS & D. JOHNSTON, *THE INTERNATIONAL LAW OF POLLUTION* (1974).

8. *The Corfu Channel Case (Albania v. United Kingdom)*, [1949] I.C.J. 4.

9. *Id.* at 22.

10. 3 R. Int'l Arb. Awards 1905 (1941).

relevant. Canada conceded that fumes from a smelter at Trail, British Columbia, were causing damage in adjacent areas in the state of Washington, and a tribunal was created to determine, *inter alia*, the amount of damages. In widely quoted dictum, the tribunal asserted that "[n]o State has a 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 . . . when the case is of serious consequence and the injury is established by clear and convincing evidence."¹¹

Long before the *Trail Smelter Arbitration*, the United States Supreme Court had declared through Justice Holmes in *Georgia v. Tennessee Copper Co.*,¹² that:

[I]t is a fair and reasonable demand on the part of a sovereign that the air over its territory should not be polluted on a great scale by sulphurous acid gas, that the forests on its mountains, be they better or worse, and whatever domestic destruction they have suffered, should not be further destroyed or threatened by the act of persons beyond its control, that the crops and orchards on its hills should not be endangered from the same source.¹³

Generally, these principles derive from the Roman legal maxim *sic utere tuo, ut alienum non laedas*.¹⁴ Unfortunately, neither principles nor maxims are of much consequence in the case of transboundary air pollution.¹⁵ Nations rarely relinquish jurisdiction over cases of pollution emanating from their territory, and even more rarely admit liability for such pollution. The *Trail Smelter Arbitration*¹⁶ is, in fact, *sui generis*: Canada admitted liability and agreed to allow U.S. courts to assess damages. When the U.S. courts declined to do so, both countries agreed to let a special binational tribunal "arbitrate" the amount of damages. There has been no case like this before or since, and the circumstances of the case are unlikely to arise again.

11. 3 R. Int'l Arb. Awards at 1965.

12. 206 U.S. 230 (1907).

13. *Id.* at 238.

14. "Use your own property in such a manner as not to injure that of another." BLACK'S LAW DICTIONARY 1238 (5th ed. 1979).

15. Transboundary water pollution is more susceptible to international adjudication and dispute settlement referring to these principles because the sources of water pollution are more determinable than the sources of air pollution, especially long-range air pollution. For the prevailing view in the international community regarding transboundary water pollution, see Helsinki Rules on the Uses of the Waters of International Rivers, art. X, U.N. Doc. A/CN.4/274, reprinted in YEARBOOK OF THE INTERNATIONAL LAW COMMISSION, U.N. Doc. A/CN.4/SER.A/1974/Add.1(Part 2), at 357; also reprinted in INTERNATIONAL LAW ASSOCIATION, REPORT OF THE FIFTY-SECOND CONFERENCE, HELSINKI 484 (1966) [hereinafter cited as Helsinki Rules]. The Helsinki Rules provide for abatement of pollution causing "substantial injury" to another state and for the offending state to compensate the injured co-basin state for any damages. For a general history of international efforts, see R. M'GONIGLE & M. ZACHER, POLLUTION, POLITICS AND INTERNATIONAL LAW (1979); L. TELCLAFF & A. UTTON, INTERNATIONAL ENVIRONMENTAL LAW (1974).

16. 3 R. Int'l Arb. Awards 1905 (1941).

Nations today are exceedingly protective of both their sovereignty and their pollution prerogatives. They are especially resistant to suggestions that they add pollution control costs to the already high cost of producing electric power, even though they may admit that the production of that power causes unintended but real damage in other countries.¹⁷ In the words of one international diplomat, "one can't expect Europe to reduce its sulfur emissions just to save some Scandinavian fish."¹⁸ Scandinavian environmental officials themselves concede the temerity and impracticality of their request for abatement of European sulfur pollution.

III. MULTILATERAL AGREEMENTS

The recent Convention on Long-Range Transboundary Air Pollution (ECE Convention)¹⁹ seems to be the perfect solution to the victim countries' need for international recognition of the acid rain problem and the polluting countries' need to continue to pollute. The ECE Convention dutifully invokes Principle 21 of the Stockholm Declaration in its preamble, but the West German government reportedly stipulated that preambles have no force of law and that in any case it does not hold itself legally bound by Principle 21.²⁰ The ECE Convention is the first international accord on air pollution and was hailed by its chairman, Olof Johansson of Sweden, as "a breakthrough in the development of international environmental law."²¹ However, it provides merely for the sharing of information, collaborative research, and continued monitoring of pollutants and rainfall. It contains no numerical goals, limits, timetables, abatement measures or enforcement provisions. Signatories have merely undertaken to "endeavor to limit, and, as far as possible, gradually reduce and prevent air pollution, including long-range transboundary air pollution."²² They have also agreed to adopt "the best available technology economically feasible."²³ No country has to alter its status quo unless it chooses to. To date, there are few indications that any but the victim countries (Sweden, Norway, Canada, and the United States) are considering further sulfur pollution control measures.

17. See Bird, *Environmental Policy Making: Liability for Externalities in the Presence of Transaction Costs*, 20 NAT. RESOURCES J. 487 (1980); d'Arge & Kneese, *State Liability for International Environmental Degradation: An Economic Perspective*, *id.* at 427.

18. Interview with Henri Smets, Organization for Economic Cooperation and Development, Environment Directorate (Apr. 20, 1979).

19. ECE Convention, note 4 *supra*. The Economic Commission for Europe is a United Nations regional organization with 34 member states, including Eastern and Western European countries, Canada, and the United States.

20. Reported from an interview with Henri Smets, Organization for Economic Cooperation and Development, Environment Directorate (Nov. 20, 1979).

21. Official remarks of the Chairman of the High Level Meeting within the Framework of the United Nations Economic Commission for Europe on the Protection of the Environment (Nov. 15, 1979).

22. ECE Convention, *supra* note 4, art. 2. [Emphasis added].

23. *Id.* art. 6. [Emphasis added].

The European Community, whose memberstates include Western Europe's major polluters (Britain, West Germany, France, Italy, Denmark, the Netherlands and Belgium), enacted on July 15, 1980, its long-awaited SO₂ Directive.²⁴ The resolution accompanying this directive incorporates verbatim the ECE Convention formula "to endeavor to limit, and, as far as possible, gradually reduce and prevent air pollution. . . ."²⁵ The Directive is so weak that at least two environmentally progressive countries, the Netherlands and Denmark, were reluctant to approve it. The senior air pollution official in the Dutch Ministry of Health and the Environment estimated that less than five percent of the land area of European Community member states would fail to conform to the new SO₂ standard at the time of its enactment.²⁶ Member states can apparently comply with virtually no change in present practices and with no appreciable impact on SO₂ emissions or on the total sulfur load in the atmosphere over Europe.

IV. BILATERAL NEGOTIATIONS: CANADA AND THE UNITED STATES

Multilateral action is necessary to cope with the problem of transboundary SO_x pollution in Europe since numerous countries contribute to the sulfur load. In the context of North American SO_x emissions and the resulting acid rain, however, a bilateral arrangement between the United States and Canada would be both more efficient and easier to enforce than would a multilateral treaty. Both countries are "victims" of acid rain since both have large acid-sensitive regions.²⁷ The United States sends three times as much sulfur pollution to Canada as it receives from that country, but Canada exports far more SO_x per capita than does the United States.²⁸ Thus, acid rain is a mutual problem and the two countries have a mutual interest in abating its flow across their common border. But Canadian and American negotiators are still far away from a formal agreement after three years of talks. Moreover, both countries are now contemplating energy programs which would increase their SO_x pollution²⁹ in the face of this supposed mutual interest and, more impor-

24. Directive on SO₂ and Suspended Particulates, O.J. EUR. COMM. (No. L 229) 779 (1980), reported in [1980] 2 COMM. MKT. REP. (CCH) ¶ 3315.281.

25. ECE Convention, *supra* note 4, art. 2.

26. Interview with Albert Adriaanse, Dutch Ministry of Health and the Environment, The Hague (Apr. 26, 1979).

27. Typically, these are regions with granite bedrock which have no capacity to neutralize or "buffer" any acid introduced to the water or soil above the bedrock. Much of eastern Canada and the northeastern United States is acid-sensitive.

28. SIERRA, May-June, 1980, at 41.

29. For example, during 1980, at President Carter's urging, the U.S. Congress considered legislation under which 80 oil-fired power plants will be converted to coal. Coal-fired plants in the United States emit considerably more sulfur oxides than oil. No provision was to be made to install scrubbers or other pollution-reducing technology in these converted plants. Similarly, in June 1980, President Carter conferred in Venice with the leaders of six other industrial countries (Britain, Canada, France, Italy, Japan, and West Germany), and all conferees determined to double coal use during the next 10 years, notwithstanding the

tantly, in abrogation of the ECE Convention which they both so recently signed.

In the waning days of the Carter presidency, presumably in anticipation of a new administration even less disposed to controlling power plant emissions than were their predecessors, the Canadian Parliament enacted legislation authorizing its federal government to reduce pollution from sources contributing to problems (*viz.* acid rain) in other countries.³⁰ The immediate and perhaps sole effect of this legislation was to give life to section 7415 of the U.S. Clean Air Act,³¹ under which the U.S. Environmental Protection Agency (EPA) can compel states to reduce air pollution when such pollution has been found by a duly constituted international agency³² to endanger public health and welfare in a foreign country, if and only if the foreign country has the legal ability to take reciprocal action under the same circumstances. The effectiveness of section 7415 has been at stake because it was unclear whether Canada, whose federal government has generally deferred to its provinces in pollution control matters, could reciprocate. The recent Canadian legislation apparently removed that cloud, but in actuality it has accomplished little more than to enable the then EPA Administrator to issue a hortatory statement saying that his staff would examine the issue and recommend that the offending state be formally notified. Such recommendations must come before President Reagan's EPA Administrator, and prompt or significant remedial action seems highly unlikely.

The above example serves as one indication that the whole subject of transboundary air pollution is fraught with political and economic considerations which have little to do with international law and agreements, and which may effectively neutralize domestic law with international purposes.

V. THE LIMITS OF INTERNATIONAL LAW AND INSTITUTIONS

Numerous agreements, most notably the 1979 ECE Convention, promote international consultation and cooperation in research, monitoring, and assessment of the environmental impacts of present or planned

fact that six of the seven conferees are signatories of the ECE Convention.

Finally, Canada has gone ahead with its pre-ECE Convention plans to build two new large power plants adjacent to pristine wilderness areas in Montana and Minnesota. Responding to suggestions that these plants could result in significant deterioration in the air quality of adjacent areas in the United States, John Messer, the former Saskatchewan Minister of Energy, declared: "It is our position that we don't have to abide by the laws of other countries." Interview with Robert Sugarman, Former Chairman, United States Section, International Joint Commission (Mar. 20, 1981).

30. Clean Air Amendment Act, [1981] C.C.L. 706, at 9.

31. 42 U.S.C. § 7415 (1976 & Supp. III 1979).

32. The agency is the United States-Canada International Joint Commission, which has repeatedly found that acid rain results from the long-range transport of air pollutants originating from sources in both countries. See SEVENTH ANNUAL REPORT ON GREAT LAKES WATER QUALITY OF THE INTERNATIONAL JOINT COMMISSION (Oct. 1980).

sources of pollution.³³ However, nothing in the present international legal framework effectively fosters preventive action. General principles concerning the responsibilities of nations to compensate for the damages caused by transboundary pollution may occasionally be useful in allocating expenses and may have some deterrent value, but they do little to avoid the permanent environmental damage that can be expected from acid rain and perhaps from the greenhouse effect of increased CO₂ production.³⁴ These general principles are no help in describing the point at which a nation's interest in industrial development must yield to concerns over the effects of transboundary pollution.

Moreover, there is no mechanism to enforce any international legal doctrine that is not made part of a sovereign nation's domestic law. No international agency is ceded the power to enforce international environmental principles or, indeed, "binding" international treaties and agreements.³⁵ The most respected of international adjudicatory bodies, the International Court of Justice, may rule on a case only after the involved countries have consented to a referral, which is a rare occurrence.³⁶ In the only two major international environmental cases where the involved nations consented to be bound by the decision of a neutral tribunal,³⁷ the claimants were required to demonstrate specific causes of specific environmental injury.³⁸ Unfortunately, because of the incomplete scientific understanding of both the atmospheric chemistry and the effects of transported sulfur pollutants, one cannot yet establish that specific sources are responsible for acidification of distant lakes and soils.³⁹ If action had to await a clear link between emissions and distant environmental effects, or the full determination of the damage by acidity, irreversible damage would almost certainly take place in various parts of the world.⁴⁰

VI. DOMESTIC PROCEDURES TO RESOLVE TRANSBOUNDARY DISPUTES

Domestic procedures are sometimes successfully enlisted to resolve international environmental disputes,⁴¹ especially when there are no diffi-

33. This discussion primarily addresses transboundary air pollution, but may also apply to transboundary water pollution.

34. See generally texts cited in notes 7 & 15 *supra*.

35. Directives of the Council of the European Communities are incorporated into the domestic laws of the member states and, accordingly, have a status different from that of other multilateral agreements.

36. I.C.J. STAT. arts. 36, 37.

37. Trail Smelter Arbitration (United States v. Canada), 3 R. Int'l Arb. Awards 1905 (1941); The Lac Lanoux Arbitration (Spain v. France), 12 R. Int'l Arb. Awards 281 (1957).

38. The *Trail Smelter Arbitration*, for example, refers to a state's obligation not to allow the air pollution to affect another state where injury is established by clear and convincing evidence.

39. See generally the sources cited in note 17 *supra*.

40. See note 2 *supra*.

41. See *W. Poro v. Houilleries du Bassin de Lorraine, OLGE Bayern, Saarbrücken* (1957), where a German motel owner sued a French electric power plant, whose emissions of soot and smoke damaged crops, flowers, and the recreation business in German territory

cult choice of law questions and where the source of the injury and amount of damages are determinable. The effects of increased acidification such as loss of fish stocks, enhanced corrosion, and reduced agricultural productivity, are compensable types of injury; but judgments for damages are poorly suited to disputes arising from transboundary acid rain pollution. The multiplicity of sources and their relative contribution to atmospheric loadings make it difficult to prove a claim, assign liability, or provide effective remedies.

If polluters' national courts were willing, for example, to apply Principle 21 of the Stockholm Declaration or any of its predecessors or successors⁴² against their own offending citizens, then such principles of international law would have teeth. Thus far, no country's courts have been so aggressive, although several courts have entertained suits involving extra-territorial damage.⁴³ Attitudes of self-interest and national autonomy regarding environmental problems are shared by judges as well as by legislators and bureaucrats, and these attitudes seem unlikely to change in the foreseeable future.

VII. PROGNOSIS: LIMITED ABATEMENT BUT INCREASED AWARENESS

Current controls, including general principles of international law and the ECE Convention, are not adequate to abate SO_x emissions sufficiently to remedy the transboundary acid rain problem.⁴⁴ Numerous control strategies, policies, and technologies are available and could be extremely effective, but few nations seem willing to bear the cost.⁴⁵ Indeed, the pressures today are in the opposite direction, *viz.*, to relax air quality and emissions standards to thereby make coal-generated electric power more efficient and economical.⁴⁶

The prospects for timely action look bleak. Sweden and Norway will undoubtedly call on the ECE Convention signatories to implement its principles. The polluting countries will probably continue to call for proof of damage, identification of specific sources, and resolution of scientific uncertainties. The polluters may propose to bear the modest costs of lim-

across the border. The German court awarded damages pursuant to French law. Subsequently, the defendant company installed effective pollution control equipment financed by joint French-German government contributions pursuant to a pre-existing French-German treaty dealing, *inter alia*, with boundary pollution control.

42. See notes 5, 8, 12 & 37 *supra*.

43. In *Ohio v. Wyandotte Chemicals Corp.*, 401 U.S. 493 (1971), the United States Supreme Court declined to exercise its original jurisdiction, but implicitly confirmed the competence of Ohio's state courts to deal with the transnational disputes involved. See also *Michie v. Great Lakes Steel Division, Nat'l Steel Corp.*, 495 F.2d 213 (6th Cir. 1974). See generally RESTATEMENT (SECOND) OF CONFLICT OF LAWS § 53 (1963); RESTATEMENT (SECOND) OF FOREIGN RELATIONS LAWS OF THE UNITED STATES § 18 (1962).

44. Notes 22 & 29 *supra*.

45. Note 17 *supra*.

46. See, *e.g.*, note 29 *supra*, for a discussion of industrialized nations' decision to switch from oil to coal.

ing acidified lakes, an offer which the recipient countries will undoubtedly reject as an inadequate substitute for abatement and as potentially dangerous to aquatic ecosystems.

The Stockholm Declaration stimulated the creation of numerous national institutions to protect the environment and promoted world awareness of the acid rain phenomenon, if not of its danger. The ECE Convention, like multilateral agreements on water quality and marine pollution,⁴⁷ may at a minimum help maintain the environmental status quo and perhaps bring about voluntary improvements in the environment. Nevertheless, no international principles or practices, and certainly not the qualified language of the ECE Convention,⁴⁸ can compel remedial action.

The most likely area for progress may come through implementing the ECE Convention's provisions for exchanging available information on "major changes in national policies and in general industrial development, and their potential impact, which would be likely to cause significant changes in long-range transboundary pollution."⁴⁹ Aggressive implementation by victim countries of this provision and of its attendant notice and consultation requirements would afford an opportunity to attract media and citizen attention in the polluting countries. This could exert a salutary influence on the polluters' plans for sulfur control.

The projected dissemination by the Secretariat of the Economic Commission for Europe of member states' energy scenarios could offer another wedge for victim countries to influence the policies of the polluting countries. Information exchanges among ECE countries on developing coal-utilization technologies should guarantee rapid dissemination of new technological developments. Broad multilateral subscription to such technologies may yield economies of a scale sufficient to make them affordable. Finally, ECE-mandated multilateral research on crop damage and health effects from sulfate aerosols and acid rain may sooner or later demonstrate clearly both the cost-effectiveness and the necessity of controlling and abating sulfur emissions throughout the industrial world. Ultimately, that should induce responsible officials to revise upward their estimates of what is economically feasible.⁵⁰

47. Probably the most notable are the Convention for the Protection of the Marine Environment of the Baltic Sea Area, Helsinki, Mar. 22, 1974, *reprinted in* 13 INT'L LEGAL MAT. 544 (1974); Convention for the Prevention of Marine Pollution from Land-Based Sources, *adopted* Feb. 21, 1974, *opened for signature* June 4, 1974, *reprinted in* 13 INT'L LEGAL MAT. 352 (1974); and the Convention for the Protection of the Mediterranean Sea Against Pollution, *done at* Barcelona, Feb. 16, 1976, *reprinted in* 15 INT'L LEGAL MAT. 290 (1976) [hereinafter cited as Mediterranean Sea Convention].

In the recent Draft Protocol to the Mediterranean Sea Convention signatories have for the first time undertaken to change national policies, including industrial siting policies, to accord with the Protocol's terms. See [1980] 3 INT'L ENVIR. REP. (BNA) 189 for a reprint of the full text.

48. See art. 2 of the ECE Convention, quoted in the text accompanying note 22 *supra*.

49. *Id.*

50. See notes 3 & 17 *supra*.

Transboundary air pollution is governed not by international law but by national self-interest. That self-interest, however, combined with the consciousness-raising effect of vigorous international discussion and negotiation about sulfur and carbon pollutants and their potentially irreversible effects, can induce thoughtful and enlightened public officials to show concern and try to abate acid rain and CO₂ for their own nation's future.

In this respect, 1980 was an important year. With government support, West German scientists began ambitious research programs on the effects of acid deposition⁵¹ on conifer forests and on buildings and monuments, including the Cologne Cathedral. The United States committed large sums to research the effects of acid deposition and to develop new pollution control technology. Significant progress has been made in developing a unique "low NO_x" boiler to drastically reduce nitrogen oxide emissions from coal burning facilities.⁵² The Ontario Ministry of the Environment ordered the INCO smelting plant at Sudbury, Ontario—the single largest pollution source in the world, emitting one million tons of sulfur pollutants annually into the atmosphere—to reduce SO₂ emissions by more than fifty percent by December 1982.⁵³ Finally, most Western European countries reduced their annual SO₂ emissions by efficiently employing low-cost sulfur control strategies, such as burning low-sulfur coal and oil, washing coal before combustion, and producing more electricity from sulfur-free nuclear power.⁵⁴

VIII. CONCLUSION

International organizations and agreements serve the essential function of educating the international political community. They help to build a consensus about a transnational problem and to develop a context in which sovereign states pursue pro-international policies by perceiving

51. "Acid deposition" is more technically correct than "acid rain." It encompasses rain, snow, sleet, mist, hail, fog, dew, and frost, as well as dry deposition of fine sulfate particulates.

52. Nitrogen oxides are precursors to nitric acid, which accounts for one-third of the acid in North American acid rain. See President Carter's Second Message to Congress on the Environment, 15 WEEKLY COMP. OF PRES. DOC. 1353 (AUG. 2, 1979).

53. Ontario and Canadian federal officials made it clear that the INCO control order was designed to strengthen Canada's position in the United States-Canada negotiations and to pressure the United States to take corresponding measures against U.S. sources of acid rain. See [1980] 3 INT'L ENVIR. REP. (BNA) 234-35. Environmental officials in both countries seem to be telling one another, in effect, "If you lean on us more, we'll be able to justify stronger control measures."

54. It is, of course, impossible to know whether the same strategies would have been employed in the absence of international discussion ("consciousness-raising") of transboundary air pollution and the effects of acid rain. The net result, however, is to reduce the total sulfur load in Europe's atmosphere. There are indications, however, that increased emissions from Eastern Europe may have offset any Western Europe reductions. But Eastern European countries, all signatories of the ECE Convention, have become conscious of the long-range transboundary air pollution problem much more recently than Western Europe, where the Europe-dominated Organization for Economic Cooperation and Development has been discussing transboundary air pollution for almost a decade.

that it is in their own interest to do so. By making and keeping issues like transboundary air pollution or world climate change salient topics for international investigation, discussion, and negotiation, they create a ripple effect. International monitoring, data gathering, and scientific research help to form a consensus among scientists that a problem is serious and deserves remedial action. Sooner or later these ripples are bound to reach policymakers and concerned citizens and to influence national agendas. In this lies the main hope for progress in international environmental protection generally, and in long-range transboundary air pollution specifically.

