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International Control of Cross-Media Pollution—An Ecosystem Approach

ABSTRACT

Cross-media pollution, or the transfer of pollutants from one environmental medium to another, is a growing international problem that long escaped attention because treaties and the institutions to implement them were devised usually to protect only one element of the environment—air, land, or water. A more holistic, ecosystem approach is needed for so complex an issue, and this article suggests the river basin as an areal unit for that approach. After analyzing the functions of existing international basin commissions, the article concludes that if their functions were appropriately expanded these entities would be eminently suitable to deal with cross-media pollution, thereby dispensing with the need to create new institutions to manage this old but newly discovered problem.

A new term has recently entered the lexicon of environmental usage—cross-media pollution.¹ It means a pollution that has moved or may move from one environmental medium to another (for example, from air to land, from land to water, or from land to air). The expression indicates an unexpected movement of pollutants that was not provided for in domestic legislation or international agreements for the control of pollution. It is one more example of the profound and complex interrelationships within our physical environment. This paper suggests that the interacting relationship of different types of pollution requires a holistic approach within an area where environmental elements or media also interact in an ecosystem.² The river basin is such an ecosystem, and has long been

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1. For example, it was the theme of a conference held in Washington, D.C., in Nov. 1984. The proceedings of that conference were subsequently published, CONSERVATION FOUNDATION, NEW PERSPECTIVES ON POLLUTION CONTROL: CROSS-MEDIA PROBLEMS, AN ISSUE REPORT (1985) [hereinafter cited as NEW PERSPECTIVES]. Cross-media pollution was also discussed in ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT REPORT, THE STATE OF THE ENVIRONMENT 1985 65-66, 246-47, 264-65 (1985), [hereinafter cited as OECD 1985].

2. The term "ecosystem" has been in use by ecologists for many years. See, e.g., the definition given in P.R. EHRLICH, A.H. EHRLICH, AND J.P. HOLDREN, ECOSCIENCE: POPULATION, RESOURCES, ENVIRONMENT 97 (1977):

The interdependence that characterizes the physical and biological elements of the environment has led ecologists to coin the term *ecosystem* (short for ecological system) for the functional unit that includes both *biotic* (living) and *abiotic* (nonliving) elements.

Only recently, however, has the term become part of the language of international law. A notable

recognized as a natural unit for international cooperation in water management and protection.³ That cooperation is already fairly well organized and, if international river basin institutions were appropriately strengthened and their functions expanded beyond water management, a holistic approach to transfrontier pollution could be implemented.

Characteristics of Cross-Media Pollution

How does cross-media pollution arise and why, after decades of environmental regulation, is it an apparently new and serious problem? Take an everyday occurrence. What we think of as ordinary domestic trash—used containers of chlorine bleach, insect spray, antifreeze, paint thinner, or oven cleaner—goes to the municipal dump. There the toxins, instead of staying put in the landfill, leak into the soil and ground water and eventually contaminate the local water supply, perhaps even the surrounding air.⁴ This is cross-media pollution. Black-smoke industries spew sulfur dioxide and nitrous oxide into the air from tall stacks that carry these pollutants away from the immediate neighborhood. The chemicals are borne aloft on currents of the upper air and come down hundreds of miles away in the form of acid rain, which destroys forests, kills fish, changes lake water to the acidity of lemon juice, and corrodes buildings.⁵ This is another example of cross-media pollution.

example is the text of the agreement signed in Kuala Lumpur, Malaysia, in July, 1985, by the member states of the Association of South East Asian Nations (ASEAN). Agreement on the Conservation of Nature and Natural Resources, Brunei-Indonesia-Malaysia-Singapore-Thailand, July 9, 1985. The text was not immediately released for publication: it is printed in full in 15 ENV'TL POL. & L. 64 (1985). The Preamble and art.s 6-9 all refer to "ecosystems" and art. 11 notes the adverse effect that pollution may have on "the functioning of natural ecosystems as well as on each of the individual ecosystem components. . . ." This agreement is considered the most modern regional instrument in the conservation field.

On recent applications of the term "ecosystem" to river basins, see *infra* notes 61-64.

3. See *infra* notes 48-51.

4. The horrendous pollution caused by industrial dumping at landfills has captured most of the attention and, for example, almost the entire Superfund program in the United States has been and is being devoted to cleaning up such sites. Comprehensive Environmental Response, Compensation and Liability Act of 1980, Pub. L. No. 96-510, 94 Stat. § 2767 (1980), popularly known as the Superfund Act. What is not often realized, however, is the extent to which ordinary household garbage contributes to the hazards of municipal landfills, or that such "domestic" wastes may pollute several media at once. See, e.g., the illuminating article by Boraiko, *Storing Up Trouble . . . Hazardous Wastes*, 167 NAT'L GEOGRAPHIC MAG. 319 (Mar. 1985). A Dutch environmental organization has urged that this problem be addressed by government collection of what it terms "small chemical waste." 9 INT'L ENV. REP. (BNA), CURR. REP. 133 (1986).

5. There is a voluminous literature on acid rain pollution in North America and Europe. See, e.g., UNITED STATES GEOLOGICAL SURVEY, U.S. DEP'T OF THE INTERIOR, CIRCULAR 923, ACID PRECIPITATION: AN ANNOTATED BIBLIOGRAPHY (1984), which contains more than 1,600 entries on the subject. According to one resource specialist, more than 3,000 scientific papers have been published in the past 15 years, documenting the causes and effects of acid rain. Sheiman, *Facing Facts: Acid Rain Update*, 7 AMICUS J. 4 (No. 4, 1986). On the long battle to restrain the use of tall stacks as a pollution control technology in the United States see Vestigo, *Acid Rain and Tall Stack Regulation Under the Clean Air Act*, 15 NW. U. L. REV. 711 (1985); and NATURAL RESOURCES DEFENSE COUNCIL, TALL STACKS, A DECADE OF ILLEGAL USE: A DECADE OF DAMAGE DOWNWIND: A REPORT TO THE NATIONAL CLEAN AIR COALITION (1985). Eventually, the Environmental Protection

From one environmental medium to another, the transfer of pollutants continues all the time. Indeed, this is not really a new phenomenon, but one that was, until recently, not recognized. It has been around since the dawn of history, and probably even before that. The salination of soil in Antiquity in parts of Mesopotamia and Egypt could be considered an instance of cross-media pollution through overly intensive irrigation, which leached toxic minerals from deep below the land surface.⁶ Egypt lost some 1.5 million acres of agricultural land in the Nile delta in the period of late Roman and early Arab rule. The canal network broke down, hindering drainage to the sea, and so a once-fertile area became an alkali desert.⁷ Until the development of municipal sewage systems, cities had to dispose of night soil and other wastes in surrounding fields or in pits, which caused considerable pollution of both ground and surface water.⁸

Mining and smelting, too, have done their share in shifting substances around in air, water, and on land. Fourteenth-century tin miners in southwestern England and twentieth-century oil drillers in the United States alike have been held responsible for doing damage to a medium other than the one in which they worked. The miners were held responsible for silting up coastal harbors and the oil drillers for injecting oilfield brines into ground water.⁹ The deep-well injection of petroleum and chemical wastes has become, in the modern era, an increasingly serious source of cross-media pollution. Toxic substances have been found to migrate long distances underground and come to the surface miles from the point of injection, contaminating soil, water, and even the atmosphere. In the United States more hazardous wastes are being disposed of by this means than are stored in dumpsites, and some deep-well injections close to the Great Lakes are a potential threat to Canadian communities.¹⁰ However, the polluters are not all from one side of the frontier. There is evidence

Agency was required, by a court order which the agency challenged in vain, to issue final rules restricting the use of tall stacks. *Sierra Club v. U.S. Environmental Protection Agency*, 719 F.2d 436 (D.C. Cir. 1983), *cert. denied sub nom. Alabama Power Co. v. Sierra Club*, 468 U.S. 1203 (1984).

6. See *A HISTORY OF LAND USE IN ARID REGIONS* 96-97 (L.D. Stamp ed. 1961); see also T. JACOBSEN, *TOWARD THE IMAGE OF TAMMUZ AND OTHER ESSAYS ON MESOPOTAMIAN HISTORY AND CULTURE* 156 (1970).

7. Hamdan, *Evolution of Irrigation Agriculture in Egypt*, in *A HISTORY OF LAND USE IN ARID REGIONS*, *supra* note 6, at 119.

8. See, e.g., A.S. WISDOM, *THE LAW ON THE POLLUTION OF WATERS* 7 (1966). Another way of getting rid of effluent was to pour it down a well, regardless of where it might end up. A starch factory in Paris, for instance, reportedly discharged 20,000 gallons of polluted water a day into such a well in the winter of 1832-1833. G.P. MARSH, *MAN AND NATURE* 308 (1864, reprint 1965).

9. On the English tin miners, see L.A. TECLAFF, *THE RIVER BASIN IN HISTORY AND LAW* 75-76 (1967); on the Texas oil companies, see *Brown v. Lundell*, 334 S.W.2d 616 (Tex. Ct. App. 1960), *aff'd*, 344 S.W.2d 863 (1961), and *Gulf Oil Corp. v. Alexander*, 291 S.W.2d 792 (Tex. Ct. App. 1956), *writs denied*, 295 S.W.2d 901 (Tex. 1956).

10. Brown, *The Lower Depths: Underground Injection of Hazardous Wastes*, 7 *AMICUS* J.14, 17 (No. 3, 1986). Brown cites an instance at Presque Isle State Park, on Lake Erie, which could extend into Canada. *Id.* at 23; and map at 16, showing the number of injection sites adjacent to the Great Lakes.

that toxic chemical wastes injected by Canadian companies into wells and an underground salt cavern in southwestern Ontario are leaching into the St. Clair River, to the distress of Michigan authorities.¹¹

Throughout history a great deal of cross-media pollution occurred due to ignorance, lack of regulation, or sheer disregard of the consequences. However, a disturbing amount of cross-media pollution has resulted from efforts to control pollution and improve environmental quality. Paradoxically, environmental regulation itself appears to be to blame. Typically, a problem is recognized. The action is taken by law, by treaty, or through the courts; and a new problem ensues. For example, nearly a century ago, the German city of Essen, in the Ruhr Valley, was, in effect, enjoined from discharging *any* of its sewage into the river—a desperate measure resorted to by a desperate downstream community. Fortunately, the situation was alleviated by other means. Instead of forcing Essen to drown in its own effluvia, the Ruhr towns banded together to form pollution control organizations and achieved their goal by cooperation, rather than by sanctions.¹²

The few anti-pollution provisions in treaties early in this century flatly prohibited the discharge of pollutants of any kind or any amount into surface waters.¹³ Such all-embracing general prohibitions were usually unenforceable, or resulted in a transfer of effluent to the soil or ground water, or both. For example, a fisheries convention of 1904, between France and Switzerland, states categorically that:

Factories, mills and other establishments located in the vicinity of the Lake (of Geneva) are prohibited from discharging into the waters waste or substances injurious to fish. Such establishments are under the obligation to ensure at their own cost that such substances are discharged into the soil.¹⁴

11. Palmer-Benson, *The Blobs*, 7 *AMICUS* J. 6 (No. 4, 1986).

12. Fair, *Pollution Abatement in the Ruhr District*, in *COMPARISONS IN RESOURCE MANAGEMENT* 156 (H. Jarrett, ed. 1961). On the Ruhr associations, see paper by Gieseke, *River Basin Authorities on the Ruhr and on Other Rivers in Germany*, 2 U.N. Conference on Water Pollution Problems in Europe, Documents 277-82, *WATER POLL./CONF.* 2 (1961).

An even older, international example occurred in the basin of the Espierre River, which flows from France into Belgium. From 1872 onwards, the Espierre carried off into Belgium, among other highly polluted waters, the effluent from a factory on the French side which had been forbidden by French authorities to discharge its wastes through the sewer system into French streams. Delos & Lentacker, *The Espierre Problem: A Case of Transfrontier Pollution*, in *ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, ENVIRONMENTAL PROTECTION IN FRONTIER REGIONS* 290, 296 (1979) [hereinafter cited as *OECD FRONTIER REGIONS*].

13. Such generalized prohibitions occur, for instance, in the Boundary Waters Treaty, Jan. 11, 1909, United States-United Kingdom (Canada), art. IV, 36 Stat. 2448, 2450 (1909-11) T.S. No. 548; and in the Frontier Waters Agreement, Apr. 10, 1922, Denmark-Germany, art. 29, 10 L.N.T.S. 187, text also in U.N. LEGISLATIVE TEXTS AND TREATY PROVISIONS CONCERNING THE UTILIZATION OF INTERNATIONAL RIVERS FOR OTHER PURPOSES THAN NAVIGATION 577, 588, *ST/LEG./SER.B/12* (1963) [hereinafter cited as U.N. LEGIS. SER.].

14. Convention for the Regulation of Fishing in Frontier Waters, Mar. 9, 1904, France-Switzerland, Martens Nouveau Recueil, 2e ser., tome 33, at 501; text also in U.N. LEGIS. SER., *supra* note 13, at 701.

These earlier pollution regulations were sporadic and had only a local effect, but the modern laws and treaties have had another effect altogether. Their number is legion, and ranges from village ordinances all the way up to global, multilateral conventions. They are often specific, prescribing "black" lists, "grey" lists, and precise quantities, times, places, and means of disposal of individually named pollutants.¹⁵ Their drafters had good intentions, but the outcome, in many instances, has been an unlooked-for transfer of contamination from one medium to another.¹⁶ In the 1970s, for instance, land disposal of municipal sewage was encouraged and supported by environmental regulation.¹⁷ Today, it has been singled out as a prime source of cross-media pollution. A study published in 1985, and prepared at the request of the U.S. Senate Committee on Environment and Public Works, discloses that:

Federal environmental legislation in the 1970s and 1980s encouraged end-of-pipe waste treatment methods, rather than waste reduction measures, to control air and water pollutants. Regulators favored end-of-pipe technologies because they were easy to enforce. From industry's perspective, this type of treatment offered tax advantages and produced easily measurable results—benefits not generally attributed to alternative means of regulatory compliance, such as waste reduction. End-of-pipe treatment methods often resulted, however, in the transfer of waste residuals from one environmental medium to another.¹⁹

Many transfers of pollution go unremarked by authority because the bulk of national and international regulation refers to a single medium—air, land, or water—and is further compartmentalized according to the type of pollutant (for example, solid versus liquid waste) or type of recipient medium (for example, surface water, ground water, drinking

15. See, e.g., Convention on the Protection of the Rhine Against Chemical Pollution, Dec. 3, 1976, 16 I.L.M. 242 (1977). A similar division of substances by their toxicity is to be found, e.g., in Lists I and II of the Annex to European Economic Community, Council Directive of 4 May 1976 on Pollution Caused by Certain Dangerous Substances Discharged into the Aquatic Environment of the Community, O.J. EUR. COMM. 23 (No. L 129, 1976).

16. Even restorative measures can backfire. Two companies ordered to clean up contaminated groundwater in California's Silicon Valley were discovered to be pumping it, untreated, into a nearby creek which recharged hitherto uncontaminated wells. 16 ENV'T. REP. (BNA), CURR. DEV. 1035-36 (1985).

17. E.g., by the Federal Water Pollution Control Act Amendments of 1972 Pub. L. No. 92-500, 86 Stat. 816, 824, 841K (1972); and Environmental Protection Agency regulations in 40 C.F.R. §§35.900-35.970. See Massey, *How Federal Law Encourages Land Application of Municipal Wastewater Effluents and Sludges*, 23 S. TEX. L.J. 1 (1982).

18. See OECD 1985, *supra* note 1, at 163-64.

19. U.S. Congress, Congressional Budget Office, *Hazardous Waste Management: Recent Changes and Policy Alternatives* 44 (1985).

For several awful examples of legislative and administrative intent gone astray, see *Good Intentions Can Take Their Toll on the Terrain*, New York Times, May 11, 1986, at E5, col. 1. E.g., state officials on Long Island, N.Y., who were concerned about air pollution from garbage burning but were ignorant of the porosity of the island's soils, forced municipalities to bury the wastes in sanitary landfills which rapidly leaked toxic chemicals into underlying groundwater. *Id.* col. 1.

water). Different agencies become responsible for implementing these different instruments and develop their own "constituencies" of polluters. Officials are largely unaware of what other agencies are doing, despite the fact that, within the past quarter of a century, many countries have centralized their environmental regulation under a single umbrella department, such as the Environmental Protection Agency (EPA) in the United States.²⁰

Transboundary pollution problems have been dealt with in similar fashion. Countries drafted treaties to cope with specific situations as they arose, and often established separate regulating entities for each treaty. For instance, on the Rhine River, there is one international commission which deals only with discharges of chlorides and other chemicals, and another which deals only with pollution from vessels.²¹ When the United States and Mexico signed a comprehensive water treaty in 1944,²² they gave the International Boundary and Water Commission (IBWC) authority in matters such as Colorado River salinity, which afflicts Mexican farmers, and Tijuana's overflowing sewage, which afflicts Californian coastal communities.²³ However, when the two countries recently signed a general environmental agreement, they did not give the implementing role to the IBWC but, instead, established national coordinators.²⁴

20. Noted by Deputy Administrator Alvin L. Alm, of the U.S. Environmental Protection Agency, who said:

Plenty of environmental officials, in the EPA and in the states, still spend their whole careers working on one environmental medium. Often their disciplines add to this inertia: a sanitary engineer works on water pollution and a meteorologist on air pollution and neither gains sufficient knowledge of the other medium or of the larger system.

The EPA's Approach to Cross-Media Problems, in *NEW PERSPECTIVES*, *supra* note 1, at 9.

On the centralization of environmental regulation under a single department, see U.N. Environment Programme (UNEP), *The State of the Environment 1976: Report of the Executive Director* 14-15, U.N. Doc. UNEP/GC/58 (Jan. 30, 1976).

21. The International Commission for Protection of the Rhine Against Pollution is responsible for implementation of the Convention for the Protection of the Rhine Against Chemical Pollution, Dec. 3, 1976, 16 I.L.M. 242 (1977) and the Convention on the Protection of the Rhine Against Pollution by Chloride, also Dec. 3, 1976, 16 I.L.M. 265 (1977). The Commission was established by the Convention of Apr. 29, 1963, between France, the Federal Republic of Germany, Luxembourg, the Netherlands, and Switzerland (known as the Berne Agreement), English translation of text in A.J. PEASLEE, *INTERNATIONAL GOVERNMENT ORGANIZATIONS*, Part Five, 430 (Rev. 3d ed. 1976).

22. Treaty Relating to the Utilization of the Colorado, Tijuana, and Rio Grande, Feb. 3, 1944, United States-Mexico, 59 Stat. 1219, T.S. No. 994, with supplementary protocol signed Nov. 14, 1944. Under art. 3, the parties agreed to give preferential attention to the solution of all border sanitation problems.

23. On the role of the IBWC and extension of its jurisdiction under the treaty, see Utton, *An Assessment of the Management of U.S.-Mexican Water Resources: Anticipating the Year 2000*, 22 NAT. RES. J. 1093 (1982).

24. Agreement on Cooperation for the Protection and Improvement of the Environment in the Border Area (the Border Environmental Cooperation Agreement), Aug. 14, 1983, United States-Mexico, 22 I.L.M. 1025 (1983). See also St. Dep't Press Release No. 313 of Aug. 19, 1983. The Agreement addresses air, land and water pollution (art. 5) and acknowledges the work of the International Boundary and Water Commission (Preamble). It proclaims that nothing shall affect the functions entrusted to that body (art. 12), but does not give the IBWC a specific role. art. 8 designates as National Coordinators the Environmental Protection Agency, for the United States, and the Subsecretariat of Ecology of the Secretariat of Urban Development and Ecology (SEDUE), for Mexico.

As a result of all this regulation on a medium-by-medium basis, some polluters are transferring contamination entirely in accordance with the law, while others either resort to illegal means of disposal or slip through cracks in the regulatory system. Internationally, this has produced a phenomenon termed "waste tourism."²⁵ Waste containing dioxin from a chemical plant in Austria, for example, reportedly made a European "grand tour" before being finally eliminated in the North Sea. It was sent first by rail to Szczecin in Poland, then by freighter to Antwerp, where it was put in storage tanks. When its deadly dioxin content was discovered, the waste was hurriedly transferred to an incinerator ship for burning offshore.²⁶ Had an accident occurred, the dioxin could have contaminated the environment in any one of three countries or two bodies of water, the Baltic and the North Sea.

It has been estimated that up to 50 percent of hazardous waste in Europe is disposed of illegally.²⁷ Waste is also transferred across frontiers from medium to medium either by permit or in the absence of regulation. In many industrialized countries waste dumps lie close to international boundaries—for example, the Schoenberg dump in East Germany, only a few kilometers from the drinking water supply of the West German city of Lubeck,²⁸ or the dumpsites by the Niagara River, which threaten water supplies on both sides of the United States-Canadian border.²⁹

The Search for Remedies

Cross-media pollution is, nevertheless, beginning to be recognized, nationally and internationally, as a distinct problem with innumerable interactions and ramifications. For example, the Conservation Foundation held a conference in Washington, D.C., in 1984 to draw attention to the matter, and has an ongoing project called "Options for a New Environmental Policy." Under this project it is gathering data, exploring policy measures, and working with other institutions, such as the National Academy of Sciences, on the formulation of research.³⁰

Several countries, among them the Netherlands, Sweden, West Germany, and the United States, are attempting to integrate their environ-

25. See Smets, *Transfrontier Movements of Hazardous Wastes*, 14 ENV'T'L POL. & L. 16, 20 n. 6 (1985).

26. *Id.* where its itinerary is described in more detail and where other, equally lurid, examples are given.

27. *Id.* at 20 n. 5.

28. The Commission of the European Communities was questioned in 1980 about the Shoenberg dump and about the propriety of storing hazardous wastes generated within the community in border areas of third countries. Written Question No. 1687/79, O.J. EUR. COMM. 82 (No. C 126, 1980), text also in TECLAFF & UTTON, *INTERNATIONAL GROUNDWATER LAW* 335 (1981). According to Smets, *supra*, note 25, at 17, a significant amount of the hazardous waste sent across frontiers in Western Europe is exported to the German Democratic Republic, because it may be disposed of there at lower cost.

29. See HANG & SALVO, *THE RAVAGED RIVER: TOXIC CHEMICALS IN THE NIAGARA* (1981). According to this study, more than 50 dumps are close to the Niagara River. *Id.* at 3.

30. NEW PERSPECTIVES, *supra* note 1, at 3.

mental protection activities, not only between individual pollution control procedures, but also with other government programs.³¹ In the United States, the EPA is reportedly reviewing all environmental legislation to determine instances where the law encourages cross-media transfer of pollutants.³² In furtherance of this new policy, for instance, the agency published notice of regulatory investigation of methylene chloride, initiated under air, water, drinking water and chemical statutes.³³ Section III A of the notice recognizes that:

Sources of methylene chloride are multiple and potentially subject to regulation under several EPA statutes; therefore only a coordinated approach will result in consistent and non-duplicative regulatory decisions. Thus, this ANPR announces both EPA's initiation of appropriate action under Section 6 of TSCA . . . and an integrated regulatory investigation.³⁴

Also, because disposal of sewage sludge is regulated under various statutes according to the disposal method used, and is now known to cause intermedia transfer of pollutants, the EPA is also compiling profiles of contaminants in sludge to determine which media they are likely to affect and how to prevent these effects.³⁵

Moreover, the EPA has begun to assess total human exposure to toxic substances in a given geographic area. One of the areas already studied is the Santa Clara Valley in California.³⁶ Another, in process of being analyzed, is the Kanawha Valley of West Virginia. Most of the effort there will concentrate on characterizing air emissions, but will also estimate risk from all potential pathways of contamination, including water and hazardous waste.³⁷

Some recent treaties and recommendations of international organizations have also taken into account cross-media pollution. For example, in 1978 the Organization for Economic Co-Operation and Development (OECD), in recommendations on water management, proposed that:

31. OECD 1985, *supra* note 1, at 246-47. In 1984, the European Parliament urged the European Economic Community to combine into a single and effective central convention all the international conventions, EEC directives, and national laws for protecting the North Sea. The text of the resolution is contained in O.J. EUR. COMM. 135 (No. C 46, 1984).

32. According to EPA Administrator Lee M. Thomas, speaking at a meeting of the Natural Resources Council of America on May 30, 1985. 16 ENV'T REP. (BNA), CURR. DEV. 335 (1985).

33. 50 Fed. Reg. 42,037 (Oct. 17, 1985).

34. *Id.* at 42,041.

35. 16 ENV'T REP. (BNA), CURR. DEV. 1095 (1985).

36. OECD 1985, *supra* note 1, at 66.

37. 16 ENV'T REP. (BNA), CURR. DEV. 898-99 (1985). See also Excerpts from Budget Office Regulatory Program Listing EPA Priorities from Apr. 1, 1985, to Mar. 31, 1986 (released Aug. 8, 1985), text in 16 ENV'T REP. (BNA), CURR. DEV. 658 *et seq.*, (1985). EPA's Agency Operating Guidance FY 1986-1987, establishing 12 categories of significant regulatory action, gives as Category 10, "Implement a coordinated approach to solve multimedia pollution concerns in discrete geographic areas." *Id.* at 659.

Authorities should ensure that the water pollution control measures they implement do not lead to uncontrolled pollution transfers to other water resources or to soil or air systems.³⁸

The Council's comment on this recommendation indicated the direction future control should take, but only in very general terms:

Experience shows that the polluter will, in general, attempt to discharge waste where the operation is least costly and the controls less stringent (for example, direct discharge of effluents through groundwaters; incineration with generation of air pollution, etc.). In order to combat uncontrolled discharge and undesirable transfers of pollution, authorities responsible for environmental protection should ensure that economic and regulatory instruments and controls, both for the different types of water resources and for other media (air, soil), are comprehensive and correctly balanced.³⁹

The OECD addressed the problem again in its 1985 Report on the State of the Environment.⁴⁰ Among the new pollution concerns described in the survey was cross-media pollution arising from the use of sewage sludge as fertilizer.⁴¹

Two recent instruments on air pollution refer to the transfer of pollutants from medium to medium. One is the Geneva Convention on Long Range Transboundary Air Pollution, which emphasizes the need to "monitor chemical components in other media such as water, soil and vegetation. . . ."⁴² The other is the 1980 United States-Canadian Memorandum of Intent (on Transboundary Air Pollution), which obligates the two parties to "exchange information generated in research programs being undertaken in both countries on the atmospheric aspects of the transport of air pollutants and on their effects on aquatic and terrestrial ecosystems. . . ."⁴³

On a broader scale, the International Joint Commission, United States-Canada, is exploring a new concept of monitoring major North American ecological trends through an integrated transboundary network of basic

38. Organization for Economic Co-Operation and Development, *Recommendations of the Council on Water Management Policies & Instruments*, issued in Paris, Apr. 5, 1978, No. 7, Doc. C (78) 4 (Final), text also in *LAW OF INTERNATIONAL WATER RESOURCES* 193 (FAO Legislative Study No. 23) (D. Caponera, comp., 1980) [hereinafter cited as *CAPONERA* 1980].

39. *Id.* Appendix No. 7, *CAPONERA* 1980, *supra* note 38, at 195.

40. OECD 1985, *supra* note 1, at 65.

41. *Id.* at 65, 79, 163. See also the declaration adopted by the OECD Environment Committee in June 1985, which proclaims that the OECD member governments will reduce overall pollution through comprehensive control "so that problems are not transferred from one part of the environment to another." *Environment: Resource for the Future, Declaration of the OECD Environment Committee*, 18-20 June 1985, *reprinted in* 14 *ENV'T'L POL. & L.* 34 (1985).

42. Convention on Long-Range Transboundary Air Pollution, Nov. 13, 1979, 18 I.L.M. 1442, T.I.A.S. No. 10541 (1979).

43. Memorandum of Intent Concerning Transboundary Air Pollution, Aug. 5, 1980, United States-Canada, 20 I.L.M. 690, 692, T.I.A.S. No. 9856 (1981).

scientific and resource management information gathering. The purpose of this project is to anticipate, detect, and avoid major environmental problems along the United States-Canadian border.⁴⁴

The United Nations Environment Programme (UNEP) dealt with the matter more directly in its Montreal Guidelines on Protection of the Marine Environment Against Pollution from Land-Based Sources.⁴⁵ According to the Guidelines:

In taking measures to prevent, reduce and control pollution from land-based sources, States have the duty to act so as not to transfer . . . damage or hazards from one area to another or transform such pollution into another type of pollution.⁴⁶

Similarly, Article 195 of the 1982 United Nations Convention on the Law of the Sea binds the parties not to transfer pollution, stating that:

In taking measures to prevent, reduce and control pollution of the marine environment, States shall act so as not to transfer, directly or indirectly, damage or hazards from one area to another or transform one type of pollution into another.⁴⁷

A Natural Unit for Pollution Control—The River Basin as Ecosystem

In addition to the growing awareness of the threat posed by transfers of pollution, there has been a slow transition from acknowledgment of the river basin as a drainage unit to its acknowledgment as an ecological unit, or ecosystem. Its physical unity predisposes the drainage basin to be the best areal unit for national and international water management and this has long been advocated in the literature. Three decades ago, the United Nations gave the drainage basin concept official endorsement, when the Secretary-General, in his report to the Economic and Social Council, stated unequivocally that "river basin development is now recognized as an essential feature of economic development."⁴⁸ Also, in 1958, the U.N. Department of Economic and Social Affairs published the report of a panel of experts established to review the economic and

44. The IJC co-sponsored a workshop to that end at the Philadelphia Academy of Natural Sciences in Oct. 1984. See INTERNATIONAL JOINT COMMISSION, SECOND BIENNIAL REPORT UNDER THE GREAT LAKES WATER QUALITY AGREEMENT OF 1978, 6 (1984) [hereinafter cited as IJC SECOND BIENNIAL REP.].

45. United Nations Environment Programme, Ad Hoc Working Group of Experts, Montreal, 11-19 Apr. 1985, Guidelines on Protection of the Marine Environment Against Pollution from Land Based Sources, UNEP/WG.120/3 (Part IV), reprinted in 14 ENV'T'L POL. & L. 77 (1985) [hereinafter cited as MONTREAL GUIDELINES].

46. *Id.*

47. UNITED NATIONS, THE LAW OF THE SEA: UNITED NATIONS CONVENTION ON THE LAW OF THE SEA 71 (1983).

48. 21 U.N. ESCOR Annex Off. Rec. 21st Sess., at 6, U.N. Doc. E/2827 (1956).

social implications of the integrated river basin.⁴⁹ While the domestic legislation embodying the concept dates back more than half a century,⁵⁰ international agreements embracing entire basins only began to be promulgated in the 1950s.⁵¹

The idea of using the basin as a unit for water pollution control came more slowly to fruition. Although states have incorporated pollution provisions in water management treaties since the latter part of the 19th century, most of these provisions are confined to boundary waters.⁵² Some twenty years or so ago, however, international organizations such as the International Law Association⁵³ and the United Nations Economic Commission for Europe (ECE)⁵⁴ began to adopt policy declarations on water pollution control in the context of the drainage basin. Slowly these policies, if not translated into very effective state practice, were at least incorporated in treaties.⁵⁵

Later came the realization that the full potential of the international drainage basin for water management and pollution protection can only

49. U.N. Dep't of Economic and Social Affairs, Integrated River Basin Development, U.N. Doc. No. E/3066 (1958). The report stated:

It is now widely recognized that individual water projects—whether single or multiple purpose—cannot as a rule be undertaken with optimum benefit for the people affected before there is at least the broad outline of a plan for the entire drainage area. .

Id. at 1.

50. *E.g.*, the British Land Drainage Act of 1930 (20 & 21 Geo. 5, c. 44 §§ 1, 83, 1930); the Tennessee Valley Act of 1933, ch. 32, §§ 22-23, 48 Stat. 58, 69 (establishing the Tennessee Valley Authority); and the French Law Approving the Plan of Works for Improvement of the Rhone from the Swiss Frontier to the Sea from the Point of View of Power, Irrigation, Navigation, and Other Agricultural Uses, May 27, 1921 (21 Duvergier, Collection Complete Des Lois (N.S.) 261). More recent legislation would include the U.S. Water Resources Planning Act of 1965, 79 Stat. 244; the French Law Concerning the Regime and Distribution of Waters and Protection Against Pollution, Dec. 16, 1964 (47 Bull. Legislatif Dalloz 676, 1964); and the Delaware River Basin Compact of 1961 (75 Stat. 688, 689, 691).

51. *E.g.*, Statute of the Committee for Co-Ordination of Investigations of the Lower Mekong Basin, Oct. 31, 1957, text in U.N. LEGIS. SER., *supra* note 13, at 267. See also the table, International Agreements Reviewed and Agencies Established, in UNITED NATIONS, DEPARTMENT OF TECHNICAL COOPERATION FOR DEVELOPMENT, EXPERIENCES IN THE DEVELOPMENT AND MANAGEMENT OF INTERNATIONAL RIVER AND LAKE BASINS 62-64 (NATURAL RESOURCES/WATER SERIES NO. 10), ST/ESA/120 (1983) [hereinafter cited as EXPERIENCES].

52. See the table in J.G. LAMMERS, POLLUTION OF INTERNATIONAL WATERCOURSES 124-25 *passim* (1984). Boundary waters are defined in the Boundary Waters Treaty of 1909 as "waters from main shore to main shore of the lakes and rivers and connecting waters, or the portions thereof, along which the international boundary . . . passes." Boundary Waters Treaty, Jan. 11, 1909, United States-United Kingdom (Canada), Preliminary article, 36 Stat. 2448, T.S. No. 548.

53. International Law Association, Report of the Fifty-Second Conference, Helsinki, 14-20 Aug. 1966, 484-532 (1967), The Helsinki Rules on the Uses of the Waters of International Rivers. The Helsinki Rules were later amplified by the Rules on Water Pollution in an International Drainage Basin (by C.B. Bourne, Rapporteur), in International Law Association, Montreal Conference, Report of the Committee on International Water Resources Law 4-22 (1982).

54. U.N. Economic Commission for Europe, Recommendation to ECE Governments Concerning River Basin Management, Geneva, 1971, Preamble, E/ECE/WATER/9/Annex 2, text in CAPONERA 1980, *supra* note 38, at 150.

55. See the table in LAMMERS, *supra* note 52.

be realized by taking into account the interaction of water and other elements of the environment within the basin.⁵⁶ Such a realization was forcefully and explicitly expressed in the Articles on the Relationship between Water, Other Natural Resources and the Environment.⁵⁷ These Articles require states to ensure that:

(t)he management of their natural resources (other than water) and other environmental elements located within their own boundaries does not cause substantial damage to the natural condition of the waters of other States.⁵⁸

The concept found authoritative expression in the Great Lakes Water Quality Agreement of 1978,⁵⁹ which treats the drainage basin as an ecosystem and defines it as:

(t)he interacting components of air, land, water and living organisms, including man, within the drainage basin of the St. Lawrence River at or upstream from the point at which that river becomes the international boundary between Canada and the United States. . . ."⁶⁰

Since the 1978 Agreement, ecosystem approaches continue to be adapted or developed in the Great Lakes-St. Lawrence basin for a wide range of management problems, and are being considered for other international river basins, notably in Africa.⁶¹ Also, the concept of the river basin as ecosystem was one of the four major issues discussed at an international seminar held at the University of Linköping, Sweden, in 1984,⁶² on the potential of using the river basin as a basis for coordinated land and water

56. This trend was noted at the ECE Committee on Water Problems' Seminar on Co-Operation in the Field of Transboundary Waters, held at Dusseldorf, 15-19 Oct. 1984 (Water/Sem.11/3) [hereinafter cited as DUSSELDORF SEMINAR]. The representative of the United Nations Environment Programme (UNEP) emphasized that:

Many countries of the [European] region, acting individually or jointly with their neighbours, had created the right conditions for the gradual introduction of the concept of integrated environmental management . . . and for its development over entire European river basins . . . on the basis of flexible and appropriate principles. . . ."

Id. at 10, ¶ 35.

57. International Law Association, Belgrade Conference, Report of the Committee on International Water Resources Law 17-18 (1980); text also in CAPONERA 1980, *supra* note 38, at 314.

58. *Id.* art. 1 (b).

59. Great Lakes Water Quality Agreement, Nov. 22, 1978, United States-Canada, 30 U.S.T. 1384, T.I.A.S. No. 9257.

60. *Id.* art. I (g).

61. African Ministerial Conference on the Environment, Cairo Programme for African Co-Operation, 16-18 Dec. 1985, reprinted in 16 ENV'T'L POL. & L. 27 (1986). Sec. E, on priority subregional activities, gives priority, *inter alia*, to supporting and implementing integrated development plans for Lake Chad and the Niger and Cubango/Cuando rivers in order to use their "waters and ecosystems rationally." Sec. E.1. (d), (e) and (g). *Id.* at 28.

62. International Seminar on the Relevance of River Basin Approach for Coordinated Land and Water Conservation and Management, Linköping, Sweden, 4-8 June 1984 [hereinafter cited as LINKÖPING SEMINAR].

conservation and management.⁶³ As one participant in that seminar pointed out, the ecosystem is connected to the surrounding biosphere by a system of inputs and outputs, which may be in the form of radiant energy, water, gases, chemicals, or organic materials moved through the ecosystem boundary by meteorological, geological, or biological processes.⁶⁴ This concept comes close to the nub of the cross-media pollution problem because, obviously, some of the inputs and outputs—whether water, gases, chemicals, or organic materials—are undesirable, and the drainage basin provides a natural boundary for considering their interactions.⁶⁵

In the drainage basin, then, we have an ecosystem that has found wide expression in international law and is capable of serving as a natural areal and functional unit for the investigation, monitoring, and control of cross-media pollution. It provides not merely a conceptual basis for tackling these problems, but a practical one also, because the surface and groundwaters of a large drainage basin eventually receive and transmit nearly all forms of pollution. UNEP's Montreal Guidelines, noted above,⁶⁶ recognize this characteristic, and the section on planning strategies specifically includes watershed or drainage basin planning, stating that:

This strategy acknowledges that a large proportion of pollution enters the marine environment via watercourses Through consideration of socio-economic and environmental factors utilizing a drainage system as the boundary limit, the desired uses and level of quality that can be attained for any given marine water body are determined.⁶⁷

INTERNATIONAL DRAINAGE BASIN INSTITUTIONS AND THE CONTROL OF CROSS-MEDIA POLLUTION

Because the drainage basin provides both a conceptual and practical unit for dealing with the many forms of cross-media pollution that occur within its boundaries, and because a large number of river and lake basins are shared by two or more countries, it would seem logical to use as an institutional framework entities with a basinwide areal and functional responsibility.

63. The Preface declares that "ecologists have started to express the integrated totality formed by air, soil, vegetation and water by the concept 'catchment ecosystem' Thus, a drainage basin can be seen as a group of physical and biological resources linked by a complex of processes." *Id.* at III.

64. Reynolds, *River Basin as an Ecosystem*, in LINKOPING SEMINAR, *supra* note 62, 217, at 223.

65. Cross-media pollution was not discussed at the Linkoping Seminar, but the idea that river basins might be more appropriate areas than political entities as a geographical focus for analysis of pollution transfers was put forward in the same year by the Conservation Foundation. *Controlling Cross-Media Pollutants* in STATE OF THE ENVIRONMENT: AN ASSESSMENT AT MID-DECADE 319, 353 (1984).

66. MONTREAL GUIDELINES, *supra* note 45.

67. *Id.* Annex I.

However, are the existing entities in international drainage basins suitable to the purpose? What functions could and should they perform to enable them to act as transboundary environmental agencies? Should they collect data themselves, or coordinate data collection by agencies of the basin states? Should they have research and monitoring capability, or rely on other institutions? Should they establish guidelines and set standards, not on a medium-by-medium basis as has been done up to now, but on a basis of total environmental detriment and overall exposure? Should they have input from non-governmental organizations and from the general public? Finally, should their role with respect to member governments be limited to advice and consultation, or should they and could they have the power to finalize and enforce measures of control?

Research and Data Gathering

The primary and greatest need is research. As the Conservation Foundation's conference in 1984 brought out, lack of data is characteristic of any environmental area, but particularly so of cross-media pollution.⁶⁸ It may be argued that enough data should have been gathered within the past quarter of a century on individual media; all that is now required is to bring together the product of this multifarious research; that the time has come for action, not digging around for further information. Indeed, environmentalists themselves have charged that governments and agencies drag their feet by calling for more data, instead of instituting pollution control measures. This has been a Canadian complaint in the controversy between Canada and the United States over acid rain.⁶⁹ The European Parliament, too, recently criticized the European Economic Community (EEC) Commission's proposals for protecting the environment of the Mediterranean basin, stating that they were vague and inadequate because they dealt mainly with research, training, information gathering, and forms of collective deliberation.⁷⁰

On the other hand, it may be perilous to mandate by treaty or domestic legislation that an agency act before enough substantive information has been gathered. The EPA hinted at this notion in 1978, when promulgating proposed hazardous waste regulations:

Our objective has been to create a program based on as much substantive data and analysis as possible, but even where we have limited data the statute requires that we establish standards and controls.⁷¹

68. NEW PERSPECTIVES, *supra* note 1, at 3.

69. See generally, ACID RAIN AND FRIENDLY NEIGHBORS: THE POLICY DISPUTE BETWEEN CANADA AND THE UNITED STATES (Schmandt & Roderick eds. 1986).

70. O.J. EUR. COMM. 485, No. C 141 (1985).

71. 43 Fed. Reg. 58,946-58,947 (1978).

Basic data collection, of at least hydrological or hydrometeorological information, is already a task of the majority of international water management agencies.⁷² Entities with a specific mandate have gone further and explored not only point sources of water pollution,⁷³ but also non-point sources.⁷⁴ Under the 1972 Great Lakes Water Quality Agreement,⁷⁵ the International Joint Commission (IJC) established a subordinate body, the Pollution from Land-Use Activities Reference Group (PLUARG). The investigation of land uses and land-use activities on a basin-wide scale was something which had not previously been undertaken before by any international drainage basin entity, at least not in a pollution context.⁷⁶ Subordinate agencies of the IJC also explored the extent of input of toxic substances by deposition from the atmosphere,⁷⁷ and the IJC itself has been asked by the party states to investigate air pollution.⁷⁸

More recently, a project was begun by federal-provincial agreement in Canada to research and monitor total human and wildlife exposure within a river basin to a single pollutant, mercury, via all pathways of contamination, including soils and vegetation, gold mines, and smelters.⁷⁹ According to the agreement, programs were designed:

(t) to determine the degree to which mercury is present in the Churchill River Diversion system, its source, the pathways, and mechanisms

72. See R.D. Hayton, Rapporteur, *Progress in Co-Operative Arrangements*, in EXPERIENCES, *supra* note 51, 65-66.

73. E.g., factories or municipal sewage plants discharging effluent by pipe directly into a river or lake.

74. Such as runoff from city streets, or fertilizer and pesticide contamination from agricultural activities.

75. Great Lakes Water Quality Agreement, United States-Canada, Apr. 15, 1972, 23 U.S.T. 301, 24 U.S.T. 2268, T.I.A.S. No. 7312, 7747.

76. See ENVIRONMENTAL MANAGEMENT STRATEGY FOR THE GREAT LAKES SYSTEM, International Reference Group on Great Lakes Pollution From Land Use Activities, Final Report to the International Joint Commission (1978) (PLUARG).

77. These subordinate agencies included PLUARG, the Water Quality Board, the Upper Lakes Reference Group, and the Science Advisory Board. See, e.g., INTERNATIONAL REFERENCE GROUP ON POLLUTION OF THE GREAT LAKES FROM LAND-USE ACTIVITIES, ATMOSPHERIC LOADING OF THE LOWER GREAT LAKES AND THE GREAT LAKES DRAINAGE BASIN (Mar. 1977); INTERNATIONAL REFERENCE GROUP ON POLLUTION OF THE GREAT LAKES FROM LAND-USE ACTIVITIES, INTERNATIONAL JOINT COMMISSION, ATMOSPHERIC LOADINGS TO THE GREAT LAKES (Sept. 1977, mimeographed); and GREAT LAKES SCIENCE ADVISORY BOARD ANNUAL REPORT, A PERSPECTIVE ON THE PROBLEM OF HAZARDOUS SUBSTANCES IN THE GREAT LAKES BASIN ECOSYSTEM, 22-26, 38-41, 51 (Recommendation D), (1980). The INTERNATIONAL JOINT COMMISSION, WATER QUALITY OF THE UPPER GREAT LAKES (1979), stated that:

Atmospheric inputs are disproportionately significant. They directly enter the euphotic zone of the lakes and are immediately available to the biological community. . .

Id. at 56. The Upper Lakes Reference Group found that atmospheric inputs might be responsible for up to 40 percent of the loadings of certain pollutants. *Id.* at 2.

78. *The International Joint Commission: Canada-United States*, in EXPERIENCES, *supra* note 54, 197, 199.

79. Canada-Manitoba Agreement on the Study and Monitoring of Mercury in the Churchill River Diversion, concluded on Mar. 10, 1983. Photocopy of text provided by the Canada-Manitoba Mercury Agreement Coordinator, Winnipeg, Manitoba.

involved in the movement and concentration of mercury in ecosystems and the effects that such mercury may have on the people of the area. . . .

Specifically, these programs will investigate the processes by which mercury is mobilized from natural or anthropogenic sources, bioaccumulated through the food chain to fish and other animals, and ultimately consumed by humans.⁸⁰

It is not beyond the capacity of an international drainage basin commission or committee, given the funds and the manpower (a subject to which we will return below), to explore the means whereby pollution arrives or arises in its area of jurisdiction and how that pollution is transferred from one medium to another.

Regulatory Information

Just as important as the technical data is the regulatory information. As noted above,⁸¹ some environmental agencies, such as the EPA in the United States, are beginning to look into legislation and regulations to determine if and where the law itself encourages cross-media pollution. This is a task which should be undertaken by our hypothetical drainage basin entity and receive top priority, but it is not as yet being done in a transboundary context in any systematic way.

The cumulation of regulatory data is not a particularly difficult task per se. Such information is publicly available in official records and has been transmitted to computerized data banks by organizations such as the International Council of Environmental Law.⁸²

Structure and Staffing

Structure and staffing have a bearing on the composition of drainage basin entities. Among the existing bodies, some are elaborate multi-level organizations in which the senior members are usually political figures.⁸³ These members must rely on subsidiary organs, such as advisory boards, expert groups and ad hoc study teams for scientific and technical infor-

80. *Id.* Preamble to Schedule A.

81. *See supra*, note 32.

82. The International Council of Environmental Law has its legal seat in Geneva, but its executive office is in Bonn (Federal Republic of Germany). One of its main functions is to gather and promote exchange of information and, apart from storing data, it issues a bibliographical publication entitled *References to Publications Concerning Legal, Administrative and Policy Aspects of Environmental Conservation*.

83. *E.g.*, the Niger and Senegal commissions, whose highest organ is the meeting of heads of states and governments. *See EXPERIENCES, supra* note 51, at 191-96 (Niger), 142-47 (Senegal).

mation. At the other end of the scale are small and purely technical commissions, composed usually of water engineers.⁸⁴

An entity with responsibility for investigating cross-media pollution should have on its permanent staff not only scientific and technical specialists, but also lawyers with expertise in the environmental field who are capable of discerning the environmental impact of past and proposed legislation and treaties. A number of countries now have environmental impact assessment procedures, but these are geared rather to the impact of development than to the impact of regulation.⁸⁵ It is high time that impact assessment be directed toward the regulatory activity itself, and indeed, the EPA in recent regulations, has given consideration to their potential impact. For instance, its proposed effluent limitations guidelines of 1985 for the gold placer mining industry⁸⁶ devote an entire section to non-water quality environmental impacts, noting that:

(t)he elimination or reduction of one form of pollution may aggravate other environmental problems. . . . EPA has considered the effect of these regulations on air pollution, solid waste generation, land requirements, energy consumption and consumptive water loss.⁸⁷

Collaboration in Data Gathering

It is not necessary that the basin entity gather all the information, technical and regulatory, itself. This would be impossible, for instance, in the case of atmospheric or other pollution emanating from outside the region: the commission or committee could only hope to monitor the effects. Some existing water resource agencies have a mandate to undertake their own research. The Joint Committee for the Ganges, established by the 1977 Agreement between India and Bangladesh,⁸⁸ for example, was expected to generate data of its own. The commission for protection of Lake Geneva (Lac Lemman) against pollution is another body empowered to organize and carry out all the research it deems necessary and to make use of the findings.⁸⁹

84. *E.g.*, the Permanent Joint Technical Commission for Nile Waters. *EXPERIENCES*, *supra* note 51, at 159.

85. *See* TECLAFF, *WATER LAW IN HISTORICAL PERSPECTIVE* 243-47, 251-55 (1985). For a table showing which countries among the OECD group have impact statement laws, *see* OECD 1985, *supra* note 1, at 242. Of the 24-member group, eight had such impact laws as of 1984.

86. EPA Proposed Effluent Limitations Guidelines for Gold Placer Mining Industry under Clean Water Act, 50 Fed. Reg. 47,982 (Nov. 20, 1985).

87. *Id.* Section XV.

88. Agreement on Sharing of the Ganges Waters at Farakka and on Augmenting its Flows, Nov. 5, 1977, India-Bangladesh, art. VI, 17 I.L.M. 104 (1978).

89. Established by the Convention Concerning Protection of Lake Geneva Waters Against Pollution, Nov. 16, 1962, France-Switzerland, 99 U.N.T.S. 49, *reprinted in* OECD FRONTIER REGIONS *supra* note 12, at 418, and in *INTERNATIONAL GROUNDWATER LAW*, *supra* note 28, at 458. art. 3 gives the mandate for research.

However, many other organizations established by treaty rely on the contracting parties for information. Some river and frontier waters agreements do not provide for a permanent entity: each party appoints a representative plenipotentiary and deputies.⁹⁰ In such case, the parties are merely required to establish principles of cooperation governing the regular exchange of information.⁹¹ Permanent bodies, too, gather data from member states. The International Commission for Protection of the Rhine Against Pollution receives from the contracting parties, according to the Rhine Chlorides Convention of 1976,⁹² reports "based on all significant data from pertinent national programs."⁹³ And the International Joint Commission, United States-Canada, which generates its own research through subordinate bodies, also receives information from agencies of its member governments. The sheer volume of such investigation can be staggering: a recent bibliography of publications of the Great Lakes Environmental Research Laboratory (GLERL) within the past ten years contained 571 studies.⁹⁴

Data received from the basin states and their political subdivisions should be presented in comparable form.⁹⁵ The quality, accuracy, and compatibility of information supplied to basin entities have frequently left much to be desired.⁹⁶ The history of the Great Lakes International

90. E.g., art. 12 of the Polish-Soviet agreement of July 17, 1964, concerning the use of water resources in frontier waters, 552 U.N.T.S. 108 (1965), reprinted in *INTERNATIONAL GROUNDWATER LAW*, *supra* note 28, at 245; and art. 9 of the similar agreement between Czechoslovakia and Poland of Mar. 21, 1958, 538 U.N.T.S. 108 (1965), reprinted in *INTERNATIONAL GROUNDWATER LAW*, *supra* note 28, at 234.

91. As in art. 8(1) of the Polish-Soviet agreement of July 17, 1964, 552 U.N.T.S. 108 (1965), reprinted in *INTERNATIONAL GROUNDWATER LAW*, *supra* note 28, at 244.

92. Convention on the Protection of the Rhine Against Pollution by Chlorides, Dec. 3, 1976, France-Germany-Luxembourg-Netherlands-Switzerland, 16 I.L.M. 265 (1977).

93. *Id.* art. 3.

94. U.S. DEP'T OF COMMERCE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, OFFICE OF OCEANIC AND ATMOSPHERIC RESEARCH, GREAT LAKES ENVIRONMENTAL RESEARCH LABORATORY, GPO No. 556-609/10173 Apr. 1974-Mar. 1985 (1985).

95. One of the major recommendations of the Great Lakes Water Quality Board in its 1985 report to the International Joint Commission was that "the jurisdictions make every effort to achieve data compatibility among jurisdictional monitoring and surveillance programs." GREAT LAKES WATER QUALITY BOARD, 1985 REPORT ON GREAT LAKES WATER QUALITY, Recommendation 18 (1985) [hereinafter cited as *WATER QUALITY REPORT*].

96. This is so even in such simple matters as topographical surveying and even when the obligation to provide data is clearly set forth in treaties. For instance, Pakistan claims that most of the controversies that have arisen over the data exchange provisions of the 1960 Indus Waters Treaty are due to India's restrictive interpretation of those provisions. *The Permanent Indus Commission*, in *EXPERIENCES*, *supra* note 51, 376, 382. In 1957, a Greek-Yugoslav *procès-verbal* was drawn up specifically to establish a plan of collaboration for hydroeconomic studies of the drainage basin of Lake Dojran. One delegation proposed that a joint team coordinate the hydrometrical and topographical surveys to ensure comparable data, but the other party vigorously opposed such a seemingly innocuous technical endeavor. *Procès-verbal . . . Concerning Hydro-economic Studies of the Lake Dojran Basin*, Sept. 1, 1977, Greece-Yugoslavia, Sec. B (I & II), text in U.N. Legis. Ser., *supra* note 13, at 813.

Surveillance Plan (GLISP) illustrates some of the difficulties encountered, despite a sophisticated strategy for gathering and evaluating data.⁹⁷ GLISP provides a framework for coordinating the efforts of the many agencies in the United States and Canada responsible for surveillance and monitoring of activities under the 1978 Great Lakes Water Quality Agreement.⁹⁸ The original GLISP antedated the 1978 Agreement and was not really geared to the ecosystem approach embodied in that instrument. It generated enormous amounts of data which did not, however, provide a comprehensive picture of ecosystem status. So the GLISP has had to be updated and refocused, *inter alia*, to develop compatible methodologies for common operational components⁹⁹ and to place more emphasis on compatible data management.¹⁰⁰

It is essential, also, that the basin entity have the power of independent verification of data, when necessary. This was a requirement, for instance, in the 1974 Draft European Convention for the Protection of International Watercourses,¹⁰¹ and in the 1972 Great Lakes Water Quality Agreement,¹⁰² and it should be spelled out in all treaty provisions on pollution research and surveillance.

Monitoring and Surveillance

The importance of monitoring and surveillance in discovering unknown sources and pathways of contamination cannot be overestimated. Again, the Great Lakes basin provides pertinent examples. Currently available data include not only contaminants in water, but also in herring gulls, fish, and other biota. Within the past 15 years, intensive monitoring at various levels of the food chain, especially of long-lived predator fish which accumulate pollutants, has revealed previously unsuspected levels of persistent toxic substances, for example, mirex in Lake Ontario, toxaphene in Lake Superior, and PCBs, dieldrin and chlordane in Lake Michigan in such concentrations that some fish could not be eaten at all.¹⁰³

These discoveries and others, such as the atmospheric contribution of pollutants to the Lakes, were instrumental in promoting the ecosystem approach adopted in the 1978 Water Quality Agreement and in the sub-

97. WATER QUALITY REPORT, *supra* note 95, at 65-69.

98. Great Lakes Water Quality Agreement of 1978, *supra* note 59, art. VI. 1(m) and Annex II.

99. Such as atmospheric monitoring, which is applicable to the entire basin.

100. WATER QUALITY REPORT, *supra* note 95, 66-72.

101. Council of Europe, Draft European Convention for the Protection of International Watercourses Against Pollution, Feb. 1974, art. 15.1(a), *text in* 2 Y.B. INT'L L. COMM'N, Pt. 2, 346-49 (1974).

102. Great Lakes Water Quality Agreement of 1972, *supra* note 75, art. VI.

103. See generally WATER QUALITY BOARD REPORT, *supra* note 95, at 72-109, 83 Table 13 (Health Advisory on Lake Michigan Sport Fish).

sequent restructuring and updating of the international surveillance plan itself.¹⁰⁴ The research and monitoring activities of a basin entity, thus, have a forward-looking, as well as a contemporary aspect. They are instrumental in the drafting of vehicles for cooperation far into the future, and they provide the basis not only for the rectification of existing transboundary problems, but also for the prevention of new ones.

Funding

Fundamental to the whole matter is the question of money and manpower. An entity with broadbased and interconnected responsibilities must have funds and staff equal to the task, otherwise it will give the semblance of an international cooperative endeavor where none effectively exists. There are a great many bilateral and multilateral commissions for the resolution of all sorts of transboundary issues, especially in Europe, with its many land frontiers.¹⁰⁵ Yet their very existence tends to induce complacency and becloud the fact that a problem does not go away merely by setting up a commission to look into it. The drainage basin entities have been victims of this type of thinking. Many of them, as noted above, are surprisingly small bodies and meet only at infrequent intervals. Some do not even have a permanent secretariat, or any physical headquarters or assets, and function only when their members meet.¹⁰⁶

Even large and complex organizations, however, have funding difficulties. For instance, the Commission of the European Economic Community completed, in 1979, a voluminous study of the underground water resources of the Community, with ten country reports and 152 maps, but had no funds to print and disseminate the results.¹⁰⁷ The International Joint Commission, United States-Canada, also has had reason to complain of a paucity of research money and manpower. The heart of the IJC's problem is that, as a former chairman of the Canadian section pointed out:

Whatever funds are needed for individual studies and whatever personnel are required for long or short-term boards—for such functions as control, monitoring and surveillance—have been provided by the regular line departments of both countries.¹⁰⁸

104. *Id.* 66-72.

105. See Note by the Secretariat listing commissions and working parties, appended to *Environmental Protection Problems in Frontier Regions*, in Table (Annex 2), OECD FRONTIER REGIONS, *supra* note 12, at 69-90.

106. *E.g.*, the Permanent Indus Commission and the Joint Greek-Yugoslav Commission for the Development of the Vardar-Axios. The participating states each appoint a commissioner, whose staff members are seconded from their country's permanent civil service. G.J. Cano, Rapporteur, *Institutional and Legal Arrangements*, in EXPERIENCES, *supra* note 51, at 48.

107. O.J. EUR. COMM. 6, No. C 60 (1981).

108. Cohen, *River Basin Planning*, in EXPERIENCES, *supra* note 51, 107, 125.

This has left the Commission vulnerable to budgetary restrictions inflicted by the parties on their own agencies. For example, between 1981 and 1984 the EPA's Great Lakes National Program Office had its budget and manpower cut from \$6.5 million and 20.5 staff positions to \$4.6 million and 15 staff positions.¹⁰⁹ The types of research mandated by the 1978 Agreement—emphasis on toxic substances, identification of airborne pollutant sources, and impairment of tributary water quality through atmospheric deposition—together would enable the Great Lakes jurisdictions to make a long stride toward the recognition of cross-media pollution impacts. That possibility remains ephemeral, however, for the Commission continued to criticize funding arrangements which, it claimed, result in "an uncertain research climate and a diminished human scientific resource base for needed work."¹¹⁰

In multistate basins, problems are bound to arise over the allocation of expenses among member governments. Unlike the costs of development projects, which are often apportioned among states according to benefits ultimately received, the expenses of pollution research, monitoring and surveillance are rarely so equitably divided. European countries have made much of the so-called polluter-pays' principle as applied to individual polluters and polluting industries.¹¹¹ They seem less willing to apply it as among states. The Netherlands, for example, as the lowermost downstream riparian, is the chief victim of the chlorides pollution of the River Rhine. Yet, it is obligated to pay the same proportion of expenses as the major upstream polluters, France and West Germany, for any enquiry carried out under the 1976 Rhine Chlorides Convention.¹¹²

Obviously, it will be difficult to allocate the cost of investigating the sources and pathways of pollution transferred from one medium to another, especially that which originates outside the drainage basin.¹¹³ Perhaps the simplest (though not necessarily the fairest) procedure for sharing research expenses would be something like that adopted by the Italian-Swiss Commission for the Protection from Pollution of Common Waters: the formula was based on geographical and demographic criteria, such that Italy was charged close to 54 percent (for Lake Maggiore) and Switzerland just over 46 percent (for Lake Lugano).¹¹⁴

109. 6 INT'L ENV'T'L REP. (BNA), CURR. REP. 552-53 (1983).

110. IJC SECOND BIENNIAL REPORT, *supra* note 44, at 11.

111. The polluter-pays principle, as adopted by the member states of the Organization for Economic Co-Operation and Development, places the initial responsibility for paying the cost of pollution abatement on the enterprises causing the pollution. The costs are subsequently passed on to consumers in the form of higher prices. See OECD 1985, *supra* note 1, at 251-53.

112. Rhine Chlorides Convention, *supra* note 92, art. 10, Sec. (2).

113. See, e.g., the elaborate system of contributions for each participating state contained in the Annex to the Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution on Long-Term Financing of the Co-Operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe, Sept. 28, 1984, 24 I.L.M. 484, at 488 (1985).

114. Rizzo, *The Commission for the Protection from Pollution of Common Waters: Italy-Switzerland*, in EXPERIENCES, *supra* note 51, 364, 366.

Public Support and Participation

Some of the most useful information is supplied free of charge by the general public, a public that has become increasingly aware of environmental risks and is alert for signs of trouble. Groups that represent sectors of the public, such as environmental organizations, water users' associations, or labor unions, quite often conduct their own research or hire experts to investigate pollution threats. They not only provide a valuable nongovernmental counterpart to agency data-gathering and surveillance, but also an independent review of administrative decision making.¹¹⁵

Public support for environmental programs in many of the industrialized countries is, apparently, as strong as or even stronger than it was in the heyday of the environmental movement. In the United States, for instance, membership in major environmental organizations increased by the same percentage in the early 1980s as it had in the early 1970s.¹¹⁶ More than 87 percent of the Japanese, a higher proportion than in the United States, are concerned about environmental risks.¹¹⁷ In Belgium, Finland, France, West Germany, Italy, New Zealand, and the United Kingdom environmental issues have provided the platforms of "green" parties in local and national politics.¹¹⁸

Consequently, governments have become more willing to make provision for informing the public and permitting its involvement in many areas of resource planning and management. As an example, due to the fears of industry that disclosure of discharge permit information by the authorities would release industrial secrets, the British public was long barred by law from effectively knowing in any detail about the country's water pollution controls.¹¹⁹ In 1985, however, the water pollution registers, with all their particulars on permit applications, samples of effluent, and other details, were made available to the public for the first time.¹²⁰ This was not only because of a growing belief that the public had a right to be kept informed and to participate in decision making, but also because of the acknowledged professionalism of environmental organizations and their ability to evaluate scientific and technical data.¹²¹

Such expanded public access to information and to administrative pro-

115. On the role of the public and its representatives in environmental risk assessment, see STATE OF THE ENVIRONMENT: AN ASSESSMENT AT MID-DECADE, *supra* note 65, at 298.

116. *Id.* at 29.

117. *Id.* at 31.

118. OECD 1985, *supra* note 1, at 258. See also Despax, *Collective Defence of the Environment and Admissibility of Proceedings in Relation to Transfrontier Pollution*, in OECD FRONTIER REGIONS, *supra* note 12, 200. 203 n. 2, which cites a figure of 20,000 environmental organizations in nine European countries.

119. See Waite, *Informing the Public on Fresh-Water Pollution: The New Registers*, 15 ENV'T'L POL. & L. 115 (1985).

120. *Id.* at 116.

121. *Id.* at 120.

cedures is beginning to be applied also to transboundary matters, both in doctrine and in state practice. The Organization for Economic Co-Operation and Development, in guidelines aimed at promoting cooperation for frontier region environmental protection, recommended that:

Countries should in particular take care to see that persons exposed to a significant risk of transfrontier pollution are informed through channels selected by the Countries themselves and enabled to the same extent as persons in the Country of origin, to take part under similar conditions in administrative and judicial hearings and proceedings.¹²²

This principle of equal right of access is enshrined in the Nordic Environmental Convention of 1974,¹²³ and it was expressed also in a proposed Council directive of the European Economic Community on environmental impact assessment.¹²⁴ The proposed directive did not originally contain a provision for participation by members of the public in another state, but the amended text was worded thus:

If the project is likely to produce significant effect on the environment in another Member State, the population of that Member State should also be able to take part in the consultation process. The Member states shall determine, in the framework of their bilateral or multi-lateral relations, the most appropriate arrangements for this purpose.¹²⁵

These and similar recommendations have been translated into, and even anticipated by, the practice of communities in frontier regions, especially in Europe, where potentially harmful activities (such as the siting of nuclear power plants) tend to be located on or near the many

122. Guidelines for International Co-Operation with Regard to Environmental Protection in Frontier Regions, II (2), *reprinted in* OECD FRONTIER REGIONS, *supra* note 12. For a more recent expression of the concept, see UNEP Cairo Guidelines, Ad Hoc Working Group of Experts on the Environmentally Sound Management of Hazardous Wastes, Third Session, Cairo, 4-10 Dec. 1985, *reprinted in* 16 ENV'T'L POL. & L. 31 (1986). Paragraph 18, on equal access and treatment, proclaims that, in granting authorizations or operating permits for the disposal of hazardous wastes which may have transfrontier effects, the authorizing state should accord public authorities and nationals of the state concerned the same right of participation in administrative and judicial proceedings as those accorded its authorities and nationals. *Id.* at 32.

123. Nordic Environment Convention, Feb. 19, 1974, Denmark, Finland, Norway, Sweden, 13 I.L.M. 591 (1974). art. 3 provides for a right of access for persons who are or may be affected by environmentally harmful activities in another contracting state.

124. European Economic Community, Proposal to Amend the Proposal for a Council Directive Concerning the Assessment of the Environmental Effects of Certain Public and Private Projects, O.J. EUR. COMM. 5, No. C 110 (1982).

125. *Id.* art. 8.2. The original proposal is contained in O.J. EUR. COMM. 14, No. C 149 (1980). The amended proposal failed to meet with approval and this provision was dropped from the final text in Council Directive of 27 June 1985, on the Assessment of the Effects of Certain Public and Private Projects on the Environment, O.J. EUR. COMM., 40 No. L 175 (1985). The corresponding art. 7 of the final Directive refers only to exchanges of information between states. *Id.* at 42.

boundary waters.¹²⁶ Thus, German citizens have been given access to administrative authorities in Switzerland and France, and Dutch citizens to administrative authorities in France and Germany.¹²⁷ Nevertheless, it must be acknowledged that, in many countries, there is still considerable reluctance on the part of administrations at all levels to admit the public or its representatives to the investigating and planning, let alone decision-making, procedures of an agency.¹²⁸

This attitude is also evident in the work of the international river basin commissions. For instance, a report on the Italian-Swiss Commission for the Protection from Pollution of Common Waters states that "an information system for the public is not foreseen, nor is public participation in the meetings of the . . . Commission expected."¹²⁹ Two outstanding exceptions to such a restrictive approach are the Finnish-Swedish Frontier Rivers Commission and the International Joint Commission, United States-Canada (IJC). The Finnish-Swedish Frontier Rivers Commission is unusual also in that it is a permit-granting institution.¹³⁰ Before making a decision on any activity liable to cause pollution, the Commission must give an opportunity for objections to be raised, not only by authorities but also by individuals.¹³¹ Moreover, individuals may complain to the Commission about polluting activities for which no permit was applied for or granted.¹³²

The IJC has held public hearings for many years. Its power to do so stems from the investigative functions assigned to it under the Boundary Waters Treaty of 1909,¹³³ and has been further enlarged by the two Great Lakes Water Quality Agreements.¹³⁴ In its Second Biennial Report in 1984, the Commission devoted more space to its role vis-a-vis the Great Lakes community than to its role in assisting governments.¹³⁵ The Commission declared forthrightly that, without active community support, it

126. *Environmental Protection Problems in Frontier Regions* (Note by the Secretariat) in OECD FRONTIER REGIONS, *supra* note 12, at 33.

127. See LAMMERS, *supra* note 52, 25-27 (footnotes).

128. See TECLAFF, WATER LAW IN HISTORICAL PERSPECTIVE 245-51 (1985); and LAMMERS, *supra* note 52, at 24-27, 42-43.

129. Rizzo, *The Commission for the Protection from Pollution of Common Waters: Italy-Switzerland*, in EXPERIENCES, *supra* note 51, at 365.

130. See generally on the Finnish-Swedish Frontier Rivers Commission, LAMMERS, *supra* note 52, 65-68; and Ratia, *International-River Commissions: Experiences of Finland*, in EXPERIENCES, *supra* note 51, 324, 326-28.

131. Agreement Concerning Frontier Rivers, 16 Sept. 1971, Finland-Sweden, Ch. 8, art. 4, 825 U.N.T.S. 191, English translation at 272.

132. *Id.*

133. Boundary Waters Treaty of 1909, 36 Stat. 2449, T.S. No. 548, art. IX and XII.

134. Great Lakes Water Quality Agreement of 1972, *supra* note 75, and Great Lakes Water Quality Agreement of 1978, *supra* note 59. The IJC has admitted, however, that the public hearing process, while an integral part of its activities, had not always been a successful mode of public participation. IJC SECOND BIENNIAL REPORT, *supra* note 44, at 16.

135. Cf. IJC SECOND BIENNIAL REPORT, *supra* note 44, 15 (Commission and Government) and at 15-16 (Commission and Community).

was "probably beyond the reach of any agency or government, alone or in combination" to achieve the objectives of the 1978 Agreement.¹³⁶ Following up on its previously expressed need for a more direct form of discourse, the IJC announced that it was attempting to foster such discourse through public discussion at meetings of its Boards and that it was considering ways for the public to comment on and contribute to the Commission's own analyses.¹³⁷

There is no valid reason why a public that is being accorded a transboundary right of access (in doctrine, in treaties, and in frontier region practice) to the administrative proceedings of national and local authorities, should be denied such access to an international agency with responsibilities for an entire basin and obligations to the basin community. Indeed, some years ago, in a discussion of new and expanded administrative functions of an international river basin commission, it was suggested that the commission represent the collective interests of the basin vis-a-vis the various government authorities and that it would, in this way, benefit from the principle of equal right of hearing established for nationals of the basin states.¹³⁸ Such an ombudsman-like role would be particularly appropriate in the context of cross-media pollution control.

Advice and Recommendations

A drainage basin entity performing as a transboundary environmental agency should have an equally important responsibility toward member governments—to give advice and recommendations. How well it would carry out this task from the standpoint of the common goal sought would depend on several factors, including its composition, the level of representation (ministerial, subministerial, or nongovernmental), and the level of expertise among individual members of the organization.

Entities such as the International Boundary and Water Commission, United States-Mexico, or the Indus Commission, have only one level of authority.¹³⁹ Others, especially those established fairly recently in developing countries, have many organs and several levels of authority, from heads of state down to technical committees. The Niger Basin Authority and the Organisation Pour la Mise en Valeur du Fleuve Senegal are of

136. *Id.* at 16.

137. *Id.* The need for a more direct form of discourse was expressed in 1982 in INTERNATIONAL JOINT COMMISSION, FIRST BIENNIAL REPORT UNDER THE GREAT LAKES WATER QUALITY AGREEMENT OF 1978 30 (1982).

138. See Dupuy, *Normative and Institutional Proposals for the Integrated Management of International Hydrographic Basins*, in OECD FRONTIER REGIONS, *supra* note 12, 151, 167.

139. On the structure and functions of these entities, see Friedkin, *The International Boundary and Water Commission: Mexico-United States*, in EXPERIENCES, *supra* note 51, at 204-16; and Ministry of Irrigation, India, *The Indus Commission and the Indo-Bangladesh Joint Rivers Commission*, in EXPERIENCES, *supra* note 51, at 359-63.

this type.¹⁴⁰ Top level representation might appear to be the most effective in getting things done and providing a pipeline of ready access to government. In fact, where a commission lacks such representation, it has sometimes been necessary to resort to ministerial action. For instance, it took an interministerial conference in 1972 to prod the International Commission for the Protection of the Rhine Against Pollution into drawing up the chlorides and chemical conventions of 1976.¹⁴¹

However, entities with a lower level of representation have had considerable success in an advisory role. One such is the International Joint Commission, United States-Canada. It has quite an elaborate organizational structure, with many subordinate bodies, a broad interdisciplinary mix of expert advisors, and a fair amount of independence of action.¹⁴² Its recommendations are not binding, yet about three-quarters of them were accepted by the two governments.¹⁴³ It was the Commission's impartial studies and recommendations that laid the basis for the Great Lakes water quality agreements of 1972 and 1978.¹⁴⁴ Nevertheless, the increased complexity of its organization since then seems to have created problems, and bears a warning for any drainage basin entity taking on additional responsibilities.

The IJC has repeatedly found it necessary to reassert the importance of maintaining its independence and integrity under the pollution agreements. It had occasion to do so at length in its First Biennial Report, following the 1978 Great Lakes Water Quality Agreement.¹⁴⁵ In that report, the Commission questioned the objectivity of one of its own subordinate bodies, the Water Quality Board,¹⁴⁶ and in its Second Biennial

140. The Niger Basin Authority has four levels of competence: the Summit of Heads of State and Government, the Council of Ministers, the Executive Secretariat, and the Technical Committee of Experts. See *Newsletter*, International Rivers and Lakes 2 (Dec. 1982); and *Technical Note on the River Niger Commission*, in *EXPERIENCES*, *supra* note 51, 191-96.

The OMVS also has four levels: the Heads of State, the Council of Ministers, the High Commissioner, and the Permanent Water Commission. See Quoc-Lan Nguyen, *Powers of the Organization for the Development of the Senegal River in Development of the River Basin*, in *EXPERIENCES*, *supra* note 51, at 142-47.

141. Kamminga, *Who Can Clean Up the Rhine?*, in *THE LEGAL REGIME OF INTERNATIONAL RIVERS AND LAKES* 371, 373 (R. Zacklin & L. Caflisch, eds. 1981).

142. See the Annex showing the organization of the IJC in *EXPERIENCES*, *supra* note 51, at 203.

143. Cohen, *River Basin Planning: Observations from International and Canada-United States Experience*, in *EXPERIENCES*, *supra* note 51, 107, 115. Nevertheless, there have been complaints that the IJC has not been consulted as much as it should have been. In 1983 a member of the International Great Lakes Fishery Commission declared that the IJC had been bypassed as often as it was used. 6 *INT'L ENV'T'L REP. (BNA)*, *CURR. REP.* 463-64 (1983). And in 1985, a Canadian study, noting that neither government had asked the IJC to investigate how the acid rain problem could be resolved, reportedly declared that the Commission had never reached its full potential. 8 *INT'L ENV'T'L REP. (BNA)*, *CURR. REP.* 351 (1985).

144. See *supra*, notes 75 and 59.

145. *IJC FIRST BIENNIAL REPORT*, *supra* note 137, 28-29.

146. *Id.* at 29.

Report, the IJC expressed concern about the use of Commission resources to implement parts of the toxic substances control strategy on behalf of the parties.¹⁴⁷ It said:

The Commission is concerned about the use of its limited resources and the implications for its role under the Agreement should this tendency continue. When Commission groups act on behalf of the Parties in implementing such a strategy, the Commission's ability to comment on the effectiveness of programs and strategies under the Agreement is compromised. . . .¹⁴⁸

Within the general recommendatory powers of an entity the development of guidelines is very important. In essence, it means setting down in black and white the desired objective, for example, abatement and control of pollution, and outlining very broadly the measures whereby the objective is to be achieved. The Organization for Economic Co-Operation and Development, for instance, has issued a number of such guidelines in the form of Recommendations. Its Recommendations on Water Management Policies and Instruments of 1978, are typical.¹⁴⁹ Concerning cross-media pollution, they propose that authorities ensure that the water pollution control measures they implement do not lead to uncontrolled pollution transfers to other water resources or other media.¹⁵⁰ That is the objective. Then, in comment, they indicate the kind of measures that should be adopted, again very generally—authorities should ensure that economic and regulatory instruments and controls are “comprehensive and correctly balanced.”¹⁵¹ This type of framework guideline has not changed very much since then, even though somewhat more is known now about transfers of pollution. Among the dozen categories of significant regulatory action which the EPA set itself in its Operating Guidance for the year 1986-1987, Category 10 provides that the EPA shall “implement a coordinated approach to solve multimedia pollution concerns in discrete geographic areas.”¹⁵²

It is certainly within the competence of an international river basin commission in its advisory capacity to set forth guidelines for member governments and their agencies concerning cross-media pollution. Many

147. IJC SECOND BIENNIAL REPORT, *supra* note 44, at 5.

148. *Id.*

149. Organization for Economic Co-Operation and Development, Recommendations of the Council on Water Management Policies and Instruments, issued in Paris, Apr. 5, 1978, *reprinted in* CAPONERA 1980, *supra* note 38, at 193.

150. *Id.* No. 7.

151. *Id.* at 195, Appendix No. 7.

152. See Excerpts from Budget Office Regulatory Program Listing EPA's Priorities from Apr. 1, 1985 to Mar. 31, 1986, Agency Operating Guidance FY 1986-1987, *reprinted in* 16 ENV'T. REP. (BNA), CURR. DEV. 658, 659 (1985).

of them already do so for water pollution and, since an ecosystem approach was adopted for the Great Lakes Basin in the 1978 Water Quality Agreement,¹⁵³ the International Joint Commission has broadened its role to encompass that approach, both in its own biennial reports and in the recommendations of its advisory boards.¹⁵⁴

The recommendatory role of a commission would be strengthened if it were allowed to propose specific numerical standards and practices for specific media, at least within the drainage basin area. The standards might be uniform for the whole basin or variable, depending on the sources of pollution and their location. Some commissions already have such powers insofar as water pollution is concerned. Among the responsibilities given the International Joint Commission by the 1978 Great Lakes Water Quality Agreement is tendering of "specific recommendations concerning . . . standards and other regulatory requirements,"¹⁵⁵ and it has since recommended new or revised water quality objectives for eleven substances.¹⁵⁶

Likewise, the International Commission for the Protection of Lac Lemman (Lake Geneva) has the power to draft regulations and recommend to governments the measures to be taken to deal with pollution.¹⁵⁷ Accordingly, the Commission made recommendations on control measures and the purification of lake waters, but took more than a decade to adopt directives for the discharge of effluent.¹⁵⁸ The International Commission for the Protection of the Rhine Against Pollution also seems to have been rather dilatory in recommending emission standards for substances listed in Annex I of the 1976 Rhine Chemical Convention.¹⁵⁹ By mid-1980 the Commission had recommended limit values for only one substance, mercury.¹⁶⁰

Actual standard-setting by a commission itself, as opposed to recommendations, is an altogether more difficult proposition. Few river basin commissions have the competence unilaterally to set standards and regulations for control even of surface-water pollution from readily identifiable sources. One long-established exception is the Central Commission for Rhine Navigation, whose regulatory capacity dates back to the 1868

153. Great Lakes Water Quality Agreement of 1978, *supra* note 59.

154. See IJC FIRST BIENNIAL REPORT, *supra* note 136; IJC SECOND BIENNIAL REPORT, *supra* note 44; and WATER QUALITY BOARD REPORT, *supra* note 95.

155. Great Lakes Water Quality Agreement of 1978, *supra* note 59, art. VII, Sec. 1(c).

156. IJC SECOND BIENNIAL REPORT, *supra* note 44, at 8. The substances are pentachlorophenol, polychlorinated dibenzodioxins, phosphorus, cyanide, selenium, mirex, chlorine, lead, microbiological indicators, diazinon, and polycyclic aromatic hydrocarbons.

157. Franco-Swiss Convention of Nov. 16, 1962, *supra* note 89, arts. 3(b) and 3(c).

158. See LAMMERS, *supra* note 52, at 244.

159. Rhine Chemical Convention of 1976, *supra* note 15.

160. LAMMERS, *supra* note 52, at 189-90.

Mannheim Convention.¹⁶¹ It can prohibit the dumping of substances in the river, limit the kinds of materials transported, and set conditions for their transport, loading and unloading: however, its authority is strictly limited to navigation.¹⁶² Another entity with somewhat unusual powers is the Finnish-Swedish Boundary Rivers Commission, whose general function is to control the use of frontier water systems and monitor water conditions, but whose main task is to handle permit applications.¹⁶³ It may refuse permission or establish conditions for activities liable to cause "substantial inconvenience" from pollution.¹⁶⁴ There are more than 50 specific types of installations which may not be constructed without permission, but the Commission's mandate is sufficiently broad to allow it to regulate almost any activity on its own initiative.¹⁶⁵ Control of individual polluters is virtually unique among international river basin entities.

An intermediate stage between merely making recommendations and actually setting standards is more feasible. This is when a commission drafts regulations or standards which become obligatory if not objected to by one of the basin states within a specified period of time.¹⁶⁶

Another advisory function a river basin entity should perform in its ecosystem approach to cross-media pollution is to propose to member governments recommendations for drawing up a new treaty or reinterpreting an old one, or for harmonizing municipal laws and regulations. As noted above,¹⁶⁷ the IJC's reports formed the basis for two new pollution agreements. Similarly, the International Commission for the Protection of the Rhine Against Pollution was instrumental in drafting the chlorides and chemical conventions of 1976.¹⁶⁸ India and Bangladesh established, in 1972, a joint rivers commission for the Ganges-Brahmaputra-Meghna delta.¹⁶⁹ This body's deliberations provided the initial framework of the Ganges Water Agreement of 1977, and all of the members took part in

161. Convention . . . Respecting Navigation of the Rhine, Oct. 17, 1868, 20 MARTENS, NOUVEAU RECUEIL 355, PARRY'S T.S., v. 138, at 167-79. The Commission's authority is based on Arts. XLIII-XLVII.

162. *The Central Commission for Rhine Navigation*, in EXPERIENCES, *supra* note 51, at 266-67. The Commission's regulations do not derive directly from the Mannheim Convention, which imposed only the negative obligation of ensuring that navigation is not impeded. The pollution controls are elaborated in a series of waterway codes of recent date, adopted by resolution by the Central Commission, and then incorporated into the legal system of the contracting states.

163. Agreement Concerning Frontier Rivers, 16 Sept. 1971, Finland-Sweden, 825 U.N.T.S. 191.

164. *Id.* ch. 6, art. 7.

165. *Id.* The list of installations which may not be constructed without permission is contained in Annex C of the Agreement.

166. See Colorado, Tijuana, and Rio Grande Treaty, 1944, United States-Mexico, *supra* note 22, art. 25, prescribes a period of 30 days.

167. See *supra* at note 144.

168. See *supra* note 21; also LAMMERS, *supra* note 52, 171-83.

169. See EXPERIENCES, *supra* note 51, 273, 276.

the negotiations.¹⁷⁰ The International Boundary and Water Commission, United States-Mexico, submits its policy recommendations to the two governments in the form of "minutes." These minutes, when approved, have the force of executive agreements and are, in effect, modifications of the basic 1944 Treaty.¹⁷¹ Such was Minute No. 242 of 1973 for a solution to the salinity problem of the Colorado River.¹⁷²

Interagency Collaboration

The idea of a single entity with responsibility for the protection of an entire international drainage basin against cross-media pollution has a powerful appeal in its holistic approach. One commission—to carry out research and monitoring, to mobilize the interest and support of the basin community, to advise governments, recommend control strategies, and draft instruments of cooperation—would undoubtedly be more effective than two or three. In some very large, multistate basins, however, this may not be possible. Indeed, there is an observable trend toward creating commissions for sub-basins, though these are more often technical bodies established to oversee particular hydraulic works. In the huge La Plata Basin, for instance, there are no fewer than a dozen such agencies, with little or no coordination among them.¹⁷³

However, when it comes to pollution prevention in large basins such as that of the Rhine, a genuine basin approach is emerging and individual bodies may be able to achieve by linkage what they could not achieve separately. As long ago as 1963, the Berne Agreement establishing the International Commission for the Protection of the Rhine Against Pollution propounded the linkage approach.¹⁷⁴ It required the Commission to collaborate with other international commissions created for the Rhine tributaries and estuaries.¹⁷⁵

170. *Id.* at 276. For agreement, see *supra* note 88.

171. Colorado, Tijuana, and Rio Grande Treaty, 1944, United States-Mexico *supra* note 22. On the nature of these "minutes" and the procedures for submitting them, see Friedkin, *supra* note 139, at 206. Each commissioner serves as technical advisor to the department of foreign relations of his government in the negotiation and drafting of boundary and water treaties.

172. *Text of IBWC Minute No. 2421*, ST. DEP'T BULL. 395 (1973), reprinted in INTERNATIONAL GROUNDWATER LAW, *supra* note 28, at 360.

173. See the table in Cano, *Legal and Administrative Tools for River Basin Development*, in LINKOPING SEMINAR, *supra* note 62, 118, 125. On the other hand, some sub-basin commissions have themselves recommended the creation of a single basin entity. For example, the Technical Committee for the hydrometeorological survey project of the upper Nile basin, and the Permanent Joint Technical Commission for Nile Waters (Egypt-Sudan), in the lower basin, have recommended and are studying proposals for the formation of a consolidated nine-state Nile basin commission. See EXPERIENCES, *supra* note 51, at 163, 295-96, and 402.

174. Agreement Concerning the International Commission for the Protection of the Rhine Against Pollution, Apr. 29, 1963, *supra* note 21.

175. *Id.* art. 10. The Protocol of Signature accompanying the Agreement states that the collaboration provided for in art. 10 shall specifically be instituted with the international commissions for the Moselle, Saar (Sarre), and Lake Constance, as well as with the Central Commission for the Navigation of the Rhine, and that the first objective should be a regular and complete exchange of information.

The idea of linking sub-basin entities was given general expression in the 1974 Draft European Convention for the Protection of International Watercourses Against Pollution, which provided for international commissions operating in the same hydrographic basin.¹⁷⁶ This strategy holds promise for entities with a cross-media pollution mandate, and even where formal collaboration cannot be achieved, some form of consultation mechanism should be set up between entities already in place. For instance, Hungarian experts have been invited since 1977 to the sub-committee sessions of the Yugoslav-Austrian Mura River Commission, because the Mura contributes pollution to the Drava, which flows into Hungary.¹⁷⁷ Such informal exchanges—which might take place also between river basin commissions and air pollution commissions—are at least a step toward a true ecosystem framework.

CONCLUSIONS

It is time to stop thinking of the drainage basin as a discrete compartment of the environment labeled water, as if air and land had no part. In fact, jurists may have done the drainage basin a disservice in recent literature and in the pronouncements of international water law bodies by substituting for it the term "watercourse system." Watercourse system is a handy, self-explanatory, indeed necessary, expression if one is considering water use alone. But the drainage basin is more than that. It is an ecosystem, defined by a natural land boundary, with a land area drained by surface streams, underlain by soils and groundwaters, overlain by the atmosphere, and occupied by innumerable forms of life, including man—all components of the environment that interact in ways of which we are still ignorant.

If we are to adopt an ecosystem approach to the problem of transboundary cross-media pollution, and the drainage basin is an ecosystem that has already gained recognition in legislation and treaties as a unit for more than water resources protection or management per se, then we must take a long, hard look at the institutional framework in international drainage basins. Many of the existing institutions in these basins were established at a time when pollution was considered only one of their concerns, and perhaps a minor one at that. But, though it is necessary

176. Draft European Convention for the Protection of International Watercourses Against Pollution, 1974, *supra* note 101, art. 14 (3).

177. See EXPERIENCES, *supra* note 51, at 345. See also Federal Water Pollution Control Act, § 310(a), 33 U.S.C. § 1320(a), which permits, on a basis of reciprocity, public officials of foreign countries, which are or may be adversely affected by pollution originating in the United States, to attend and participate with the same rights as a U.S. state water pollution control agency in public hearings relating to that pollution. A similar provision is contained in the Clean Air Act, § 115, 42 U.S.C. § 7415 (1982). On the equal right of access of foreign officials, see also Tit. B, ¶ 7, of the Annex to OECD, Recommendation of the Council for the Implementation of a Regime of Equal Right of Access and Non-Discrimination in Relation to Transfrontier Pollution, adopted May 17, 1977, OECD Doc. C (77) 28 (Final) of May 23, 1977, reprinted in 16 I.L.M. 977 (1977).

to create entities where none exist at all, it is not necessary to multiply them; in fact, that may be counterproductive.

One issue to emerge from recent discussions of cross-media pollution is that there are too many bodies presiding over an artificially fragmented environment. We need to strengthen the present basin organizations by granting a broader mandate and a truly basin-wide area of jurisdiction. The drainage basin entity, granted appropriate powers, can perform invaluable functions, including: linking information systems, making data available to all its "constituents," advising member governments on legislation and regulations, reporting adverse impacts, and warning of injury to human health and the environment. In effect, it should be a watchdog for the bioregional implementation of principles of international law concerning shared natural resources.

This paper has dealt with the procedural aspects of curbing cross-media pollution. However, even the most efficient organization with a jurisdiction extending over a near-perfect area will have to come to grips with actually controlling that pollution. The best procedures are only half the battle; the other half will depend on the effectiveness of the means and the substantive rules employed by the anti-pollution agencies. There are three possibilities: to put the pollutants where they cannot be transferred to other media; to tighten up the recycling of waste materials so that there are fewer residuals; or, to cease doing or producing things that cause pollution.

The most obvious means, of course, is to find places for safe, permanent disposal of the pollutants. The situation is desperate and this is shown by suggestions that less polluted localities should be sacrificed as dumps for the sake of the over-burdened, more developed ones. For instance, the Environmental Affairs Commissioner of the European Economic Community proposed to the European Parliament that countries having the "ecological capacity" to dispose of radioactive waste should exhibit "community solidarity" and accept such waste from member states unable to dispose of it on their own territory.¹⁷⁸ Naturally, representatives from thinly populated and less industrialized peripheral areas voiced alarm that their "ecological capacity" be used (or, rather, abused) in such fashion. Their concern is the international counterpart of NIMBY ("Not in My Backyard"), the watchword of communities in the United States that refuse to harbor disposal sites for nuclear and other hazardous wastes.¹⁷⁹

178. 7 INT'L ENV'T'L REP. (BNA), CURR. REP. 46-47 (1984).

179. See, e.g., the map of potential nuclear waste sites in mostly rural areas of 15 states in 2 U.S. WATER NEWS 12 (No. 9, Mar. 1986). However, a decision by the 5th Circuit Court of Appeals on Nov. 1, 1985, suggests that even if communities succeed in keeping out nuclear waste dumps, they may not be able to exclude other hazardous materials. The Court ruled that the national interest in the safe disposal of hazardous materials outweighed the wishes of towns and counties to reject a

This approach, of course, poses a host of legal, political and ethical questions, including the problem of the right to maintain existing environmental well-being in some areas as against the right to development in others. It may be that, in accordance with the tenets of utilitarian ethics, the happiness of the greater number will eventually prevail. There is little doubt, however, that such relocation of wastes, if undertaken on a global scale, would have to be preceded by far-reaching changes in the international system of independent and sovereign states. This is underscored by the fact that the proposals noted above, tentative as they are, came from within the European Economic Community, whose avowed aim is eventual political integration.

Tightening the rules for recycling waste materials would seem to entail fewer changes in present political systems and, therefore, might be more palatable generally—especially since it would be in keeping with the prevalent faith in the omnipotence of technology and the virtue of development. In the first place, however, it is not at all certain that advances in technology can keep recycled wastes from eventually coming back to pollute, any more than a juggler can keep a set of plates in the air forever. Second, the costs of recycling and the very comprehensive regulation needed would entail more drastic political and economic changes than we may be willing to face and prepare for. There is, of course, a third option: to stop expanding numerically and economically, so that we pollute less. But is it a genuine option? Can we maintain our civilization without growth?

Notwithstanding the difficulties of dealing effectively with cross-media pollution, some measures will have to be undertaken if our civilization is to remain free of the threat of burial under its own refuse. We can expect these measures to be reluctantly, hesitantly and painfully applied. The adoption of an effective institutional framework may make painful decisions more palatable when they can no longer be avoided. At best it can help to solve the problem: at the very least it can buy time.

site. The decision overturned an ordinance adopted by St. James Parish in Louisiana to prohibit the treatment, storage and disposal of PCBs (polychlorinated biphenyls) within the parish. *Rollins Environmental Services (FS), Inc. v. Parish of St. James*, 775 F.2d 627 (5th Cir. 1985). Rollins, a Delaware corporation, had developed a national system of toxic waste disposal facilities and sought to locate a processing plant in St. James Parish.