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Transboundary Toxic Pollution and the Drainage Basin Concept

If one were to proclaim at any international water law conference today that the Harmon Doctrine¹ is alive and well and widely practiced, there would be a general outcry of horror and disbelief. What about limited territorial sovereignty, *voisinage*², *neminem laedere*³, equitable utilization, the drainage basin concept, abuse of rights, management of shared natural resources, and all the other principles of international water law that have been enunciated and developed over the past three-quarters of a century? Yet, in effect, many upper riparians in international drainage basins continue to dispose of their municipal, industrial, and agricultural wastes as they always have done, without regard to the quality of shared surface and groundwaters and without regard either to treaty obligations or to the precepts of international law.

A decade ago the Danube River in Europe was polluted in all its reaches, pollution of the Detroit and Niagara rivers in North America imperiled the citizens of both the United States and Canada, and the Rhine River in Europe had become the world's biggest sewer.⁴ After ten years, several treaties,⁵ and many pronouncements of international bodies⁶ on what

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1. The Harmon Doctrine is named after U.S. Attorney-General Harmon who, in 1895, gave his opinion in the U.S.-Mexico dispute over diversion of the waters of the Rio Grande, that under international law the United States had the right to divert any waters inside its frontiers in the absence of treaty obligations. 21 OP. ATT'Y GEN. 274, at 280-83 (1895). Known also as the absolute sovereignty theory, the expression has since been applied to almost any form of highhanded conduct or declaration of views by an upper riparian state toward a lower riparian on an international waterway.

2. *Voisinage* is the principle of neighborliness (sometimes translated as neighborship) in international water law which creates mutual legal obligations between states. A term widely used by European writers on water law, it is discussed by J. Andrassy in his *Les Relations Internationales de Voisinage*, 11 RECUEIL DES COURS (ACADEMIE DE DROIT INTERNATIONAL) 77-182 (1951).

3. "To injure no one," from the Roman law precepts "to live honorably, to injure no one, to give to every man his own." ULPIAN, DIGEST I.1.10, quoted in translation in G. SABINE, A HISTORY OF POLITICAL THEORY 167 (4th ed. 1973).

4. Utton, *International Water Quality*, in L. TECLAFF & A. UTTON, INTERNATIONAL ENVIRONMENTAL LAW 154 (1974).

5. E.g., The Rhine Chlorides Convention, Dec. 3, 1976, 16 I.L.M. 265 (1977); the Rhine Chemical Convention, Dec. 3, 1976, 16 I.L.M. 242 (1977); and the Great Lakes Water Quality Agreement of 1978, United States-Canada, 30 U.S.T. 1384, T.I.A.S. 9257. There have been no treaties with pollution provisions concerning the Danube within this period. For treaties with pollution provisions concerning other international rivers, see the Appendix to N. Ando's chapter, *The Law of Pollution Prevention in International Rivers and Lakes*, in THE LEGAL REGIME OF INTERNATIONAL RIVERS AND LAKES 331, 358-70 (R. Zacklin & L. Caflisch eds. 1981) [hereinafter cited as LEGAL REGIME].

6. Asian-African Legal Consultative Committee, Draft Proposition on the Law of International

should be done about pollution, these and other international rivers remain highly polluted. The rivers may be slightly improved in some respects,⁷ but are more endangered in others.⁸ There has been a tendency to deal with contamination of international rivers and lakes in an ad hoc and localized fashion. The very term "transboundary pollution" has taken on a local connotation and denotes specific episodes and circumscribed areas of water quality impairment. Problems have been dealt with by state governments, by communal authorities, and by the courts as they arise and become acute, without reference to any broader context of water quality management.⁹ Groundwater, in international drainage basins, has been largely ignored unless the groundwater basins are actually intersected by a frontier and are afflicted with contamination requiring an urgent remedy.¹⁰ Here, again, the term "transfrontier pollution" has acquired a very limited meaning.

There are several reasons for this ad hoc, localized treatment of water pollution and for the continuing de facto "Harmon Doctrine" approach despite lip service paid to principles of international water law. Inter-

Rivers, Proposition VIII (1973), text in D. CAPONERA, *THE LAW OF INTERNATIONAL WATER RESOURCES* (FOOD AND AGRICULTURE ORGANIZATION LEGIS. STUDY NO. 23) 201 (1980) [hereinafter cited as *FAO LEGIS. STUDY NO. 23*]; Institute of International Law, Resolution on the Pollution of Rivers and Lakes and International Law, Athens, 12 September 1979, text in *id.* at 282; Organisation for Economic Co-operation and Development (OECD), Conference on Security and Cooperation in Europe, Final Act, Helsinki, 1 Aug. 1975 (Water Pollution Control and Fresh Water Utilization), excerpted text in *id.* at 199; Organisation for Economic Co-operation and Development (OECD), Recommendation of the Council on Water Management Policies and Instruments, Paris, 5 Apr. 1978, text in *id.* at 192; Organisation for Economic Co-operation and Development (OECD), Recommendation of the Council on Principles Concerning Transfrontier Pollution, Paris, 14 Nov. 1974, text in *id.* at 181; Third Report on the Law of the Non-Navigational Uses of International Watercourses, by Stephen M. Schwabel, Special Rapporteur, International Law Commission, Thirty-fourth Session, 1982, U.N. Doc. A/CN.4/348.

7. Phosphorus concentrations in the Great Lakes have been brought under control. INTERNATIONAL JOINT COMMISSION, FIRST BIENNIAL REPORT UNDER THE GREAT LAKES WATER QUALITY AGREEMENT OF 1978 3 (1982) [hereinafter cited as *IJC FIRST BIENNIAL REP.*].

8. Dieldrin levels, for instance, have remained unchanged or have increased in the Great Lakes. *Id.* at 3. The Rhine is still described as a "sewer for the chemical industry." Kamminga, *Who Can Clean Up the Rhine*, in *LEGAL REGIME*, *supra* note 5, at 371.

9. E.g., the long-standing disagreement between neighboring Belgian and French local authorities over pollution of the Espierre River. See Dellos & Lentaker, *The Espierre Problem: A Case of Transfrontier Pollution*, in ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, ENVIRONMENTAL POLLUTION IN FRONTIER REGIONS 290-313 (1979). A similar dispute arose over the pollution of the Mur River in Yugoslavia by discharge of sludge from Austrian hydropower stations in 1956. See Handl, *State Liability for Accidental and Transnational Environmental Damage by Private Persons*, 74 AM.J. INT'L L. 546 (1980). An example of recourse to the courts was the so-called Reinwater case brought by Dutch horticulturalists against the French Mines de Potasse d'Alsace over pollution of the Rhine River. *Handelswekerij G.J. Bier and Stichting Reinwater v. Mines de Potasse d'Alsace*, decided by the District Court (Arrondissements-Rechtbank) of Rotterdam, May 12, 1975, French translation in 1 REV. JURID. DE L'ENVIRONNEMENT (1976), English Summary in 22 NETH. INT'L L. REV. 203 (1975). For a discussion of this case, see Sand, *The Role of Domestic Procedures in Transnational Environmental Disputes*, in ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, LEGAL ASPECTS OF TRANSFRONTIER POLLUTION 146 (1977), at 155-58.

national river entities are primarily consultative bodies with weak future planning machinery and possess no power to make binding and enforceable decisions. There is also a lack of specific and comprehensive multinational or binational pollution treaties as opposed to general treaties which merely contain some provisions on pollution prevention.¹¹ Few, very few, treaties specifically mention or include groundwater.¹² In a number of treaties the extent of protecting water quality, especially groundwater quality, can be ascertained only by construing together separate references to frontier waters, water economy, water quality, groundwater, and pollution, in a kind of shopping list.¹³ Underlying all of these factors is the reluctance of states to yield sovereign control over resources within their boundaries to any international form of administration. Nearly two decades ago the establishment of supranational commissions was considered utopian¹⁴ and time has not yet disabused this prognostication.

What, then, has happened to the river basin as a unit of water management, the unit given official endorsement by the United Nations¹⁵ and embodied in treaties concerning some of the world's largest rivers and lakes,¹⁶ as *the* most suitable operative area of international water administration. Is the river basin an unsuitable unit for purposes of water quality control? Is the basin concept (oh treason!) acceptable for building dams and hydropower plants in underdeveloped countries, but unacceptable to curb the "wastefulness" of industrial, agricultural, and urban activities in developed countries? It would not seem so from the pronouncements of international bodies such as the International Law Association (in its Helsinki Rules),¹⁷ the Organisation for Economic Co-operation and De-

10. See generally Teclaff & Teclaff, *Transboundary Groundwater Pollution*, in INTERNATIONAL GROUNDWATER LAW 77 (L. Teclaff & A. Utton, eds. 1981).

11. See, e.g., the list of treaties appended to N. Ando's article in LEGAL REGIME, *supra* note 5.

12. Teclaff & Teclaff, *supra* note 10, at 90-95.

13. *Id.*

14. Ely & Wolman, in THE LAW OF INTERNATIONAL DRAINAGE BASINS 145 (A. Garretson, R. Hayton & C. Olmstead eds. 1967).

15. 21 U.N. ESCOR. ANNEX at 6, U.N. Doc. E/2827 (1956); see also L. TECLAFF, THE RIVER BASIN IN HISTORY AND LAW 201 (1967).

16. E.g. Agreement Concerning a Preliminary Economic Study of the Joint Utilization of the Waters of Lake Titicaca, Feb. 19, 1957, Bolivia-Peru, text in U.N. LEGISLATIVE SERIES, LEGISLATIVE TEXTS AND TREATY PROVISIONS CONCERNING THE UTILIZATION OF INTERNATIONAL RIVERS FOR OTHER PURPOSES THAN NAVIGATION at 168, U.N. Doc. ST/Leg/Ser. B/12 (1964) [hereinafter cited as U.N. LEGIS. SER.]; Statute of the Committee for Co-Ordination of Investigations of the Lower Mekong Basin, Oct. 31, 1957, *id.* at 267; Agreement for the Full Utilization of the Nile Waters, Nov. 8, 1959, Sudan-United Arab Republic, *id.* at 143; and Agreement on East Pakistan Border Disputes, 362 U.N.T.S. 4, text also in U.N. LEGIS. SER. at 300.

17. Consistent with the principle of equitable utilization of the waters of an international drainage basin, a State:

- (a) must prevent any new form of water pollution or an increase in the degree of existing water pollution in an international drainage basin which would cause substantial injury in the territory of a co-basin State, and
- (b) should take all reasonable measures to abate existing water pollution in an inter-

velopment (OECD),¹⁸ the Economic Commission for Europe (ECE),¹⁹ and the International Law Commission.²⁰ Indeed, their persistent faith in the river basin concept is beginning to be vindicated in the developed countries because of the increasing threat of toxic pollution.²¹

Toxic pollution is not an impairment of water quality which can be cured by ordinary physical and chemical treatment and disinfection. The parametric values of temperature, pH, dissolved oxygen, and microbiological parameters which hitherto have formed the standards for water quality control²² are of little relevance to pollution which is long-lasting, bio-accumulative, often irreversible, and absolutely deadly to living organisms. Single plumes of these toxic substances can be traced over great

national drainage basin to such an extent that no substantial damage is caused in the territory of a co-basin State.

INTERNATIONAL LAW ASSOCIATION, REPORT OF THE FIFTY-SECOND CONFERENCE, Helsinki, 14-20 August 1966, 484-532 (1967), The Helsinki Rules on the Uses of the Waters of International Rivers, Art. X (1). Text also in FAO LEGIS. STUDY No. 23, *supra* note 6, 293, at 294. See also Rules on Water Pollution in an International Drainage Basin (by Prof. C.B. Bourne, Rapporteur) in INTERNATIONAL LAW ASSOCIATION, MONTREAL CONFERENCE, REPORT OF THE COMMITTEE ON INTERNATIONAL WATER RESOURCES LAW (1982), at 4-22. These draft articles are intended to elaborate the Helsinki Rules.

18. "River basin oriented management should be encouraged as providing an effective solution to water problems beyond the scope of local management, and where advisable this should be considered in an international framework," and "[a]n operational structure, organized on a hydrological river basin system is particularly favourable for water management, because the resource being managed has rationally defined hydrological boundaries; water supply and demand can be more realistically balanced, and pollution controlled more effectively." Organisation for Economic Co-operation and Development, Recommendation of the Council on Water Management Policies and Instruments, *supra* note 6, para. 4 and Appendix, para. 4.

19. U.N. Economic Commission for Europe, Recommendation to ECE Governments concerning River Basin Management (Geneva, 1971), Preamble, text in FAO LEGIS. STUDY No. 23, *supra* note 6, at 150: "On the basis of existing experience it appears that the improvement of water resource management may best be attained through the establishment of appropriate regional organs which operate in the framework of natural river basins, sub-basins or groups of smaller basins. . . ." Also Committee on Water Problems, Report of the Thirteenth Session, U.N. Doc. ECE/WATER/28, Annex I, Draft Decision on International Co-operation on Shared Water Resources, which invited member governments to "promote and strengthen international cooperation through international river commissions . . . as well as, at a second stage, if necessary, to take steps for the possible elaboration of a joint plan for the entire basin." The Decision was adopted by the ECE at its 37th session (Mar.-Apr. 1982). International Rivers and Lakes (Newsletter, U.N. Dep't of Technical Co-Operation for Development) 6-7 (No. 2, Dec. 1982).

20. See the extensive and very informative section on environmental protection and pollution in Third Report on the Law of the Non-Navigational Uses of International Watercourses, *supra* note 6, at 157-236, especially the proposed Article 10 at 220-22.

21. For a well-informed study of the ecology of toxic substances, see MANAGEMENT OF TOXIC SUBSTANCES IN OUR ECOSYSTEMS: TAMING THE MEDUSA (B.W. Cornaby ed. 1981).

22. See, e.g., Organisation for Economic Co-operation and Development, Recommendation of the Council on Water Management Policies and Instruments, *supra* note 6, Appendix, para. 8: "Water quality parameters have hitherto mainly been limited to measurements of oxidisable matter (BOD, COD) and suspended solids. These measurements, although very useful in the past, are now recognized as being insufficiently specific to monitor the increasing quantity of variety of pollutants e.g., toxic and persistent pollutants. . . ." *Id.*

distances for many years.²³ The polluted plumes often affect groundwater to a greater extent than surface water bodies because of long-established industrial practices of injecting toxins into deep wells for disposal, pumping toxins into abandoned mine workings, or simply dumping pollutants on the ground. Groundwaters do not have the capacity of surface waters for regeneration; once contaminated, groundwaters may remain polluted for hundreds of years. The problem has reached crisis proportions in the United States, where it is estimated that half the nation's population is dependent upon underground sources for its drinking water supply²⁴ and where episodes such as Love Canal, Valley of the Drums, and Times Beach have focused public attention upon the perils of unregulated waste disposal.²⁵ Various toxic substances which include long-range airborne heavy metals, pesticides sprayed upon watershed forests, industrial effluent, municipal sewage, and vessel discharges in the estuary, may impact the entire basin and, as the toxins accumulate downstream, can be devastating to the environment.

Toxic pollution, moreover, reflects the failure of traditional pollution control measures such as dilution or receiving water standards.²⁶ Current water pollution policies embodied in treaties and legislation now widely recognize that certain substances should never be permitted to enter the aquatic environment.²⁷ Toxic pollution is frequently caused by land use

23. Toxic contamination originating from the Niagara River, for instance, affects water quality all along the southern shore of Lake Ontario, and water from the Niagara spends an average of 15 years in the lake. *THE RAVAGED RIVER: TOXIC CHEMICALS IN THE NIAGARA* (A Study by the Toxics Project of New York Public Interest Research Group, Inc.) 6 (1981); see also COUNCIL ON ENVIRONMENTAL QUALITY, ELEVENTH ANNUAL REPORT 109-11 (1980).

24. According to figures assembled by the Environment and Natural Resources Subcommittee of the House Government Operations Committee, as reported in *N.Y. Times*, July 26, 1983, A15, col. 1.

25. For example, a voluminously documented account of the extent and nature of groundwater contamination from reckless waste disposal is contained in *TOXIC CHEMICAL CONTAMINATION OF GROUND WATER: EPA OVERSIGHT, HEARINGS BEFORE A SUBCOMM. OF THE HOUSE COMM. ON GOVERNMENT OPERATIONS*, 96th Cong., 2d Sess. (1981).

26. See, e.g., Organisation for Economic Co-operation and Development, Recommendation of the Council on Water Management Policies and Instruments, *supra* note 6, Appendix para. 8:

In certain countries parameters for effluent discharge are still specified only in terms of concentrations (e.g. grams of pollutants per litre or cubic metre of effluent). This is useful in preventing a 'shock effect' in rivers where discharges might otherwise exceed toxicity limits. Nevertheless, this is clearly insufficient and encourages easy circumvention of pollution control regulations by diluting the effluent.

Id.

27. It has become common to divide hazardous pollutants into two lists, "black" for the most toxic and "grey" for those less so. "Black" lists of prohibited substances are contained in, e.g., Protocol for Protection of the Mediterranean Sea Against Pollution from Land-Based Sources, May 17, 1980, text in 19 I.L.M. 869 (1980); Convention for the Protection of the Rhine Against Chemical Pollution, Dec. 3, 1976, 16 I.L.M. 242 (1977); Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter, Nov. 13, 1972, 11 I.L.M. 1291 (1972); Convention for the

(as opposed to water use) activities and, unlike nearly all other causes of water pollution, these land based activities are beyond the jurisdiction of traditional water management agencies such as mainstem river and boundary waters commissions. Hence, some form of institutional framework capable of coping with the menace and an operational area sufficiently extensive to encompass all the sources of contamination are urgently needed. The drainage basin fits the requirements of an operational area, but the institutional framework is still lacking. Nevertheless, since the problems of toxic pollution have gained wide attention—and this has happened only within the past decade—it is possible to trace a process of enlargement both in the areal jurisdiction and the powers of transfrontier water management entities. Two of the world's most important and most heavily industrialized river basins, the Rhine River and the Great Lakes–St. Lawrence River, exemplify this enhancement of the drainage basin concept.

In the Rhine River basin some mechanisms for control of pollution have been in existence since the last century.²⁸ The Central Commission for Navigation of the Rhine, moreover, regulates vessel transport of hazardous substances on the mainstem.²⁹ The first general entities for pollution control did not come into being until the 1960s, and include the International Commission for Protection of Lake Constance Against Pollution (1960),³⁰ the International Commission for Protection of the Moselle (1961),³¹ the International Commission for Protection of the Waters of the Saar (1961),³² and the International Commission for Protection of the Rhine Against Pollution (1963).³³ Although their collective jurisdiction

Prevention of Marine Pollution by Dumping from Ships and Aircraft (Oslo Convention), Feb 15, 1972, 11 I.L.M. 262 (1972); Baltic Sea Marine Environment Convention, Mar. 22, 1974, 13 I.L.M. 546 (1974); and Paris Convention on Marine Pollution from Land-Based Sources, June 4, 1974, 13 I.L.M. 352 (1974).

28. See the list of these early treaties concerning fisheries in Ando, *supra* note 5, at 366-67.

29. The Central Commission, which was originally set up by the Congress of Vienna (1815), is now based on the Convention of Mannheim (1868), arts. XLIII-XLVII. Convention . . . Respecting Navigation of the Rhine, Oct. 17, 1868, 20 Martens, *Nouveau Recueil* 355, Parry's T.S., v. 138, at 167-79.

30. Established by the Convention Concerning the Protection of Lake Constance Against Pollution, Oct. 27, 1960, Baden-Wurtemberg, Bavaria, Austria, and Switzerland, text in U.N. LEGIS. SER., *supra* note 16, at 348, and in 1 *Feuille Federale* (Suisse) 1171 (1961).

31. Protocol Concerning the Construction of an International Commission for the Protection of the Moselle Against Pollution, Dec. 20, 1961, Federal Republic of Germany, France, and Luxembourg, text in 2 INTERNATIONAL ENVIRONMENTAL LAW—MULTILATERAL TREATIES 961:94/11-94/12 (W.E. Burhenne ed.).

32. Protocol Concerning the Construction of an International Commission for the Protection of the Saar Against Pollution, Dec. 20, 1961, Federal Republic of Germany-France, text in [1976] 2 Y.B. INT'L L. COMM'N, pt. 2, 185. On the structure and functions of this commission, see ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, TRANSFRONTIER POLLUTION AND THE ROLE OF STATES 148-49 (1981).

33. By the Berne Agreement of April 29, 1963, between the Federal Republic of Germany, France, Luxembourg, Netherlands, and Switzerland. French text in 69 *Revue Generale de Droit International Public* 897 (1965); also in 2 *FEUILLE FEDERALE* (Suisse) 1510 (1963).

covered the Rhine mainstem, two major tributaries and Lake Constance, these bodies were not basin entities and did little more than proffer recommendations for water quality objectives because of their limited institutional framework.³⁴

It was not until the 1970s that action on toxic substances began to be taken within a basin context. One of the precursors to such action was the interministerial conference called by the Netherlands (lowermost riparian of the Rhine) in October 1972. The International Commission for the Protection of the Rhine Against Pollution was instructed to draw up, *inter alia*, a convention on chemical pollution.³⁵ The Council of Europe's Draft European Convention for the Protection of International Watercourses Against Pollution, produced at Strasbourg in February 1974,³⁶ prohibited (or restricted) the discharge into waters of international hydrographic basins any dangerous or harmful substances listed in the Convention's Appendix II.³⁷ The Strasbourg Convention, moreover, provided that where two or more international commissions exist for protection of the international watercourses of the same hydrographic basin, the interested contracting parties coordinate their activities.³⁸ If adopted, this Convention would become applicable to the entire Rhine basin (among other European river basins) by virtue of the provision on discharge of toxic substances and the provision requiring coordination of the basin's commissions. The activities of the commissions, however, are confined chiefly to the traditional advisory, monitoring, and information gathering role.³⁹

But the Convention remains a draft. The European Economic Community, however, took up the cause and adopted a directive which is binding upon its members and effected by means of approximation of domestic legislation. The Council Directive of May 4, 1976, on Pollution Caused by Certain Dangerous Substances Discharged into the Aquatic Environment⁴⁰ establishes a "black list" of substances considered most toxic to the environment (List I)⁴¹ and a "grey list" of those considered

34. See, e.g., Kamminga, *supra* note 8, at 373.

35. *Id.*

36. Council of Europe, Draft European Convention for the Protection of International Watercourses Against Pollution. Feb. 1974, text in [1974] 2 Y.B. INT'L L. COMM'N PT. 2, 346-49; excerpted text also in FAO LEGIS. STUDY NO. 23, *supra* note 6, at 74.

37. *Id.* Art. 5 (1).

38. *Id.* Art. 14 (3).

39. *Id.* Art. 15.

40. 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. (No. L 129) 23 (1976) [hereinafter cited as Council Directive of 4 May 1976].

41. List I in the Annex to the Directive comprises the following families and groups of substances: organohalogen compounds and substances which may form such compounds in the aquatic environment; organophosphorus compounds; organotin compounds; substances possessing proven carcinogenic properties in or via the aquatic environment; mercury and its compounds; cadmium and its compounds; persistent mineral oils and hydrocarbons of petroleum origin; and persistent synthetic substances which may float, remain in suspension or sink, and which may interfere with any use of the waters.

somewhat less hazardous (List II).⁴² Member states are required to eliminate pollution by List I substances and to reduce pollution by List II substances.⁴³ Member states, moreover, were required to apply a system of zero-emission to discharges of List I substances into groundwater,⁴⁴ at least until the implementation of a separate directive on groundwater.⁴⁵ The EEC Directive brought basin-wide control of toxic pollution somewhat nearer for the Rhine—with one notable exception. Switzerland is not a member of the EEC, so the whole upper basin of the Rhine above Basel, therefore, remained outside the scope of the directive.

Shortly afterward, however, another instrument was brought forth to enhance the basin concept. The EEC Directive of May 4, 1976, was based on three documents: the Paris Convention for the Prevention of Marine Pollution from Landbased Sources;⁴⁶ the draft European Convention for the Protection of International Watercourses Against Pollution;⁴⁷ and the draft Convention for the Protection of the Rhine Against Chemical Pollution. This last was signed at Bonn on December 3, 1975⁴⁸ and, for the first time, the Rhine basin was specifically mentioned. Like the EEC Directive, the convention establishes a black and a grey list of substances according to degree of hazard (Annexes I and II). Pollution from Annex I substances must be gradually eliminated "*from the surface waters of the Rhine basin*,"⁴⁹ whereas pollution from Annex II substances is merely to be reduced in "*Rhine waters*."⁵⁰ The parties to the convention, moreover, are required to provide a national inventory of discharges into the surface waters of the Rhine basin that may contain Annex I substances to which emission standards are applicable,⁵¹ and to communicate the elements of their inventory to the International Commission for Protection of the Rhine Against Pollution.⁵² Discharges into surface waters of the Rhine basin that *may* contain one of the Annex I substances are subject

42. List II comprises List I substances for which limit values have not been determined; 20 metalloids and metal compounds; biocides and their derivatives not appearing in List I; substances which have a deleterious effect on the taste and/or smell of products for human consumption derived from the aquatic environment; toxic or persistent organic compounds of silicon; inorganic compounds of phosphorus; nonpersistent minerals oils and hydrocarbons; cyanides and fluorides; and substances which have an adverse effect on the oxygen balance, particularly ammonia and nitrites.

43. Council Directive of 4 May 1976, *supra* note 40, Art. 2.

44. *Id.* Art. 4 (1).

45. This separate directive was promulgated in 1979. European Economic Community, Council Directive of Dec. 17, 1979, on the Protection of Groundwater Against Pollution Caused by Dangerous Substances, O.J. EUR. COMM. (No. L 20) 43 (1980).

46. Convention for the Prevention of Marine Pollution from Land-Based Sources (Paris Convention), *supra* note 27.

47. Council of Europe, Draft European Convention for the Protection of International Watercourses Against Pollution (1974), *supra* note 36.

48. Convention on the Protection of the Rhine Against Chemical Pollution, Dec. 3, 1976, *supra* note 27.

49. *Id.* Art. 1 (1a).

50. *Id.* Art. 1 (1b).

51. *Id.* Art. 2 (1).

52. *Id.* Art. 2 (2).

to authorization and emission standards⁵³ in accordance with concentration limits proposed by the Commission on the basis of toxicity, persistence and bioaccumulation, and the best technical means available.⁵⁴

While the convention is still a long way from a thorough basin approach, the recognition that toxic pollution requires a basin approach is evident in the distinction drawn between the most dangerous Annex I substances and the less deadly, though hazardous, Annex II substances. The Annex I restrictions, however, apply only to *discharges* to surface waters of the basin. The possibility of pollution from land use activities and the contamination of groundwater are dealt with summarily and as an afterthought. The contracting parties are required to take measures guaranteeing that the storage of Annex I and Annex II substances poses no danger of pollution for Rhine waters; presumably the requirement would also apply to tributary basins from which pollutants could reach the mainstem.⁵⁵ "If necessary" the International Commission shall propose underground water protection measures to prevent the pollution of the Rhine waters by Annex I and Annex II substances.⁵⁶ Again, this provision *might* apply to underground waters somewhere in the basin which, by interconnection with surface waters, eventually contribute to mainstem pollution. But the convention does not mention the word "basin" nor does it refer to the protection of groundwaters for their own sake.

The Rhine Chemical Convention would be a weak instrument if it were not for an element that has been added to stiffen its institutional framework. One of the parties to the Convention is the European Economic Community, which is also a member of the Rhine Commission.⁵⁷ However, the input of the European Community, whether acting on its own initiative via Council directives or acting within the framework of the Chemical Convention, has so far been limited for several reasons. First, the European Community's directives are new and only now coming into force.⁵⁸ Secondly, its role as a member of the Rhine Commission has not

53. *Id.* Art. 3 (1 and 2).

54. *Id.* Art. 5.

55. *Id.* Art. 7 (1).

56. *Id.* Art. 7 (2).

57. The European Community, which is a party to the Rhine Chemical Convention, was made a member of the Rhine Commission by a separate agreement signed on the same day as the Chemical Convention. Additional Agreement to the Agreement, signed in Berne, 29 April 1963, Concerning the International Commission for the Protection of the Rhine Against Pollution, Dec. 3, 1976. Unofficial English translation in O.J. EUR. COMM. (No. L 240) 20 (1977).

58. For example, the 1976 framework Directive on the Discharge of Dangerous Substances into European Community Waters (*see supra* note 39) is still only in the preliminary stages of being implemented by directives limiting the discharge of individual substances. Discharge limits proposed for mercury, aldrin, dieldrin, endrin and cadmium are the first in what is expected to be a long list of such proposals, for the Commission has drawn up a further list of 129 substances for potential control, in addition to those listed in the framework directive. *See* 6 INT'L ENV'T REP. (BNA), CURR. REP. 3-4 (Jan. 12, 1983), and sources cited therein.

been sharply defined and has been criticized as potentially negative.⁵⁹ But "it must be realized that the Rhine cannot be cleaned up by either the European Community or the International Commission alone. What is required is a strategy by which the weak points of both institutions can be minimized and their strong points fully utilized."⁶⁰

The basin approach begins tentatively to emerge in the Rhine because of the fear of toxic pollution and because of the multiplication of entities covering the basin's territory, its waters, and the activities within the basin. In the Great Lakes-St. Lawrence Basin the spur is the same—a deadly danger. The Great Lakes system is many times larger and ecologically more diverse than that of the Rhine; it is the world's largest freshwater inland lakes system, and accounts for twenty per cent of the world's total freshwater supply.⁶¹ The drainage area totals 755,200 sq. km, as opposed to 160,000 sq. km for the Rhine catchment, yet the estimated populations of the two are strikingly similar in size: 37 million for the Great Lakes basin, 40 million for the Rhine basin.⁶² The shorelines of the Great Lakes system, although very densely populated and heavily industrialized in the Detroit and Niagara river sectors, are not as fully developed overall as those of the Rhine nor are the frontier waters of the Great Lakes basin as intensively used throughout their length. The relationship in international water law of the two basin states of the Great Lakes-St. Lawrence River is one of contiguity, rather than of succession which characterizes the relationship of the five states of the Rhine. Despite these differences between the Great Lakes and the Rhine, the time scale and the progression toward a basin approach have been very similar. Although the achievements with respect to an institutional framework are more striking and offer greater promise for the future, the difficulties encountered in imposing a basin strategy for pollution control upon polluters and political entities in the Great Lakes basin loom just as large as in the Rhine basin.

Until the 1970s pollution problems were dealt with mostly on an ad hoc basis. The International Joint Commission (IJC), however, was already in place as an entity with a long tradition of effective service to the basin states and with a mandate sufficiently broad to encompass

59. Kamminga, *supra* note 8, at 380.

60. *Id.* 383-84.

61. ENVIRONMENTAL MANAGEMENT STRATEGY FOR THE GREAT LAKES SYSTEM, FINAL REPORT TO THE INTERNATIONAL JOINT COMMISSION, FROM THE INTERNATIONAL REFERENCE GROUP ON GREAT LAKES POLLUTION FROM LAND USE ACTIVITIES (PLUARG) 1 (1978) [hereinafter cited as PLUARG 1978].

62. For the Great Lakes basin area and population, see PLUARG 1978, *id.* at 1; for the Rhine, see van der Veen, *The significance of the river Rhine for the environment and for public health*, in R. HUETING, C. VAN DER VEEN, A. KISS, & H. JESSURUN D'OLIVEIRA, RHINE POLLUTION: LEGAL, ECONOMIC AND TECHNICAL ASPECTS 28-58 (1978), at 29.

pollution.⁶³ The IJC was not created specifically in response to need, as was the International Commission for the Rhine, or the commissions for the Saar, the Moselle and Lake Constance. In 1964 the two basin states requested the IJC to investigate the extent of pollution and recommend remedial measures in the lower Great Lakes (Erie and Ontario) and the international section of the St. Lawrence.⁶⁴ The first instrument for pollution prevention and control, the 1972 Great Lakes Water Quality Agreement,⁶⁵ arose out of the 1964 Reference and the IJC's response in 1970.⁶⁶ This agreement was primarily concerned with the phosphorus load and consequent eutrophication of the lower lakes. Nevertheless, the Agreement contained references to the basin, and to toxic substances.

The Agreement contains a crucial definition of the Great Lakes System as "all of the streams, rivers, lakes and other bodies of water that are within the drainage basin of the St. Lawrence River at or upstream from the point at which this river becomes the international boundary. . . ."⁶⁷ However, the general and specific water quality objectives concern only the boundary waters.⁶⁸ Other programs directed toward the achievement of these objectives include:

1. Requirements for the substantial elimination of discharges of mercury and other toxic heavy metals;⁶⁹
2. Requirements for the substantial elimination of discharges of toxic persistent organic contaminants;⁷⁰
3. Measures for the control of pest control products, especially those judged to have long-term deleterious effects;⁷¹
4. Measures for the abatement and control of pollution from oil and hazardous polluting substances.⁷²

63. By virtue of the Boundary Waters Treaty of 1909, United States-Great Britain (Canada), 36 Stat. 2449, T.S. No. 548. Article 7 established the Commission. Article 4 (2) provides that "boundary waters and waters flowing across the boundary shall not be polluted on either side to the injury of health or property on the other." However, the treaty did not give the International Joint Commission (IJC) any specific powers or provide procedures for implementing this provision. Such all-embracing prohibitions on pollution without concomitant powers of enforcement were common also in domestic legislation of that period.

64. INTERNATIONAL JOINT COMMISSION, REPORT, POLLUTION IN THE GREAT LAKES BASIN FROM LAND-USE ACTIVITIES I (March 1980). [hereinafter cited as LAND-USE ACTIVITIES REP.].

65. 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.

66. INTERNATIONAL JOINT COMMISSION, REPORT, POLLUTION OF LAKE ERIE, LAKE OTARIO AND THE INTERNATIONAL SECTION OF THE ST. LAWRENCE RIVER (1970).

67. Great Lakes Water Quality Agreement (1972), *supra* note 65, Art. I (d).

68. *Id.* Arts. II and III. But Art. V (3) does provide that programs and other measures for pollution control shall also apply to tributary waters "where necessary" for the achievement of quality objectives for boundary waters.

69. *Id.* Art. V (i)(b)(ii).

70. *Id.* Art. V (i)(b)(iii).

71. *Id.* Art. V (i)(d)(i).

72. *Id.* Art. V (i)(e).

The Agreement also expanded⁷³ two areas of concern which were made the subject of separate references for study and recommendations given to the Commission concurrently with the signing of the 1972 Agreement.⁷⁴

Prior to the 1972 Agreement the IJC had been hampered in the matter of pollution prevention and abatement, negatively, by the absence of guidelines in the 1909 Boundary Waters Treaty, and positively, by the Harmon Doctrine reservation of sovereignty embodied in that treaty.⁷⁵ What had been achieved over the years was done virtually despite the treaty, by the parties' willingness to cooperate and to accommodate differences.⁷⁶ The 1972 Agreement, however, gave the Commission specific responsibilities absent from the Treaty for collation, analysis, and dissemination of data relating to water quality (including pollution from tributary waters); for tendering advice and recommendations to the parties and state and provincial governments; for assisting the coordination of joint activities and research; and, most importantly, for making independent verification of data submitted to it.⁷⁷

To implement these functions, the Commission was empowered to establish a Great Lakes Water Quality Board, a Research Advisory Board, a regional office which might be located within the basin, and such other subordinate bodies as might be required to undertake specific tasks.⁷⁸ So, the Upper Lakes Reference Group was established to study and make recommendations regarding the Upper Great Lakes, while the Pollution from Land Use Activities Reference Group (PLUARG) was created to study the impact of pollution on boundary waters from land use activities.⁷⁹ The establishment of PLUARG was especially significant because it shifted the focus from point to non-point sources of pollution and offered potentially the broadest basin capability. PLUARG inventoried land uses and land use activities throughout the basin and, in an innovative approach in public participation, created seventeen citizen consultation panels.⁸⁰

73. *Id.* Art. VI (i)(f).

74. The IJC would make studies and recommendations on pollution of the boundary waters from land use activities and include the Upper Great Lakes (Huron and Superior). See LAND USE ACTIVITIES REP. (1980), *supra* note 64, at 1.

75. Article II of the Boundary Waters Treaty states that "[e]ach of the High Contracting Parties reserves . . . exclusive jurisdiction and control over the use and diversion, whether temporary or permanent, of all waters on its own side of the line which in their natural channels would flow . . . into boundary waters. . . ." Boundary Waters Treaty of 1909, *supra* note 63.

76. According to Graham, this commitment to negotiation "has rendered the Harmon doctrine, whatever its status as a legal doctrine, largely irrelevant on a practical level." Graham, *International Rivers and Lakes: the Canadian-American Regime*, in LEGAL REGIME, *supra* note 5, 3-22, at 19. It is difficult to agree with this assessment.

77. Great Lakes Water Quality Agreement of 1972, *supra* note 65, Art. VI. Independent verification is a unique feature, according to Carroll. J. E. CARROLL, ENVIRONMENTAL DIPLOMACY 132 (1983).

78. Great Lakes Water Quality Agreement of 1972, *supra* note 65, Art. VIII.

79. LAND-USE ACTIVITIES REP., *supra* note 64, at ix and 1-2.

80. *Id.* at ix and 3-4.

Because of a lack of monitoring programs and analytical techniques, many toxic substances were not yet suspected of being a menace to the aquatic environment. For instance, mirex and hexachlorobenzene were the only industrial organic compounds featured in the initial PLUARG study.⁸¹ As a result, however, of the expanded and improved data collection and research functions mandated by the 1972 Agreement, toxic pollution was fast becoming *the* most prominent issue in Great Lakes water quality management.⁸²

The importance of toxic pollution was reflected in the 1978 Great Lakes Water Quality Agreement.⁸³ For the first time the broad context of the basin concept was officially enshrined. The goal of the 1978 Agreement, as set out in the Preamble, is to restore and enhance water quality in the Great Lakes Basin *Ecosystem* by "recognizing that restoration and enhancement of the boundary waters cannot be achieved independently of other parts of the Great Lakes Basin Ecosystem with which these waters interact." The Great Lakes Basin Ecosystem, furthermore, is defined 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 this river becomes the international boundary between Canada and the United States."⁸⁴ An ecosystem approach, as outlined by the IJC, means "adopting a basin-wide, long-term perspective which includes taking account of the impacts of all of man's activities on the natural and socioeconomic systems of the Great Lakes Basin."⁸⁵

The focus on toxic substances control as the primary purpose of the Agreement forms the first item of a three-part agenda: "[t]he discharge of toxic substances in toxic amounts be prohibited and the discharge of any or all persistent toxic substances be virtually eliminated . . ."⁸⁶ Three annexes to the 1978 Agreement specify requirements for the substantial elimination of discharges of persistent toxic substances. Annex I establishes absolute limits for concentrations in water of thirty persistent and non-persistent toxic substances, including pesticides and other compounds which might find their way into water from land use activities. Annex 10 establishes a "black" and a "grey" list (Appendix I and Appendix 2)

81. See PLUARG 1978, *supra* note 61, at 39.

82. For instance, the Upper Lakes Reference Group was discovering the extent of input of toxic substances by deposition from the atmosphere. See Carroll, *supra* note 76, at 134. Public participation and the formation of environmental groups specifically oriented to Great Lakes problems, such as Great Lakes Tomorrow (formed in 1975), also focused on toxic pollution, *e.g.*, a proposed ban on PCBs. *Id.* at 140-41.

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

84. *Id.* Art. I(9)(g).

85. LAND-USE ACTIVITIES REP. *supra* note 64, at xii.

86. Great Lakes Water Quality Agreement of 1978, *supra* note 83, Art. II.

of substances according to their known or potential toxic effects on aquatic and animal life. Annex 12 outlines general principles, programs, and provisions for monitoring research and an early warning system, all aimed to reduce inputs of persistent toxic substances essentially to zero.

The International Joint Commission was given additional wide-ranging powers and responsibilities which reflect the basin and ecosystem approach. The 1972 Agreement and the 1978 Agreement have similar wording on data gathering, analysis, and dissemination, but the 1972 version says "tributary waters,"⁸⁷ whereas the 1978 Agreement refers to "tributary waters and other sources."⁸⁸ The 1972 Agreement refers merely to Great Lakes water quality⁸⁹ research, whereas the 1978 Agreement relates to "research in the Great Lakes Basin Ecosystem."⁹⁰

The 1978 Agreement confirmed and continued to establish institutions to assist the Commission: the Great Lakes Water Quality Board (now officially designated principal advisor to the Commission); the Great Lakes Science Advisory Board, a body of experts to provide advice on research to the Commission and to the Water Quality Board; and the Great Lakes Regional Office, to assist the Commission and the Boards and provide a public information service.⁹¹ The Water Quality Board in turn established a Toxic Substances Committee. The Toxic Substances Committee and the Science Advisory Board had, within two years, produced reports identifying specific concerns, analyzing means of control, and offering recommendations from their different perspectives.⁹² PLUARG had submitted its final report,⁹³ and public hearings on the report were held throughout the Basin. With Love Canal still vividly in people's minds, the Report was criticized for not giving greater weight to toxic substances. PLUARG, nevertheless, specifically recommended that tributary surveillance and sampling programs be expanded to include toxic organic compounds and metals and that solid waste disposal sites, historic and existing, be identified and monitored.⁹⁴

Although the 1972 and 1978 Agreements expanded the parameters of toxic pollution abatement, the role of the IJC and its subordinate bodies remains essentially advisory. Implementation of the policies outlined in

87. Great Lakes Water Quality Agreement of 1972, *supra* note 65, Art. VI.1. (a).

88. Great Lakes Water Quality Agreement of 1978, *supra* note 83, Art. VII.1. (a).

89. Great Lakes Water Quality Agreement of 1972, *supra* note 65, Art. VI.1. (e).

90. Great Lakes Water Quality Agreement of 1978, *supra* note 83, Art. VII.1. (f).

91. *Id.* Art. VIII.

92. INTERNATIONAL JOINT COMMISSION, GREAT LAKES WATER QUALITY BOARD, FIRST REPORT OF THE TOXIC SUBSTANCES COMMITTEE (1980); INTERNATIONAL JOINT COMMISSION, GREAT LAKES SCIENCE ADVISORY BOARD, 1980 ANNUAL REPORT: A PERSPECTIVE ON THE PROBLEM OF HAZARDOUS SUBSTANCES IN THE GREAT LAKES BASIN ECOSYSTEM (1980).

93. PLUARG 1978, *supra* note 61.

94. *Id.* at 7-8.

the 1978 Agreement rests squarely upon the two basin states. There is no possibility of the intervention of a supranational regulatory body, such as the EEC Commission in the Rhine basin. The present state of the Great Lakes, especially in sectors such as the Niagara River,⁹⁵ bears mute witness to the failure of the co-riparians and their political subdivisions of the Great Lakes to fulfill their obligations.⁹⁶ This has led the IJC to conclude that "... the foundations of the present Water Quality Agreement may warrant some reassessment in order to ensure the long term commitment that must reach to the roots of the Great Lakes Basin community and the supporting institutions of government."⁹⁷

In its First Biennial Report under the 1978 Agreement, published in 1982, the Commission scolded the parties for failing to implement an ecosystem perspective as a framework to address international water quality problems.⁹⁸ "Unless the attitudes, perceptions, and values of government officials and all the citizens of the Great Lakes Basin are reasonably consistent with an ecosystem approach," the Commission warned, "implementation of the General and Specific Objectives of the Agreement will be difficult if not impossible to achieve."⁹⁹ The Commission declared that the "sense of drift" was nowhere more apparent than with the issue of toxic pollution and emphasized the absence of an overall Great Lakes Ecosystem strategy for toxic substances control activities that were being carried out under various pieces of legislation among the jurisdictions.¹⁰⁰

A second major cause of concern to the Commission, quite as much as the parties' failure to live up to their obligations, was what the IJC termed "fundamental" weaknesses in institutional arrangements as affecting the IJC's own role.¹⁰¹ Funding was one such arrangement with demonstrable weaknesses, and the Commission urged the desirability of directly financing the "core" aspects of research, monitoring, and coordination.¹⁰² Even more serious, the Commission's independence and operational flexibility had eroded. This problem had arisen even before the signing of the 1978 Agreement. There were attempts during the negotiation of that instrument to have the Great Lakes Regional Office

95. INTERNATIONAL JOINT COMMISSION, SPECIAL REPORT UNDER THE 1978 GREAT LAKES WATER QUALITY AGREEMENT ON POLLUTION IN THE NIAGARA RIVER (January 20, 1981).

96. The commission itself noted in its First Biennial Report (1982)(*supra* note 7 at 10-11) that some states of the United States within the Great Lakes basin had concluded that, since they were not signatories to the Agreement, they were not mandated to commit the travel resources necessary for the participation of their policy and technical-level officials in work related to the Agreement.

97. IJC FIRST BIENNIAL REP., *supra* note 7, Letter of Transmittal, para. 4.

98. *Id.* at 5.

99. *Id.*

100. *Id.* at 5-6. (The Commission cited the 1981 Report of the Great Lakes Water Quality Board, *infra* note 114.)

101. *Id.* at 27.

102. *Id.*

(established under the 1972 Agreement as a basin-wide coordinating entity) eliminated. Further attempts to restrict the IJC's mandate with respect to tributaries, which would have struck directly at the basin as jurisdictional unit for pollution control, were not wholly successful.¹⁰³ Nevertheless, the Commission still had grave reasons for complaint.

Until the pollution agreements of 1972 and 1978, the IJC had received from its scientific and technical advisors an input which, it claimed, was relatively free from organizational and political bias. The Water Quality Agreements changed this mode of operation. Members of the Water Quality Board, the principal advisory organ, are nominated by their respective jurisdictions (a process in which the IJC has very little input) and act as "representatives" of federal, state, or provincial government entities rather than in an independent professional capacity. Acknowledging that the members, as individuals, often do strive to give objective advice, even when it goes counter to the entities they represent, the Commission nevertheless declared that "there is no explicit mandate, assurance, or even expectation that this will occur as a general rule."¹⁰⁴ It called for a reassessment of the constitution of the Water Quality Board and an explicit statement as to whether that body should be an organ "of and between the jurisdictions" or a Board of the Commission like all other IJC Boards.¹⁰⁵

The Commission was equally concerned that the Great Lakes Regional Office, though saved from extinction, now operated under a mandate quite different from that previously given it. Under the 1972 Agreement, the IJC had clear authority to manage that office, an authority which "... reinforced the presence of the Commission as an independent unitary body with the authority to develop the capability for independently gathering, analyzing, and evaluating information which was often of a highly technical nature."¹⁰⁶ The 1978 Agreement, however, significantly subtracted from that authority in the Terms of Reference pertaining to the Regional Office and the two Great Lakes advisory boards.¹⁰⁷ The Regional Office is now required to provide administrative support and technical assistance to the less objective boards and their sub-organizations and not, it seems, to the Commission directly.¹⁰⁸ For the Commission's programs, the regional office is to provide merely a public information service.¹⁰⁹ The import of these changes is apparently not clear but the IJC

103. See Carroll, *supra* note 77, at 136-38.

104. IJC FIRST BIENNIAL REP., *supra* note 7, at 28.

105. *Id.* at 29.

106. *Id.*

107. For the Terms of Reference attached to the 1978 Great Lakes Water Agreement, see 30 U.S.T. 1448-49.

108. *Id.* at 1449, para. 3 (b)(i).

109. *Id.*, para. 3 (b)(ii).

recognizes the changes as a twofold threat: first, to its ability to directly use the Office's technical expertise, and, secondly, to its operational flexibility within the organizational framework.¹¹⁰

The expanded areal and functional jurisdiction given the IJC in the 1972 and 1978 Agreements has to some extent been taken away. Without a clear mandate and sufficient resources to gather, analyze, and evaluate information, and to coordinate and advise on research activities as an independent and unitary body, the Commission cannot truly function as a basin entity. The words "Great Lakes Basin Ecosystem" become a meaningless expression, for "there is no alternative to the development of closed systems for management of toxins."¹¹¹

The instruments and entities for control of toxic pollution in the Rhine and Great Lakes basins, flawed though they may be, do vindicate the concept of the drainage basin as an operational unit of management and point the way toward a viable institutional framework. Two elements, in particular, stand out in the history of this development. One is the role of research, monitoring, and surveillance. The other is the role of the public.

There is probably not a jurisdiction anywhere in the world with adequate data for the assessment of toxic pollution within its borders. For example, ten years after the problem of toxic pollution in the Great Lakes began to be recognized and studied, the IJC admitted that "the impact of these contaminants on human and environmental health is *not well understood* and considers this lack of understanding to be a matter of great concern."¹¹²

Without the toxic pollution research conducted within the past decade, it is unlikely that a basin or ecosystem approach would have been adopted, even to the limited extent that now exists in the Rhine and Great Lakes basins. Conversely, without a basin or ecosystem approach to research, there would be no way of determining the nature, the extent, and the pathways of toxic pollution. The complex interaction of these factors is abundantly demonstrated in the case of the Great Lakes. It was the Upper Lakes Reference Group (established in 1972) that discovered the input of toxic heavy metals by atmospheric deposition (a problem quite distinct from that of acid rain precipitation). As a result, the 1978 Agreement stipulates that the parties identify airborne pollutant sources and relative source contributions and consider the indirect effects of impairment of tributary water quality through atmospheric deposition in drainage ba-

110. IJC FIRST BIENNIAL REP., *supra* note 7, at 29. According to Carroll (*supra* note 77, at 137-38), the IJC's independent surveillance and verification capability has been deeply compromised.

111. Woodwell, *Toxic Substances: Clear Science, Foggy Politics*, in MANAGEMENT OF TOXIC SUBSTANCES, *supra* note 21, 5-17, at 16.

112. IJC FIRST BIENNIAL REP., *supra* note 7, at 3 (emphasis added).

sins.¹¹³ The sequence, research-basin-research, comes full circle in the Water Quality Board's observation three years later that "[m]ost organic contaminants, because of their diffuse input (e.g., atmospheric) and because of their persistence, have become basinwide problems. Because of the widespread usage of pesticides such as DDT and herbicides, and organochlorines such as PCB, there is a strong tendency for these contaminants to cause systemwide problems."¹¹⁴ Accordingly, overall surveillance and monitoring plans for the Great Lakes have changed. The Great Lakes International Surveillance Plan (GLISP), as developed under the 1972 Water Quality Agreement, emphasized the eutrophication problem. Under the 1978 Agreement GLISP is oriented toward toxics and requires assessment of input from tributaries, point sources discharges, the atmosphere, and connecting channels.¹¹⁵

The greatest obstacle, virtually a "toxic" one, to research and surveillance programs is lack of funds. Not surprisingly, this turns out to be a major problem in both the Rhine and Great Lakes basins. The Secretariat of the International Rhine Commission, three years after signature of the Chemical Convention, still had a budget of only \$150,000 and a staff of one professional and three administrative employees.¹¹⁶ The staff of the Environment and Consumer Protection Service of the European Commission is almost thirty times as large, but it is concerned with all surface and groundwaters in the entire Community, not just those of the Rhine basin, and so manpower is necessarily spread thin.¹¹⁷ In the Great Lakes basin, the IJC, its Boards, and their subordinate entities have repeatedly drawn attention to the adverse impact of budgetary restrictions by the parties, especially the United States, on research, monitoring, and surveillance.¹¹⁸ As the Science Advisory Board cogently observed, "[t]he impact . . . on the lakes themselves will probably not be known for some time, if ever, because there will be inadequate surveillance and monitoring to measure changes in the lakes."¹¹⁹

113. Great Lakes Water Quality Agreement of 1978, *supra* note 83, Art. VI.1. (l).

114. INTERNATIONAL JOINT COMMISSION, GREAT LAKES WATER QUALITY BOARD, 1981 REPORT ON GREAT LAKES WATER QUALITY 14 (presented November 1981, Cleveland, Ohio) [hereinafter cited as GREAT LAKES WATER QUALITY BOARD, 1981 REPORT.] A similar sequence resulted from the work of PLUARG, whose original mandate was to investigate pollution from land use, especially phosphorus loadings. But it was PLUARG that initiated tributary monitoring for toxic substances in the Canadian portion of the basin, and it was PLUARG's estimate that there were more than 4,000 waste disposal sites in the basin containing hazardous or toxic liquid and solid wastes. See PLUARG 1978, *supra* note 63, at 90; and IJC FIRST BIENNIAL REP., *supra* note 7, at 19.

115. See GREAT LAKES WATER QUALITY BOARD, 1981 REPORT, *supra* note 114, at 64-65, and Annex 11 of the Great Lakes Water Quality Agreement of 1978, 30 U.S.T. 1444.

116. Kamminga, *supra* note 8, at 373.

117. *Id.* at 382.

118. E.g., IJC FIRST BIENNIAL REP., *supra* note 7 at 7-11; INTERNATIONAL JOINT COMMISSION, GREAT LAKES SCIENCE ADVISORY BOARD, 1981 ANNUAL REPORT 35-36 (1981); GREAT LAKES WATER QUALITY BOARD, 1981 REPORT, *supra* note 114, at 10-11.

119. GREAT LAKES SCIENCE ADVISORY BOARD, 1981 REPORT, *supra* note 118 at 36.

The role of the public is related to research, monitoring, and surveillance, and has resulted in some changes in organizational framework toward a drainage basin approach because of toxic pollution. Specific episodes of toxic pollution aroused public feeling and forced official action to an extent hitherto lacking in "traditional" water quality management. Some of these very alarming episodes, such as Love Canal, took place in international drainage basins and focused public attention on the transboundary aspects of the problem.¹²⁰ The rapid growth of the environmental movement was also a general factor in this development. In the Rhine basin, Netherlands environmental organizations have been particularly active and, as a result of public pressure, an International Water Tribunal composed of internationally known experts was convened. The Tribunal's task is to try "cases" of official disregard of binding obligations with reference to the Rhine river.¹²¹ In the Great Lakes basin the citizens' group, Great Lakes Tomorrow, founded in 1975, has also played an influential role.¹²² These are not narrowly based organizations, pursuing merely local aims. Great Lakes Tomorrow attracted membership and carried on its informational activities on both sides of the border, and the International Water Tribunal gathered the support of many European environmental organizations.

Institutional means of public input to the decisionmaking process are not lacking in either basin, but their effectiveness is very largely determined by the mandate and organization of the entities involved. The public in the Rhine basin, for instance, cannot exert much influence, either via national parliaments or the European Parliament, on the decisions of the European Economic Community which are made, for the most part, by a small group of bureaucrats. The public has an indirect, but greater, input on the International Rhine Commission's decisions because these decisions require approval by national parliaments.¹²³ The Great Lakes basin is a different story, in part because the IJC has a tradition of holding public hearings,¹²⁴ and in part, perhaps, because the concept of a hydrologic unity is more readily perceived in lake basins than in river basins.¹²⁵ Here a genuine binational basin constituency is developing,

120. Environmental groups from both sides of the international frontier have sought to intervene in lawsuits against polluters in the Niagara area whose dumpsites were found to be leaking into the drinking water of both Canadian and U.S. municipalities. See *U.S. v. Hooker Chemical and Plastics Corp.*, 540 F. Supp. 1067 (D.C. N.Y., 1982); and 6 INT'L ENV'T REP. (BNA), CURR. REP. 8-9 and 138 (1983).

121. International Rivers and Lakes (Newsletter of the U.N. Dep't of Technical Co-operation for Development) 8 (No.3, May 1983).

122. Carroll, *supra* note 77, at 140-41.

123. Kamminga, *supra* note 8, at 382-83.

124. The power to hold public hearing stems from the investigative functions assigned to the IJC under the Boundary Waters Treaty of 1909 (see *supra* note 63), Arts. IX and XII.

125. Other examples are Lake Constance and Lake Geneva, where a high degree of transboundary cooperation has been achieved. In the case of Lake Geneva, cooperation has resulted in a regional

is recognized and encouraged by the IJC, and is instrumental in strengthening the drainage basin approach by broadening the base of information. Once again PLUARG, with its emphasis on land-use activities and on the entire basin unit, was the innovator. Midway through the 1972 Reference given PLUARG, it established a public information and consultation program that was the largest ever undertaken under the International Joint Commission.¹²⁶ PLUARG'S recommendations on public participation were adopted and elaborated by the Commission in its report on the PLUARG study.¹²⁷ More importantly, the 1978 Agreement, because of its basin and ecosystem objectives, enhanced the Commission's existing mandate under the 1972 Agreement to disseminate information on research, conduct public hearings, and make special reports to the public.¹²⁸ In this context, the Science Advisory Board in 1979 established an Expert Committee on Societal Aspects of Great Lakes Water Quality, whose membership represents, *inter alia*, "public interest facets of the Great Lakes basin ecosystem" and whose agenda items included the institutional aspects of hazardous waste management and the risk assessment process in coordination with the Water Quality Board's Toxic Substances Committee.¹²⁹

The role of the public in providing information useful for toxic pollution control is a very vital one, and has been demonstrated in many ways, especially in the identification of existing and historic hazardous waste disposal sites. But information is a two-way street. In its First Biennial Report under the 1978 Agreement, the IJC, while recommending that the parties "... encourage citizen involvement in identifying and shaping long term ecosystem goals in order to build greater community consensus and commitment . . ." ¹³⁰ acknowledged some shortcomings in its own commitment to that goal:

"The Commission senses that the past information base as provided by its institutions has not been available in a form so that its relevance to larger social concerns and aspirations can be assessed. A more direct form of discourse between the various institutions which are involved in the regulation of the environmental quality of the Great Lakes System and the many individuals in the Basin who

agreement on groundwater protection. See Arrangement Relating to the Protection, Utilization and Recharging of the Franco-Swiss Genevese Aquifer, Geneva-Haute Savoie, Sept. 6, 1977, unpublished, text with English commentary in Teclaff and Utton, *supra* note 4, at 461-77.

126. PLUARG 1978, *supra* note 61, at 90-91.

127. LAND USE ACTIVITIES REP., *supra* note 64, at 772-73.

128. The wording of this mandate is precisely the same in Art. VI, secs. 1 (e), 2 and 3 of the 1972 Agreement (see *supra* note 65) and Art. VII, secs. 1 (f), 2 and 3 of the 1978 Agreement (*supra* note 83). It is the basin and ecosystem frame of reference which makes the difference.

129. GREAT LAKES SCIENCE ADVISORY BOARD, 1981 REP., *supra* note 118, at 37-39.

130. IJC FIRST BIENNIAL REP., *supra* note 7, at 30.

would directly be affected by institutional decisions, i.e., the Basin "society at large," is both necessary and desirable. The Commission, therefore, feels it should consider a "broadening" of its base of information in order to establish a process for understanding the human context of Great Lakes goals and achievements."¹³¹

CONCLUSIONS

The concept of the drainage basin as the appropriate areal unit for water management is again being put to the test in two of the world's most industrialized and most polluted river systems. The success of the basin concept depends on the realization that it implies not only a hydrographic area but, even more so, a blueprint for effective cooperation. Blueprints for cooperation exist in both basins in the form of the 1976 Chemical Convention for the Rhine and the 1978 Agreement for the Great Lakes. The Chemical Convention is more of a framework treaty, to be filled out by later agreements or by decisions of the Rhine and EEC commissions. A framework convention may be more appropriate in the Rhine Basin because a supranational institution, European Economic Community, already exists. The Great Lakes Agreement is necessarily detailed and specific, because the riparian states have not relinquished part of their sovereignty to a basin entity. In the Great Lakes and most other international basins, the details and precision of treaty provisions must substitute for a supranational institution. A detailed treaty should establish feasible emission limitations for all hazardous substances. The treaty should also establish water quality standards for the entire basin in order to avoid discrepancies and a lack of uniformity. The treaty should be in such a form as would assure its force as law in each basin state, especially in states with a federal structure. Changes in emission limitations or water quality standards and the addition of new substances for which limitations have been established may require formal amendment of the basic agreement. These matters could be entrusted to the basin commission if the commission is of a sufficiently high governmental level and enjoys enough incorporated safeguards to avoid the suspicion of creating a supranational institution.

The basin commission's members preferably should be of ministerial rank, e.g., ministers of the environment or of water resources.¹³² This may compensate for the absence of supranational powers and avoid the greatest drawback, lack of communication with the respective govern-

131. *Id.*

132. The Niger River Commission, which was transformed into a Basin Authority in 1980, may be the forerunner of a trend in that direction. Its highest organ is the meeting of the heads of states and governments. *International Rivers & Lakes* (Newsletter of the U.N. Dep't of Technical Co-Operation for Development) 2 (No. 2, Dec. 1982).

ments which stymied the otherwise excellent work of the IJC. A commission of such high-level composition would be similar to the EEC Council of Ministers without the EEC's supranational character. Since the Commission would be of a more orthodox nature, its decisions would be unanimous, thereby allaying fears of the usurpation of sovereign powers. The participating governments might even have the power of veto over the commission, but its decisions should be binding law within each state after a lapse of sixty days.

Some commissions were given powers extending far beyond mere water management at the peak of the river basin's acceptance as a model for water management and development. For example, the TVA, the Damodar Valley Authority in India, and the Cauca Valley Authority in Colombia combined economic and political powers.¹³³ Their task was to develop backward regions and to become precursors of new regional divisions of states on a more rational basis than that of traditional historical and political divisions. There is little likelihood that the TVA-type experiments with their all-embracing supra-basin authorities will be multiplied, especially in an international context. But if modern basin commissions, particularly those dealing with toxic pollution, are to have the necessary minimum effectiveness against a threat to all forms of life more real and more certain even than the peril of nuclear destruction, the commissions must, like the early developmental basin authorities, have powers extending beyond surface waters into and over the land area of the river basin.¹³⁴ The dumping and disposal of toxic wastes anywhere within the basin must be of prime concern to the basin commission which must have an input in the harmonization of relevant standards by the basin states. In the event that the actual formulation of standards is not entrusted to it, the commission must be kept informed of the standards and have the capability, if not of veto, then of delaying their adoption until the views of the public within the basin can be ascertained. The right and the duty to canvass public opinion is one of the most important powers of the commission, and adequate hearings should be held at accessible locations in the basin before vital issues are decided.

This presupposes sufficient funding, and funding is a *sine qua non* for the efficacy of any of the commission's activities. Sufficient funding is especially important for the control of land use in toxic waste disposal. As the United States is discovering, even with the best intentions, prevention does not always work and must be supplemented by correction

133. See L. TECLAFF, *THE RIVER BASIN IN HISTORY AND LAW* (1967), at 127-29 (TVA), 132-34 (Damodar), and 138-39 (Cauca).

134. The Niger Basin Authority has been given executive and rulemaking powers concerning, *inter alia*, land and agricultural development in the basin. *International Rivers and Lakes*, *supra* note 132.

after the fact. Whenever possible the consequences of past reckless disposal of wastes must be ameliorated and corrected. The polluter, of course, should be obliged to pay for remedial action, but in many instances it is impossible to identify individual polluters or to assign responsibility among several of them. For such eventualities and for cases of emergency, a fund should be created by assessment of disposers of hazardous wastes, on the model of Superfund in the United States.¹³⁵ Such a fund should not be construed, however, as a license to pollute or a means of relieving individual polluters of their ultimate responsibility.

Although enforcement of standards and limitations is actually the most crucial part of protection of the waters of an international river basin, this burden should not be laid upon the commission. The commission's principal tasks should be supervisory, advisory, and admonitory. While enforcement may be entrusted to appropriate authorities of the basin states, the commission must be able to monitor all phases of toxic pollution control from "cradle to grave," from the production of the pollutant to its final disposal. For this purpose, through supporting bodies, the commission should keep track of scientific and technological developments as well as of trends in public opinion. The commission should independently verify data supplied to it. Channels of communication between the public and the commission should be numerous and always open. In order to make such a program workable there must be adequate financing, and nothing encourages financing more than an understanding and supportive public.

Since it is postulated that the commission will have the necessary powers for control of toxic pollution from land use activities, it goes without saying that its jurisdiction must encompass groundwaters within the river basin. Little has been done so far in this respect, and groundwater remains the neglected stepchild of international water law. The concept of the river basin includes groundwater and, what is more, without adequate control of groundwater contamination, the protection of surface waters from toxic pollution would be illusory. Here the jurisdiction of the commission may reach beyond the limits of the river basin because aquifers may extend beneath and beyond the surface watershed.¹³⁶ This problem has to be faced squarely, as must the problem of toxic pollution

135. Comprehensive Environmental Response, Compensation and Liability Act of 1980, Pub. L. No. 96-510, 94 Stat. 2767 (1980). The Superfund has already been widely used for clean-up of groundwater contamination in the United States.

136. Note, *e.g.*, the Colombian Natural Resources and Environmental Protection Code of 1974, which provides that if the boundaries of the underground waters of a hydrographic basin do not correspond to the surface watershed, the basin limits may be extended beyond the watershed to include aquifers whose waters are connected with the surface flow. Colombia, National Code of Renewable Natural Resources and Protection of the Environment, 1974, Decreto No. 2811 of 18 December 1974, Part III, *Diario Oficial* (2 Jan. 1975).

from airborne substances deposited on the basin's land surface and waters. The commission should not only have an input, perhaps a decisive input, in the control of airborne pollutants *within* the confines of the basin, but should also be consulted on any remedial measures that the basin states undertake jointly to control pollution sources *outside* the basin. The river basin appears to be on the way to vindicating its paramount usefulness as the best areal unit for the control of transboundary toxic pollution but, because all pollution is interrelated, the jurisdiction of the river basin commission should, when necessary, be able to reach outside the basin.