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Evolution of the River Basin Concept in National and International Water Law

ABSTRACT

Planning and managing the use of rivers, lakes and related groundwaters by river basin units is a 20th Century concept, expressed in law through statutes and treaties mostly within the past 50 to 75 years. Expressed in human endeavor, the river basin concept is as old as the earliest recorded attempts to navigate watercourse systems, control floods and irrigate cropland. From these and later developments throughout the ages, there emerged the idea of a community of interest of water users which blossomed into two great systems of domestic water law and, eventually, into the first treaties reflecting the unity of the basin. Modern technology and modern needs facilitated the expansion of water resources development within basins, but they also provided the biggest challenge to the river basin by positing other areas as optimum units of management. Within the past quarter of a century, however, environmental concerns have reinforced the basin concept and transformed it from a plan for water resources exploitation into a blueprint for holistic management and use of a unique natural unit.

INTRODUCTION

The dictionary defines "river basin" as the area of land drained by a river and its branches, or tributaries, and traces its usage in English back to the last quarter of the 19th Century.[1] If the term itself entered the language without demur long ago, disagreement over the scope of activities that may be centered on the river basin has raged ever since.[2] In part this stems from different perceptions of the basin's physical unity and of its potential as a unit of resource management. These varying perceptions form the substance of the present article.

The first part briefly traces the history of water resources use in a river basin context since remote antiquity and the formation of legal

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1. RANDOM HOUSE DICTIONARY OF THE ENGLISH LANGUAGE 1661 (2d ed. unabridged, 1987).

2. *See infra* text accompanying notes 62-72, 77-78, 86, 170-71.

principles reflecting, however imperfectly, the functional unity of the basin. There follows an outline of modern developments in water management and water use. These developments range from individual multipurpose projects at the beginning of this century to the basin schemes that became widespread by the 1960s and were being challenged by some policy-makers as outmoded. The middle section deals with new elements in river basin planning, such as the inclusion of groundwater, consideration of climate change and other environmental factors and the adoption of an ecosystem approach to management. The last part surveys the expansion of basin institutions and concludes that the river basin concept continues to gain acceptance worldwide, both in domestic and international water law.

THE BASIN IN HISTORY AS UNIT OF WATER RESOURCES DEVELOPMENT

This article begins from the premise that there is only one characteristic distinguishing a river basin from other natural areas of the earth's surface and that is drainage—the waters within the basin tend to flow toward a single outlet and form an interconnected system.[3] This physical unity is not totally self-contained, but is itself part of the hydrologic cycle.[4] A basin is usually delimited on the surface by a natural boundary called the watershed or drainage divide.[5] Climate, geology, topography, soils, flora and fauna all interact with the basin's waters, and if there is a change in any of these factors, either naturally or by human intervention through waterworks and land use, the entire watercourse system reacts through adjustments in volume, rate of flow, discharge, sediment load and quality of water.[6]

The river basin's physical unity rarely corresponds with that of other natural regions, such as climate or vegetation zones.[7] Rarely, too,

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3. LUDWIK A. TECLAFF, THE RIVER BASIN IN HISTORY AND LAW 14 (1967) [hereinafter TECLAFF, THE RIVER BASIN].

4. For a recent discussion of the hydrologic cycle and the international law that pertains to all of its phases, beginning in the atmosphere and ending in the ocean, see Symposium, *The International Law of the Hydrologic Cycle*, 31 NAT. RESOURCES J. 1 (Ludwik A. Teclaff & Albert E. Utton eds., 1991).

5. In hilly topography a watershed between two river basins is often readily distinguishable. However, some drainage divides are so low in relation to the surrounding land surface that they may permit the waters of separate river systems to merge, especially in time of flooding, or may allow one river to "capture" another. TECLAFF, THE RIVER BASIN, *supra* note 3, at 10-11.

6. On aquatic disturbance regimes, see, e.g., Meyer, *The Dance of Nature: New Concepts in Ecology*, 69 CHI.-KENT L. REV. 875, 878-81 (1994).

7. TECLAFF, THE RIVER BASIN, *supra* note 3, at 14.

have its land boundaries ever coincided with those of human political, social or economic units. The very great number of international rivers and river basins on today's maps of the world[8] attests to the fact that watercourses have more often been regarded throughout history as convenient and well-delineated political frontiers than as part of a natural resource common to many users, human and non-human. Nevertheless, the functional unity of the river basin found expression in human institutions long before it was fully understood.

Water resources management in antiquity, in such major basins as those of the Nile, Tigris-Euphrates, Indus, Yellow and Yangtze rivers, goes back thousands of years, back even into the mists of legend in the persons of kings or gods who undertook major river-taming projects.[9] The so-called fluvial or irrigation civilizations in these basins developed hydraulic engineering to a degree that was not equaled or surpassed until modern times, and their means of data gathering and awareness of the interdependencies of water systems were quite sophisticated. Many ancient records emphasize that dams, canals and dikes must be kept in repair, so as to prevent flood damage to lower-lying land. They show that engineers, planners and administrators understood the use of water-gauges and other measuring devices to obtain information about the behavior of streams in the upper parts of basins, the desirability of making diversions a good distance upstream of lands to be irrigated and the need to choose between uses and activities for the better functioning of the entire water control system. Dependence on water control in the fluvial civilizations sometimes translated into cooperation among states, but more often into political consolidation and expansion by a single power throughout a river basin, with special emphasis on securing upstream areas. Frequently, unification prompted the construction of bigger and better irrigation and reclamation works. Conversely, when empires broke up into smaller units, water resources development suffered severe setbacks because the central, basin-wide water administration had collapsed.

Medieval Europe lacked the need for river management on such a scale (and indeed the capacity to undertake it).[10] Nevertheless, in its

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8. There are more than 240 international river and lake basins listed in the Food and Agriculture Organization's index of treaties. *See* U.N. FAO's Legislative Study No. 15, *Systematic Index of International Water Resources Treaties, Declarations, Acts and Cases by Basin*, (1978). More rivers and lakes have acquired international status since the breakup of the former U.S.S.R.

9. The following section on water resources management in antiquity is based on TECLAFF, THE RIVER BASIN, *supra* note 3, at 15-25.

10. Non-navigable streams were private property of the owners of the land through which they flowed. Their use was governed by statute and custom and there was enough water to satisfy the needs of a mostly rural population. Navigable rivers were parceled out

overall inability to develop major waterworks and in its emphasis that flowing water should be as little disturbed as possible, this loose-knit, decentralized, fragmented society did recognize the natural unity of the river basin. Its attitude toward water was enshrined in the customary law maxim *aqua currit et debet currere ut currere solebat* ("water flows and should flow as it always used to do").[11] This hands-off approach found expression much later in a number of treaties forbidding interference in frontier waterways[12] and created favorable conditions for development in the 19th Century of a full-fledged riparian rights doctrine.[13]

Stripped to its essentials, the riparian rights doctrine means that only those who have access to water through ownership of land have the right to use that water. The concept derived in part from Roman water law[14] and in part from medieval custom.[15] France's Code Napoléon borrowed from Roman water law, adapting the latter to its purpose.[16] The influence of the Code Napoléon helped to spread the French version of the riparian doctrine to other European countries, as well as to Latin America and Asia. It also helped to crystallize the common law evolution

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among and exploited by local magnates who asserted an exclusive right to impose charges on navigation. There was not much room for cooperation in water management. *See* TECLAFF, THE RIVER BASIN, *supra* note 3, at 56-58, 76-77; EDOUARD P. ENGELHARDT, HISTOIRE DU DROIT FLUVIALE CONVENTIONNEL 20 (1889). Even so, there were some institutions exercising a wider jurisdiction, such as the English Commissioners of Sewers, whose origins go back to the Middle Ages and whose powers and duties were consolidated in the reign of Henry VIII. Commissioners of Sewers Act, 1532, 23 Hen. 8, ch. 5 (Eng.).

11. *Quoted in* Samuel C. Wiel, *Running Water*, 22 HARV. L. REV. 190, 195 (1908-09). The French Coutume de Normandie, for example, stipulated that water should not be diverted from its natural course. A. DAVIEL, 2 TRAITÉ DE LA LÉGISLATION ET DE LA PRATIQUE DES COURS D'EAU 135 (1845).

12. One of the earliest of these agreements was the Treaty on Boundaries Between Their Majesties the King of Prussia and the King of the Netherlands, Oct. 7, 1816, Prussia-Neth., 3 Martens Nouveau Receuil (ser. 1) 54-65.

13. On the riparian rights doctrine generally, see Ludwik A. Teclaff, *What You've Always Wanted to Know About Riparian Rights, But Were Afraid to Ask*, 12 NAT. RESOURCES J. 30 (1972) [hereinafter *Teclaff, Riparian Rights*].

14. *See generally* Eugene F. Ware, ROMAN WATER LAW (1905) (reproducing the Digest of Ulpian).

15. For the common law origins of the riparian doctrine, see Theodore E. Lauer, *The Common Law Background of the Riparian Doctrine*, 28 MO. L. REV. 60 (1963).

16. French eighteenth and nineteenth-century jurists were considerably under the influence of Roman law. *See, e.g.*, ROBERT J. POTHIER, *Traité du Droit du Domaine de Propriété*, *in* 8 OEUVRES (1807); 3 PROUDHON, TRAITÉ DU DOMAINE PUBLIC (1843). In France the riparian rights doctrine was restricted to non-navigable and non-floatable waterways. Code Napoléon art. 644 (Off. ed., 1810). The Code gave enough power to the courts to deal effectively with conflicts between water users. *Id.* at art. 645. In this way an elastic machinery was created to protect the larger interests of an entire basin, which before were safeguarded rigidly by custom.

of the riparian doctrine in England and the United States.[17] The British, in turn, spread their version throughout their empire, especially to Canada, Australia and South Africa.[18] The riparian rights doctrine reflected the interdependence of waters and the unity of the basin by recognizing the community of interests of the landowners bordering on the flowing waters but, like the medieval immemorial usage doctrine, it protected this community of interests by trying to reduce the possibility of change and the scope of new uses.[19] In Europe, the notion of a community of riparians was transferred from local groups to states, which began to conclude treaties requiring the consent of the other party or parties on a river for any alteration in the flow of frontier waters.[20] However, customary municipal law failed to establish a uniform system which could serve as a model for international law.[21] The communities of riparian states continued their existence without any rules other than those based on an agreement and the agreements did not provide guidelines from which rules for the use of international waters could evolve. There were other ways, however, in which basin cohesion became manifest.

The fact that the navigable waters of a river basin formed an

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17. The French version of the doctrine influenced two American jurists, Story and Kent. Story held that the riparian right being common to all the proprietors on a river, no one had a right to interfere with the natural flow. Tyler v. Wilkinson, 24 F. Cas. 472, 474 (C.C.D.R.I. 1827) (No. 14312). Kent elaborated the principle in 3 KENT, COMMENTARIES ON AMERICAN LAW *440 (1829). Two leading English cases refer to works and decisions of Kent and Story. Wood v. Waud, 154 Eng. Rep. 1047 (Ex. 1849); Embrey v. Owen, 155 Eng. Rep. 579 (Ex. 1851).

18. *See* Teclaff, Riparian Rights, *supra* note 13, at 38 n.58, 48-52.

19. Because exploitation of water was left attached to the land and no machinery was provided for taking into account other than immediate local problems, demands for water had to be satisfied without extensive coordination of waterworks. Under the natural flow theory of riparian rights, an *a priori* list of uses defined according to reasonableness was developed by the courts. *See, e.g.*, Tyler v. Wilkinson, 24 F. Cas. 472 (C.C.D.R.I. 1827) (No. 14312); Hendrick v. Cook, 4 Ga. 241 (1848); Clinton v. Myers, 46 N.Y. 511 (1871). The rule of attachment of water use to riparian land remained rigidly in force until well into the 20th century. *See* Attwood v. Llay Main Collieries, Ltd. 444, 458 (Ch. 1926); Robertson v. Arnold, 186 S.E. 806, 809 (Ga. 1936); Neal v. City of Rochester, 50 N.E. 803 (N.Y. 1898).

20. *See, e.g.*, Frontier Treaty, Mar. 28, 1820, Fr.-Neth., 71 Consol. T.S. 1; Convention Respecting Boundary Streams, June 22, 1882, Belg.-Fr., 160 Consol. T.S. 331. Some treaties even called for the removal of waterworks in existence. *See* Frontier Treaty, July 2, 1824, Neth.-Hanover, 74 Consol. T.S. 291; Convention Relative to the Embankment of the Dollard, Sept. 23, 1874, Neth.-Prussia, 148 Consol. T.S. 169; Frontier Determination Treaty, Dec. 2, 1856, Fr.-Spain, 116 Consol. T.S. 85; Final Act for the Delimitation of the International Frontier in the Pyrenees, July 11, 1868, Fr.-Spain, 137 Consol. T.S. 343.

21. In Europe and parts of the world which had adopted the French version of riparian rights, the doctrine was losing ground to systems of administrative allocation of water. LUDWIK A. TECLAFF, ABSTRACTION AND USE OF WATER: A COMPARISON OF LEGAL REGIMES at 17-56, U.N. Doc. ST/ECA/154, U.N. Sales No. E.72.II.A.10 (1972).

interconnected system found expression from the earliest times through measures to facilitate navigation. For example, there was a considerable freedom of trade and hence of navigation throughout most of ancient Mesopotamia's history, both in periods when the Tigris-Euphrates basin was parceled among city states and when it was under a single suzerainty.[22] In other areas and in later periods in which waterways were the best or only means of communication, a favorable pattern of drainage influenced the emergence of a commercial unity. This happened when an entire basin became the hinterland of a major seaport[23] or when boatmen's and ship owners' associations embraced so many tributaries that a virtually basin-wide organization of navigation was achieved.[24] However, although this gave such basins cohesion through water use and even facilitated political unification,[25] the community of riparian states did not appear until treaties affirmed the principle of freedom of navigation among such states.[26] In treaties encompassing tributaries, we have the first legal instruments clearly applicable to entire individual basins prescribing that the river basin be treated as a unit for the purpose of a single major water use.[27]

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22. *See* TECLAFF, THE RIVER BASIN, *supra* note 3, at 28-32, 42-46.

23. An example is the Mississippi basin and New Orleans, especially after the Louisiana Purchase, which gave the United States control over the river and all its western tributaries, with access to a land area of over one million square miles. Treaty with France, Apr. 30, 1803, art. 1, 8 Stat. 201, T.S. No. 86. *See* TECLAFF, THE RIVER BASIN, *supra* note 3, at 67-71.

24. *See, e.g.*, PIERRE DEFFONTAINES, LES HOMMES ET LEURS TRAVAUX DANS LES PAYS DE LA MOYENNE GARONNE 375 (1932). The most impressive example of the use of waterways through almost an entire river basin is provided by timber floating. When timber is transported from the uppermost tributaries to the mouth of a river, the degree of navigational unity of the basin represented by this commodity is very high. *See* Jean Dollfus, *L'homme et le Rhin*, 32 GEOGRAPHIE HUMAINE 72-74, 96-98 (1960) (for the Rhine and its tributaries in the Roman period and the Middle Ages); DONALD CREIGHTON, THE EMPIRE OF THE ST. LAWRENCE 147, 150, 169 (1958) (for the St. Lawrence and its tributaries in the late 18th and early 19th centuries).

25. TECLAFF, THE RIVER BASIN, *supra* note 3, at 28-42.

26. One of the earliest of these treaties was the Turkey-Austria Treaty of May 1, 1616, which dealt with Danube navigation. *See* 9 TESTA, RECUEIL DES TRAITÉS DE LA PORTE OTTOMANE 26-27; 1 FAUCHILLE, TRAITÉ DE DROIT INTERNATIONAL PUBLIC, § 528, at 533 (8th ed. 1925). In 1792, during the French Revolution, the French Executive Council proclaimed that the watercourse of a navigable river was the common and inalienable property of all its riparian states. ENGELHARDT, *supra note* 10, at 51; G. KAECKENBEECK, INTERNATIONAL RIVERS 32 (1959) (reprinted in its entirety as Grotius Soc. Pub. No. 1 (1962)). This principle influenced the 1804 Convention of Paris, which stipulated that the Rhine should always be considered common to both the French and German empires. Convention de l'Octroi du Rhin, Aug. 15, 1804, 8 Martens, Nouveau Recueil des Principaux Traités, Ser. 2, 261.

27. *See*, for example, the Treaty Between Austria and the Duchies of Parma and Modena, July 3, 1849, 2 Martens Nouveau Recueil 447 (declaring the River Po, together with its tributaries, whether national or not, open to all flags); *see also* the Statute of Navigation of the Elbe, Feb. 22, 1922, 26 L.N.T.S. 223, which provided a means of extending

More explicit advocacy of the treatment of a river or a river basin as a unit for the efficient utilization of water came about when rapid advances in technology (especially the invention of reinforced concrete and development of earth-moving equipment) in the latter part of the 19th Century made possible multipurpose use of streams.[28] In 1890, the first Aswan Dam on the Nile was planned for irrigation and navigation.[29] In the United States, Congress had already appropriated money for a survey of the possibilities of combining irrigation and power projects in the semi-arid West,[30] and three major dams were built by the Bureau of Reclamation within the next two decades.[31] At the same time, conservationists feared that water and other natural resources would be exhausted altogether under the impact of industrialization. They welcomed multipurpose development of water as a means of saving the resource and advocated treating all the waters of a river basin as a unit.[32] In succeeding decades, a number of official reports in the United States endorsed the idea.[33] Meanwhile, in the Ruhr region of Germany, where industrial pollution of rivers had reached crisis proportions, it was decided that management of water resources should be on a sub-basin scale. Commissions were created for six small tributaries of the River Rhine to deal both with the pollution and with power generation and, though they did not individually embrace an entire drainage basin, they embodied the ideas of basin unity and basin administration.[34]

The basin concept of water management began to be investigated by legal scholars and by scholarly associations with the object of creating

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internationalization to the whole basin. For other examples, see TECLAFF, THE RIVER BASIN, *supra* note 3 at 61-63.

28. They made possible the building of really effective dams to regulate a river for storage, flood control, power production and other uses. EDWARD A. ACKERMAN & GEORGE C.G. LOF, TECHNOLOGY IN AMERICAN WATER RESOURCES DEVELOPMENT 221-32 (1959).

29. SIR WILLIAM WILLCOCKS, THE NILE RESERVOIR DAM AT ASWAN AND AFTER 10-36 (1901).

30. Act of Oct. 2, 1888, ch. 1069, 25 Stat. 526 (1988).

31. Pathfinder (1909), Buffalo Bill (1910), and Roosevelt dam (1911). T.W. MERMEL, REGISTER OF DAMS IN THE UNITED STATES 30, 174, 188 (1958).

32. REPORT OF NATIONAL CONSERVATION COMMISSION, S. DOC. NO. 676, 60th Cong., 2d Sess., v. 1, at 27 (1909).

33. The U.S. Army Corps of Engineers prepared some 200 separate studies of important river basins in the United States. They were known as "308 Reports" from the House document in which the basins to be surveyed were listed. U.S. ARMY CORPS. OF ENG., H.R. DOC. NO. 308, 69th Cong., 1st Sess. (1926).

34. *See* Gordon M. Fair, *Pollution Abatement in the Ruhr District*, *in* COMPARISONS IN RESOURCE MANAGEMENT 142, 149 (Henri Jarrett ed., 1961); Gieseke, River Basin Authorities on the Ruhr and on Other Rivers in Germany, 2 U.N. Economic Commission for Europe, Conference on Water Pollution Problems in Europe 276-77 (U.N. Doc. Water Poll./Conf. 4) (1961).

a coherent system of rules for the community of states in an international river basin. Already, in 1911, the International Law Institute proclaimed that riparian states on a common stream were in a position of permanent physical dependence on each other.[35] From this interdependence the Institute derived two essential rules: that no state could use the waters of a frontier stream in such a way as to seriously interfere with their use by another riparian state[36]; and that the essential character of a stream traversing two or more states must not be seriously modified by excessive use of water.[37]

The fact that many river basins encompass a great deal of land led quickly to a viewpoint advocating the basin as a distinct economic region in which the integrated development of all resources would be planned and supervised by a body with basin-wide powers.[38] Such an organization was the Tennessee Valley Authority (TVA), a government corporation established in 1933 with powers to plan, construct and operate multipurpose projects for, among other goals, improvement of navigation, flood control, reforestation and proper use of marginal lands, marketing of power, and the agricultural and industrial development of the basin.[39] Directly responsible to the President,[40] the TVA was given so much independence and flexibility in its operations that the experiment was never repeated in the United States. However, the concept of an autonomous basin entity with a mandate to achieve specific economic and social aims was taken up after World War II in Asia and South America, where so-called valley authorities flourished in several countries for a number of years.[41]

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35. Declaration of Madrid, Apr. 20, 1911, 24 ANN. DE L'INSTITUT DE DROIT INT'L 367 (1911).

36. *Id.* ¶ I.

37. *Id.* ¶ II.3.

38. In France, plans embracing basins had already been made by 1920 and the law of 1921 envisaged the development of the entire French part of the River Rhône. Law Approving the Plan of Works for Improvement of the Rhône from the Swiss Frontier to the Sea from the Point of View of Power, Irrigation, Navigation, and Other Agricultural Uses, 21 Duv. & Boc. 261 (1921). In England, the whole country was divided into drainage districts by legislation in 1930. Land Drainage Act, 1930, 20 & 21 Geo. 5, ch. 44, §§ 1, 83 (Eng.). A few years later, in the United States, the President's Committee on Water Flow tentatively recommended ten basins (one of which was the Tennessee) for comprehensive development. H.R. DOC. NO. 395, 73rd Cong., 2d Sess. at 5 (1934).

39. Act of May 18, 1933, ch. 32, 48 Stat. 58 (codified as amended at 16 U.S.C. § 831 (1988)). The act referred specifically to the economic and social development of the area as part of its general purpose. *Id.* § 831(u).

40. *Id.* § 831(a).

41. *See* Damodar Valley Corporation, Act. No. 14, Mar. 27, 1948, 6 INDIA CODE 13-33 (1956) (India); Gal Oya Development Board, Act. No. 51, Nov. 24, 1949 (Sri Lanka); Presidential Decree No. 3110, Oct. 22, 1954 (Colombia, applicable to the Cauca Valley); Law No. 541, 7 Coleção 141 (1948) (Brazil, applicable to the São Francisco Valley); Act No. 46

Later on, states riparian to some very large rivers in Africa and South America agreed to develop their huge river basins under joint management, transferring the basin-as-economic-region idea to an international plane. The nine riparian states of the Niger River Basin, for example, established a commission (subsequently reorganized as the Niger Basin Authority) charged with promoting integrated development of the basin not only in energy and water resources, but also in agriculture, animal husbandry, fisheries, forestry, transport, communications and industry.[42] Similarly, the five La Plata basin countries adopted a basin program which, though not a complete economic integration of the area, provides for multilateral coordination and cooperation in a number of fields unrelated to water resources development.[43] The Amazon is another, even larger, basin in which the basin states agreed to promote harmonious economic development and to distribute its benefits equitably.[44] No matter what the entities designated to carry out these comprehensive basin programs were called (whether authorities, commissions or councils) they did not have the broad powers of the domestic valley authorities and some of them encountered severe difficulties in operation.[45]

(1961) (Ghana, establishing the Volta River Authority).

42. In the 1960s, the nine states of the Niger River basin bound themselves to cooperate closely in, *inter alia*, industrial and agricultural exploitation of the basin, and established a commission which was subsequently reorganized as the Niger Basin Authority. Convention Creating the Niger Basin Authority, Nov. 21, 1980, *in* U.N. DEPARTMENT OF TECHNICAL CO-OPERATION FOR DEVELOPMENT, TREATIES CONCERNING THE UTILIZATION OF INTERNATIONAL WATER COURSES FOR OTHER PURPOSES THAN NAVIGATION: AFRICA 56, U.N. Doc. ST/ESA/141 (1984) [hereinafter TREATIES: AFRICA].

43. River Plate Treaty, Apr. 23, 1969, 8 I.L.M. 905.

44. In 1978, the eight states of the Amazon River basin concluded a treaty for Amazonian Co-Operation encompassing much more than water resources. Treaty for Amazonian Co-Operation, July 3, 1978, 17 I.L.M. 1045. Among its purposes were the harmonious development of the Amazon region and the equitable distribution of benefits of such development. *Id.* at Preamble.

45. The cumbersome structure of some international basin administrations in Latin America and Africa has hampered their ability to deal with problems when given a broader mandate. They have been criticized for unsuitable working methods, insufficient coordination between basin agencies and national governments, inflexibility in functioning, unnecessary overlapping of work as between subregional organizations, and lack of local participation. *See, e.g.*, Guillermo J. Cano, *Argentina, Brazil and the de la Plata River Basin: A Summary Review of Their Legal Relationship*, *in* WATER IN A DEVELOPING WORLD 127, 142 (Albert E. Utton & Ludwik A. Teclaff eds., 1978); United Nations Development Programme, *The Multi-Donor Approach in Large River and Lake Basin Development in Africa*, *in* U.N. DEPARTMENT OF TECHNICAL CO-OPERATION FOR DEVELOPMENT, RIVER AND LAKE BASIN DEVELOPMENT, PROCEEDINGS OF THE UNITED NATIONS INTERREGIONAL MEETING ON RIVER AND LAKE BASIN DEVELOPMENT WITH EMPHASIS ON THE AFRICA REGION, ADDIS ABABA, ETHIOPIA, OCT. 10-15, 1988, U.N. Doc. ST/TCD/13, at 74, 95 (1990) [hereinafter U.N. RIVER AND LAKE BASIN DEVELOPMENT].

Alongside these experiments in basin development, a more modest concept of the river basin, limited primarily to water resources, had become the principal tool in planning and managing these resources, both nationally and internationally. In the United States, for example, a number of states concluded compacts pertaining to entire river basins, or parts of basins, to coordinate their water policies,[46] and the Federal government also created river basin commissions for this purpose under the Water Resources Planning Act of 1965.[47] France, by its law of 1964,[48] similarly provided for the establishment of river basin entities, coordinated by a national committee, and Great Britain several times overhauled its water administration to consolidate management at river basin and national levels.[49] In international basins, states created joint basin commissions and agreed to cooperate in management of the water resources of such major rivers as the Mekong,[50] Indus,[51] Sénégal,[52] and Columbia.[53]

The river basin concept also received the blessing of the United Nations in a number of official pronouncements. In 1956, the Secretary-General declared that river basin development was recognized as an essential feature of economic development.[54] A panel of experts, established to review the economic and social implications of the

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46. *See* TECLAFF, THE RIVER BASIN, *supra* note 3, at 146-48.

47. Water Resources Planning Act, July 22, 1965, Pub. L. No. 89-80, 79 Stat. 244 (1965) (codified at 42 U.S.C. §§ 1962b (1944)).

48. Law Concerning the Regime and Distribution of Waters and Protection Against Pollution, 1964, 47 B.L.D. 674 (1964) (Fr.).

49. River Boards Act, 1948, 11 & 12 Geo. 6, ch. 32 (Eng.); Water Act, 1973, ch. 37 (Eng.).

50. In 1957, the four states of the Lower Mekong basin (Cambodia, Laos, Thailand, and Vietnam) adopted, under U.N. auspices, the Statute of the Coordinating Committee of the Lower Mekong. Statute of the Committee for Co-Ordination of Investigations of the Lower Mekong Basin, Oct. 31, 1957, *reprinted in* LEGISLATIVE TEXTS AND TREATY PROVISIONS CONCERNING THE UTILIZATION OF INTERNATIONAL RIVERS FOR OTHER PURPOSES THAN NAVIGATION 267, U.N. Doc. ST/LEG/SER.B/12 (1963) [hereinafter U.N. LEGISLATIVE TEXTS].

51. *See* Indus Waters Treaty, Sept. 19, 1960, 419 U.N.T.S. 126. By this treaty, to which the International Bank for Reconstruction and Development was party and prime mover, India and Pakistan agreed to divide the waters of the tributaries of the Indus River, to cooperate in building waterworks, and to establish a permanent commission. *Id.* at arts. 2-4, 8, 9.

52. The Senegal Basin is governed by the most sophisticated water resources institution in Africa, the Organization for Management of the Senegal River (OMVS), established in 1972. *See* Convention Portant Creation de l'Organisation Pour la Mise en Valeur du Fleuve Sénégal, Mar. 11, 1972, Mauritania-Guinea-Sen.-Mali, *reprinted in* TREATIES: AFRICA, *supra* note 42, at 21.

53. For decades Canada and the United States developed their parts of the Columbia River basin separately. By the Columbia River Treaty of 1961 they agreed to a joint development, primarily of power. Treaty Relating to Cooperative Development of the Columbia River Basin, Jan. 17, 1961, U.S.-Can., 15 U.S.T. 1555.

54. U.N. ESCOR, 21st Sess., Annexes at 6, U.N. Doc. E/2827 (1956).

integrated river basin, reported in 1957 that individual water projects could not usually be undertaken with optimum benefit unless there was at least the broad outlines of a plan for the entire drainage area.[55]

Meanwhile, the jurists had been busy devising rules for international rivers. At successive conferences in the 1950s, the International Law Association (ILA) endorsed the integrated basin principle,[56] closely followed by the International Law Institute in its Salzburg Declaration of 1961.[57] The fullest and most detailed elicitation of principles for the cooperation of states in developing shared water resources was spelled out in the ILA's Helsinki Rules, adopted at its 1966 conference.[58] The Helsinki Rules proclaimed that each basin state was entitled, within its territory, to a reasonable and equitable share in the beneficial uses of the waters of an international drainage basin.[59] They also implied that groundwater and estuarine waters were interconnected with the surface waters of a basin,[60] hinting at a holistic approach that would be explored more thoroughly some two decades later.[61]

This period, approximately the third quarter of the 20th Century, was the golden era of the river basin as a unit of economic development. Yet, just at this time, the concept began to be seriously challenged. Advances in technology opened up the prospect of developing water resources on a colossal scale without regard to drainage basin boundaries or interconnections and indicated quite different areas as the basis of water planning and management. Projects for the transfer of water clear across large regions and even across continents were on the drawing board. They included the Pacific Southwest Water Plan to divert supposedly "surplus" water from northern California to the lower Colorado basin,[62] the North American Water and Power Alliance (NAWAPA) scheme to interlink river basins from Alaska and Canada

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55. U.N. DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS, INTEGRATED RIVER BASIN DEVELOPMENT 1, U.N. Doc. E/3066 (1958).

56. INTERNATIONAL LAW ASSOCIATION, REPORT OF THE FORTY-SEVENTH CONFERENCE 242 (1956) (held in Dubrovnik); INTERNATIONAL LAW ASSOCIATION, REPORT OF THE FORTY-EIGHTH CONFERENCE 99 (1958) (held in New York).

57. Institute of International Law, *Resolutions Adopted at the 1961 Session*, *in* 42 ANNUAIRE DE L'INSTITUT DE DROIT INTERNATIONAL 370 (1961), *reprinted in English in* 56 AM. J. INT'L L. 737 (1962).

58. *Report of the Fifty-Second Conference Held at Helsinki, 1966*, at 484, International Law Association (1966), *reprinted in* ILA, HELSINKI RULES ON THE USES OF THE WATERS OF INTERNATIONAL RIVERS (1967)[hereinafter *Helsinki Rules*].

59. *Id.* at art. IV.

60. Ludwik A. Teclaff, *Fiat or Custom: The Checkered Development of International Water Law*, 31 NAT. RESOURCES J. 45, 69 (1991) [hereinafter *Fiat or Custom*].

61. *See infra*, notes 121-30 and accompanying text.

62. U.S. DEP'T OF THE INTERIOR, PACIFIC SOUTHWEST WATER PLAN VI-8 (1963).

southward to Mexico[63] and the Siberal project for a canal link between Siberian rivers and Soviet Central Asia.[64] So heady was the atmosphere of potential development by such transfers that the Bureau of Reclamation pronounced the river basin to be virtually dead as a unit of water management.[65]

Also, the basin concept seemed not to satisfy municipal needs. Municipalities are prone to use their economic power to secure water at the expense of other users. This is not by any means a recent phenomenon. London, Birmingham, Manchester, Liverpool, New York City and Los Angeles are among cities which long ago outgrew their local supplies and sought new sources from far away.[66] However, the rapid expansion of metropolitan water supply entities and the extent of their water "imperialism" into distant watersheds became steadily more of a problem in this century as the number of very large cities rose throughout the world. By 1970 there were 133 "million" cities: forty-four in Asia, thirty-four in North America, twenty-nine in Europe, ten in the former Soviet Union, nine in South America, five in Africa, and two in Oceania.[67] The very fact that water was imported to cities where existing supplies would otherwise be a constraint encouraged still more population growth and the consolidation of many small, fringe-area water suppliers into huge semi-autonomous and autonomous metropolitan water agencies.[68] That made it difficult to integrate such units into river basin administration.

Further opposition to the basin concept came from economists and others who thought it involved too much regulation and who

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63. For a description of NAWAPA, *see* SPECIAL SUBCOMM. ON WESTERN WATER DEVELOPMENT, SENATE COMM. ON PUBLIC WORKS, WESTERN WATER DEVELOPMENT S. DOC. NO., 88th Cong., 2d Sess. 1964. The scheme was revived in the drought year of 1988. 5 U.S. WATER NEWS 11 (1989).

64. *See* Hyde-Price, *Eurasia*, *in* RESOURCE POLITICS: FRESHWATER AND REGIONAL RELATIONS 149, 164-65 (Thomas & Howlett eds., 1993) [hereinafter RESOURCE POLITICS].

65. *See* PACIFIC SOUTHWEST WATER PLAN, *supra* note 62, Appendix I, at 1.

66. LUDWIK A. TECLAFF, WATER LAW IN HISTORICAL PERSPECTIVE 118-20 (1985) [hereinafter TECLAFF, WATER LAW].

67. U.N. ECOSOC, THE DEMAND FOR WATER: PROCEDURES AND METHODOLOGIES FOR PROJECTING WATER DEMANDS IN THE CONTEXT OF REGIONAL AND NATIONAL PLANNING at 61, U.N. Doc. ST/ESA/38, U.N. Sales No. (1976). By 1994, there were 14 urban areas with populations of more than 10 million, all but four of which were in developing countries. By 2015, there are expected to be 27 such conurbations, of which at least six or seven will have populations of more than 20 million. ECONOMIST July 29, 1995, at 5, *citing* World Bank figures and estimates. To supply such huge metropolitan areas will require enormous quantities not only of water, but also of energy to transport it. Even now, pumping the one-third of Mexico city's water supply that lies farthest away from the metropolis costs twice as much as all the rest of the city's water. *Id.* at 13.

68. *See* TECLAFF, WATER LAW, *supra* note 66, at 121-24.

preferred to let the market dictate where and how water should be used.[69] Already, some countries which had adhered more or less to the basin approach as national policy began to retreat from it. The British abandoned their two-tier administration and privatized their river basin bodies in 1989.[70] Earlier in the decade, the United States abolished the basin commissions established by the Water Resources Planning Act of 1965.[71] The International Law Commission, sensitive to the opinion of a number of states, abandoned the river basin concept as the basis for a draft treaty on international waterways because it implied, of necessity, some degree of land as well as water management.[72]

It was premature to rule out the river basin, however. While some countries retreated, others affirmed or reaffirmed their adherence to the concept. Among countries which adopted basin planning and administration, not just for individual rivers but on a national scale, were Spain and Italy.[73] France has updated its water legislation of 1964[74] and its model of basin administration continues to gain adherents in eastern Europe, the former U.S.S.R., southeast Asia and Latin America.[75]

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69. *See* SPULBER & SABBAGHI, *Privatizing Water Supply and Distribution, in* ECONOMICS OF WATER RESOURCES: FROM REGULATION TO PRIVATIZATION Ch. 9 (1994). For a guide to the voluminous water market literature, see Dudley, *Water Allocation by Markets, Common Property and Capacity Sharing: Companions or Competitors?* 32 NAT. RESOURCES J. 757, 758-63 (1992); *see also* CONTINENTAL WATER MARKETING (Anderson ed., 1994) (discussing the concept of free trade in water).

70. Water Act 1989, ch. 15, arts. 4, 11 (Eng.). *See* Burnett-Hall, *Environmental Regulation in the United Kingdom: Its Development to the Present Day and Trends for the Future, Analysis and Perspective,* 12 INT'L ENVTL. REP. (BNA) 461, 464-66 (1989); *see also* SPULBER & SABBAGHI, *supra* note 69, at 202-07.

71. Act of July 22, 1965, Pub. L. 89-80, 79 Stat. 244 (1965). Six river basin commissions were abolished in 1981 by Exec. Order No. 12,319, 46 Fed. Reg. 45,591 (1981). *See* 42 U.S.C. § 1962b (1994).

72. When the International Law Commission began formulating draft articles, its first Special Rapporteur had proposed that "international watercourse" was synonymous with "international river basin." *First Report on the Law of the Non-Navigational Uses of International Watercourses,* [1976] 2 Y.B. INT'L L. COMM'N at 191, U.N. Doc. A/CN.4/295, ¶ 49. This formulation met with such opposition that it was abandoned. *See* Teclaff, Fiat or Custom, *supra* note 60, at 70-72.

73. *See* Basic Water Act of Aug. 2, 1985, R.A.L. 1985 (Sp.); Royal Decree 927/1988, July 29, 1988, B.O.E. No. 209, Aug. 31, 1988 (Sp.), *text also in* INT'L ENVTL REP. (BNA) 289: 0103; Law No. 183, May 18, 1989, 75 Leg. Ital. I, 1368 (1989) (Italy); Law No. 36, Jan. 5, 1994, 80 Lex Leg. Ital. I, 446 (1994) (Italy).

74. *See* France's Law of 1964, *supra* note 48; Law No. 92-3, Jan. 1992, 10 A.L.D. 104 (Feb. 13, 1992), J.O. 187 (Jan. 4, 1992) (Fr.).

75. The French model, according to a French Environment Ministry spokesman, has been adopted in Russia, Ukraine, Poland, Hungary, Slovakia, Vietnam, and some countries in Latin America. 17 INT'L ENVTL REP. (BNA) 133 (1994). The French Ministry of the Environment (Direction de l'eau) is establishing a world-wide network of river basin organizations known as the *Reseau international des organismes de bassin.* Its purpose is to

NEW ELEMENTS IN RIVER BASIN PLANNING AND MANAGEMENT

Meanwhile, the basin concept itself was expanded to take note of elements which had not received much, if any, consideration when the river basin was regarded purely as a unit for resource development. Legal attention began to focus on groundwater, the possible effects of climate change and the restoration of aquatic ecosystems damaged by human intervention in the hydrologic cycle. Some of these new elements involved a physical extension of what had been regarded as the basin's waters, others a reorientation of the basin concept to emphasize environmental protection. The elements absorbed so much attention that one noted jurist observed plaintively: "[W]ater law is slowly being engulfed by a universal trend in which interest in environmental law and water pollution containment law takes first place. Water law is being polluted by the environment!"[76]

Groundwater

In municipal law, the development of groundwater rules was delayed because subterranean water was considered of minor interest to the state and its disposition was left mostly to the owner of the overlying land.[77] After World War II, a trend developed toward administrative control of underground water, bringing it into the mainstream of municipal water law.[78] At this time, the beginning of the golden era of basinwide management of water resources, there came also the first recommendations that groundwater be regarded as part of the drainage basin. In the United States, for example, the President's Water Resources Policy Commission declared in 1950 that: [G]round water as well as

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contribute to institutional development, financial management, programming, and data collection and processing at river basin level. It was founded in May 1994, with the participation of representatives of river basin institutions from Brazil, Chile, Ivory Coast, Spain, France, Hungary, Indonesia, Morocco, Mexico, Poland, the Czech Republic, Romania, Slovakia, Ukraine and Venezuela. *See* AQUA FORUM, July 1995, at 4 (Newsletter of the International Association for Water Law).

76. Remark of Dante A. Caponera, *cited in* AQUA FORUM, Feb. 1994, at 1.

77. *See* TECLAFF, WATER LAW, *supra* note 66, at 146-58.

78. For example, in Great Britain, the central administration was entrusted with licensing the abstraction of underground water in areas needing water supply protection. Water Act, 1945, 8 & 9 Geo. 6, ch. 42, § 14 (Eng.). Nearly a decade later, in 1964, France subjected the capture and use of groundwater to an administrative authorization for the first time. *See* France's Law of 1964, *supra* note 48. Among other jurisdictions which began to subject groundwater to permit requirements during the third quarter of this century were Victoria (Australia), the Canary Islands, and Chile. TECLAFF, WATER LAW, *supra* note 66, at 147, 150, 152.

surface water should be included in all basin programs.[79] Such recommendations were put into action in the Delaware and Susquehanna river basin compacts in the next decade.[80] Large-scale manipulation of ground and surface waters in conjunctive use to achieve more reliable supply over a wide area, even an entire river basin, appealed to policy makers, especially in circumstances of increasing pressure on water resources.[81] Use of the drainage basin as unit of conjunctive management was espoused in conference papers[82] and in the Colombian Natural Resources and Environmental Protection Code of 1974.[83] This Code envisaged conjunctive use of surface, ground and atmospheric waters within hydrographic basins[84] and stated that, if the boundaries of groundwaters did not correspond to the surface watershed, the basin limits might be extended beyond the watershed to include aquifers whose waters were connected with the surface flow.[85]

International law largely ignored groundwater until the advent of doctrines assuming the right of basin states to an equitable share in the basin's waters, as in the International Law Association's Helsinki Rules.[86] These doctrines pertained to groundwater only insofar as it was connected with surface water. They disregarded waters not so connected. Twenty years later, the ILA Rules on International Groundwaters, an elaboration of the Helsinki Rules, took note of transboundary aquifers not connected with surface streams, treated them as if they were international drainage basins, and extended the application of the equitable

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79. PRESIDENT'S WATER RESOURCES POLICY COMMISSION, A WATER POLICY FOR THE AMERICAN PEOPLE 52 (1950).

80. *See, e.g.*, PA. STAT. ANN. tit. 32, § 815.101 (Purdon 1967) (Delaware River Basin Compact (1961)); PA. STAT. ANN. tit. 32, § 820.1 (Purdon Supp. 1995) (Susquehanna River Basin Compact (1968)).

81. LUDWIK A. TECLAFF, LEGAL AND INSTITUTIONAL RESPONSES TO GROWING WATER DEMAND 31-37 (1977).

82. *See, e.g.*, Kovacs, The Use of Ground-Water Resources in River Basin Development, Working Paper No. 44, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Sept. 16-26 (1975) (on file with the author); International Association for Water Law, 2nd International Conference on Water Law and Administration, Caracas, Feb. 8-14 (1976), Conference Recommendations as Approved by the Plenary Session on Feb. 14, 1976 (on file with the author).

83. National Code of Renewable Natural Resources and Protection of the Environment, 1974, Decreto No. 2811, Dec. 18, 1974, Part III, Diario Oficial, Jan. 2, 1975, at 145 (Colomb.).

84. *Id.* at art. 314.

85. *Id.* at art. 313.

86. Article II of the Helsinki Rules defines an international drainage basin as determined by the watershed limits of the system of waters, including surface and underground waters, flowing into a common terminus. Helsinki Rules, *supra* note 58 at 7-8. *See also* Julio Barberis, *The Development of International Law of Transboundary Groundwater*, 31 NAT. RESOURCES J. 167, 175-78 (1991).

appropriation rule to them.[87] A model framework agreement, the Bellagio Draft Treaty,[88] further elaborated the rules for groundwater, and the Dublin Statement of 1992 on Water and Sustainable Development proclaimed that the most appropriate geographical entity for planning and management of water resources is the river basin, including surface and groundwaters.[89] The groundwater legal regime has traveled a long way indeed from its neglect in the earlier water law systems.

Climate Change

Climate change became an urgent and very controversial issue in the late 1980s.[90] For institutions which accepted the possibility as it affected their functions—and few could afford to ignore it—such radical change implied making plans for an eventuality whose exact time-scale and effects were as yet unguessable. The United Nations Environment Program recognized the nature of the problem as it affected water resources and drew attention to the matter at a conference in 1988:

> Climate change can bring a totally new series of environmental impacts on river and lake basins. Should current estimates prove to be correct, global warming could radically alter precipitation patterns. New deserts could be created; lands which are now considered to be too arid for productive use may have to be relied on in the future to feed our successor

87. Article 2.2 of the Rules on International Groundwaters adopted at the Seoul Conference of the ILA unequivocally states that a transboundary aquifer that does not contribute water to, or receive water from, the surface waters of an international drainage basin constitutes an international drainage basin for the purpose of the Helsinki Rules. INTERNATIONAL LAW ASSOCIATION, REPORT OF THE SIXTY-SECOND CONFERENCE 259 (1986); *see also* the commentary on isolated groundwater basins by Professor Robert D. Hayton, as Rapporteur to the International Law Association on The Law of International Groundwater Resources. *Id.* at 238-50.

88. *See* Robert D. Hayton & Albert E. Utton, Transboundary Groundwaters: The Bellagio Draft Treaty, 29 NAT. RESOURCES J. 664 (1989).

89. *Dublin Statement on Water and Sustainable Development*, U.N. International Conference on Water and the Environment, Jan. 26-31, 1992, *reprinted in* 22 ENVTL. POL'Y & L. 54 (1992) [hereinafter *Dublin Statement*].

90. For a brief history of the controversy, *see* White, *The Great Climate Debate*, 263 SCI. AM. 36 (1990). For some authoritative studies, see S. SCHNEIDER, GLOBAL WARMING (1989); CLIMATE INSTITUTE, PREPARING FOR CLIMATE CHANGE, PROCEEDINGS OF THE FIRST NORTH AMERICAN CONFERENCE ON PREPARING FOR CLIMATE CHANGE: A COOPERATIVE APPROACH, OCT. 27-29, 1987 (1988) [hereinafter PREPARING FOR CLIMATE CHANGE]; OFFICE OF RESEARCH AND DEVELOPMENT, U.S. ENVIRONMENTAL PROTECTION AGENCY, THE POTENTIAL EFFECTS OF GLOBAL CLIMATE CHANGE IN THE UNITED STATES: REPORT TO CONGRESS (J.B. Smith & D. Tirpak eds., 1989) [hereinafter POTENTIAL EFFECTS OF GLOBAL CLIMATE CHANGE]; *see also*, Nielsen, IT'S OFFICIAL: NOW THE CLIMATE IS REALLY STARTING TO GET WARM, 11 U.S. WATER NEWS 12 (1995) (citing recent research).

> generations. Evapotranspiration may assume a new dimension, given temperature rises. The uncertainties of today may become urgent issues in less than a decade from now, and water systems will, perforce, assume an even greater importance.[91]

A warming trend could affect streamflow regimes in such a way as to bring about floods or drought or both in succession which could cause sea levels to rise, bringing salt-water intrusion into estuaries and flooding coastal plains, and could seriously damage watershed forests and other biota from climate stress.[92]

Both for national and international basins, river commissions began factoring various climate change scenarios into their planning and development activities. Some, such as the Delaware and Susquehanna basin commissions, looked to the development of increased storage and relied on their own powerful authority to make emergency regulations and even modify existing signatory state permits for water withdrawal.[93] The potential impact of rising sea levels was a major concern of Britain's National River Authority, the Delaware and Mississippi commissions and the Interim Committee for Co-Ordination of Investigations of the Lower Mekong Basin.[94] At the very least, a considerable amount of research was going on.[95]

Restoration of Aquatic Ecosystems

By the 1990s, there was widespread evidence that waterworks constructed, often long ago, for economically beneficial purposes, such as flood control, hydropower production, and irrigation, had caused significant damage to freshwater ecosystems.[96] Projects were undertaken

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91. U.N. RIVER AND LAKE BASIN DEVELOPMENT, *supra* note 45, at 110.

92. *See* Maurits la Rivière, *Threats to the World's Water*, 261 SCI. AM. 80 (1989); Hekstra, *Global Warming and Rising Sea Levels; The Policy Implications*, 19 ECOLOGIST 4 (1989); Schneider, *supra* note 90, ch. 6; PREPARING FOR CLIMATE CHANGE, *supra* note 90, ch. XIII; POTENTIAL EFFECTS OF GLOBAL CLIMATE CHANGE, *supra* note 90, ch. 9.

93. They have these powers under their respective interstate compacts. *See* Delaware River Basin Compact, *supra* note 80, at art. 10; Susquehanna River Basin Compact, *supra* note 80, at art. 11.

94. Ludwik A. Teclaff, *The River Basin Concept and Global Climate Change*, 8 PACE ENVTL. L. REV. 355, 380, 384 (1991) [hereinafter *River Basin Concept*].

95. *See generally* DELAWARE RIVER BASIN COMMISSION & U.S. ENVIRONMENTAL PROTECTION AGENCY, GREENHOUSE EFFECT, SEA LEVEL RISE, AND SALINITY IN THE DELAWARE ESTUARY (C. Hull & J. Titus eds. 1986); *see also* Teclaff, *River Basin Concept*, *supra* note 94, at 384-85.

96. *See generally* U.S. NATIONAL RESEARCH COUNCIL, RESTORATION OF AQUATIC ECOSYSTEMS: SCIENCE, TECHNOLOGY, AND PUBLIC POLICY 188-206 (1992) [hereinafter NATIONAL RESEARCH COUNCIL]; WETLAND CREATION AND RESTORATION: THE STATUS OF THE

to undo some of the damage—for example, by removing dams, levees and river-straightening works,[97] by enhancing fish and wildlife habitat[98] and by restoring water flows diminished through excessive consumption or out-of-basin diversion.[99] Most of this restoration was on a project-by-project basis, but there were serious efforts to promote ecosystem restoration on a river-basin or regional scale. United States examples of restoration include two pieces of legislation and a series of court decisions. These were the Truckee-Carson Water Rights Settlement Act of 1990 (to provide for the recovery of Pyramid Lake, Nevada),[100] the Central Valley Project Improvement Act of 1992 (to restore habitat in the rivers and streams of the Central Valley and Trinity River basins of California)[101] and the decisions leading up to the court-mandated

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SCIENCE xx (Kusler & Kentula eds., 1990); GOLDSMITH & HILDYARD, THE SOCIAL AND ENVIRONMENTAL EFFECTS OF LARGE DAMS (1984). For specific examples, see Kotlyakov, The Aral Sea Basin: A Critical Environmental Zone, 33 ENVIRONMENT 4 (1991); Young, *The Troubled Waters of Mono Lake*, NAT'L GEOGRAPHIC, Oct. 1981, at 504; Morgan, *Transboundary Liability Goes with the Flow? Gasser v. United States: The Use and Misuse of a Treaty*, 5 TRANSBOUNDARY RESOURCES REP. 1-2 (1991) (discussing the Colorado); Edward P. Glenn *et al., Cienega de Santa Clara; Endangered Wetland in the Colorado River Delta, Sonora, Mexico*, 32 NAT. RESOURCES J. 817 (1992); Gilbert F. White, *The Environmental Effects of the High Dam at Aswan*, 30 ENVIRONMENT 5 (1988); Korn, *The Salmon's Last Run*, 13 AMICUS J. 30 (1991); Kamto, *Fleuves et Lacs Internationaux Africains et Problèmes Ecologiques: Quelques Considérations Juridiques*, 21 ENVTL. POL'Y & L. 236 (1991).

97. For an example, see the proposed removal of the Elwha and Glines Canyon dams in the State of Washington under the Elwha River Ecosystem and Fisheries Restoration Act of 1992, Pub. L. No. 102-495, 106 Stat. 3173 (1992), or the unstraightening of Florida's Kissimmee River, given federal authorization by the Water Resources Development Act of 1992. Pub. L. No. 102-580, § 101(8), 106 Stat. 4797, 4802 (1992). It is noteworthy that the Bureau of Reclamation has declared a complete about-face in its policy on dams. According to Bureau Commissioner Daniel P. Beard, "The dam building era is over. Indeed we have almost eliminated structural solutions as a viable option." Daniel P. Beard, Speech given to the American Bar Ass'n Section of Natural Resources, Energy and Environmental Law's San Diego Conference, Feb. 10, 1994, *reprinted in* WATER LAW: TRENDS, POLICIES, AND PRACTICE 357 (Carr & Crammond eds., 1995). Allowing rivers to meander within their natural flood plains was seriously considered for the Mississippi and tributaries after the great floods of 1993 and has actually been put into effect by the Netherlands government on sections of the Rhine. *See* Labaton, *U.S. Is Considering a 'Revolution' in Flood Control*, N.Y. TIMES, Aug. 28, 1993, at 6; Simons, *Dutch Do the Unthinkable: Sea is Let In*, N.Y. TIMES, Mar. 7, 1993, at 1. However, environmentalists were severely criticized in the Netherlands for advocating this approach after the devastating winter floods of 1995. ST. PETERSBURG TIMES, Feb. 4, 1995, at A2.

98. *See, e.g.*, Yagerman, *Protecting Critical Habitat Under the Federal Endangered Species Act*, 20 ENVTL. L. 811 (1990).

99. *See, e.g.*, the Truckee-Carson Water Rights Settlement. Truckee-Carson Water Rights Settlement Act, Pub. L. No. 101-618, 104 Stat. 3294 (1990).

100. *Id.*

101. Reclamation Projects Authorization and Adjustment Act of 1992, Pub. L. No. 102-575, 106 Stat. 4600, 4706-31 (1992) (which includes the Central Valley Project Improvement Act (CVPIA)).

revival of Mono Lake, California.[102] On the U.S.-Canadian border, the International Joint Commission, continuing its ecosystem approach in the Great Lakes Basin, began to reconsider its past practice of regulating lake levels.[103] In African river basins, such as the Senegal experiments are being conducted with carefully timed flood releases to restore riverine habitat.[104] In Europe, some recently created commissions were given power to investigate damaged habitat, make proposals for improvement and require its restoration.[105] Amid all this individual effort to mitigate the effects of too much river regulation in the past, however, there have been few policy pronouncements on the issue by organizations. One such policy pronouncement was the report of the Long's Peak Working Group of 1992, which, in its recommendations on U.S. water policy, laid unusual stress on reversing past damage.[106] The report specifically

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102. The two landmark decisions were National Audubon Society v. Superior Court, 658 P. 2d 709 (Cal. 1983), and California Trout Inc. v. Superior Court, 266 Cal. Rptr. 788 (1990). The first invoked the public trust doctrine to challenge Los Angeles' right to divert water from Mono Lake tributaries (diversions which caused great harm to the lake's unique ecological system), the second ordered the city's licenses amended to require release of sufficient water to reestablish and maintain the lake's pre-diversion fisheries. Finally, in September 1994, by the terms of a decision of the State Water Resources Control Board and an accord between the city and several environmental groups, Los Angeles agreed to stop depleting Mono Lake until the lake levels recover and to help restore its ecological balance. For a history of the 16 years of litigation (including interim decisions), see Robie, *Mono Lake Dispute Ends With a Whimper*, 27-28 ROCKY MTN. MINERAL L. FOUNDATION, WATER LAW NEWSLETTER 1 (1994-1995); Mydans, *City of Angels Makes Peace in Water Wars*, N. Y. TIMES, Oct. 3, 1994, at A10.

103. *See* LEVELS REFERENCE STUDY BOARD, INTERNATIONAL JOINT COMMISSION, LEVELS REFERENCE STUDY: GREAT LAKES-ST. LAWRENCE RIVER BASIN, FINAL REPORT 35, 39, 46, 65 (1993). Another initiative in the Great Lakes Basin is the 1994 agreement between the federal government of Canada and the Province of Ontario, Part 4 of which makes specific provision for the rehabilitation of ecosystem function and structure of diverse self-sustaining native biological communities in twelve Areas of Concern and other priority degraded areas in the Great Lakes Basin Ecosystem. Agreement Respecting the Great Lakes Basin Ecosystem, Can.-Ont., 1994 [Reference File] INT'L ENV'T REP. (BNA) 31:0651, at :0652.

104. *See* Thayer Scudder, *The Need and Justification for Maintaining Transboundary Flood Regimes: The Africa Case*, 31 NAT. RESOURCES J. 75, 100-04 (1991).

105. One example is the commission created by the Fisheries Convention. Fisheries Convention, Mar. 19, 1986, Italy-Switz., Recueil official des lois fédérales 539 (1989) (Switz.), *reprinted in* STEFANO BURCHI, TREATIES CONCERNING THE NON-NAVIGATIONAL USES OF INTERNATIONAL WATERCOURSES-EUROPE 418 (1993) [hereinafter BURCHI, TREATIES: EUROPE]. Another is the Elbe River Commission. *See* Convention on the International Commission for the Protection of the Elbe, Oct. 8, 1990, at art. 2(j), *reprinted in* BURCHI, TREATIES: EUROPE, *supra* at 40.

106. *See generally* LONG'S PEAK WORKING GROUP ON NATIONAL WATER POLICY, AMERICA'S WATERS: A NEW ERA OF SUSTAINABILITY (1992) (on file with the Natural Resources Law Center, Boulder, Colorado) [hereinafter LONG'S PEAK REPORT]. For a discussion of the Report, *see Point/Counterpoint: Long's Peak Report: Reforming National Water Policy*, 24 ENVTL. L. 123 (1994).

recommended that the President issue an Executive Order establishing a policy of watershed-level aquatic ecosystem protection and restoration.[107] The European Conservation Strategy of the Council of Europe suggested concrete measures, such as replacing environmentally damaging developments with environment-friendly biological engineering projects, eliminating or adjusting barriers to the free movement of fish and ensuring a biologically sufficient minimum flow in hydroelectric power plant concessions, new or renewed.[108] In its current work on remedies for damage caused by use of waters of an international drainage basin, the International Law Association's Water Resources Committee is tackling restoration policy from another angle—the financial costs.[109] "Damage" is defined as including the costs of reasonable measures of reinstatement or restoration of the *environment of the drainage basin.*[110] If adopted, this definition interprets restoration on a basin-wide scale and in the broadest possible terms.

The Ecosystem Approach, Integrated Management and Sustainable Development

The term "ecosystem" in a context of natural resource management dates back at least a quarter of a century in international usage, to the Stockholm Conference on the Human Environment of 1972.[111] Six years later, Canada and the United States incorporated an ecosystem approach to pollution control in the Great Lakes Water Quality Agreement[112] and have continued to adapt and develop it in a wide range of applications throughout the Great Lakes-St. Lawrence drainage basin ever since.[113] Conferences and workshops promoted the idea as

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107. LONG'S PEAK REPORT, *supra* note 106, Recommendation 11, at 8, Recommendations 32, 33 and 35, at 11.

108. For a discussion of this development, see paragraphs 8, 9 and 10 of the section on inland waters, lakes and rivers of the European Conservation Strategy. *European Conservation Strategy, Draft Recommendation*, Council of Europe, 6th European Ministerial Conference on the Environment, Oct. 11-12, 1990 (adopted by the Ministers), *reprinted in* 20 ENVTL. POL'Y & L. 243 (1990).

109. *See* the internal minutes of the Committee, May 8, 1995 (on file with the author).

110. *Id.* (emphasis added).

111. *Report of the United Nations Conference on the Human Environment*, U.N. General Assembly, U.N. Doc. A/Conf.48/14 (1972) (Stockholm Report), *reprinted in* 11 I.L.M. 1416. Recommendation 60 calls for the Secretary-General to arrange for systematic audits of natural resource development projects in representative ecosystems of international significance. *Id.*

112. Great Lakes Water Quality Agreement, Nov. 22, 1978, U.S.-Can., 30 U.S.T. 1384, T.I.A.S. No. 9257.

113. *See* Ludwik A. Teclaff & Eileen Teclaff, *International Control of Cross-Media Pollution—An Ecosystem Approach*, 27 NAT. RESOURCES J. 21, 38-39 (1987); T. COLBORN ET AL.,

a basis for coordinated land and water management.[114] It soon appeared that "ecosystem" was being used in a variety of ways, referring in some cases to the channel and banks of a river, in others to the watercourse system and in yet others to the river basin as a whole.[115] An ecosystem approach, therefore, was capable of many different interpretations. For example, the International Law Commission, in its draft Article 20, obligates riparian states to "protect and preserve the ecosystems of international watercourses."[116] In view of the Commission's rejection of the river basin concept, the term "ecosystem" could be construed very narrowly as applying only to the stream and the contents of its water.[117]

In its 1993 guidelines on the Ecosystem Approach in Water Management, the Economic Commission for Europe cast some light on the issue.[118] It recommended consideration of the whole catchment area

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GREAT LAKES, GREAT LEGACY 193-201 (1990); LEVELS REFERENCE STUDY BOARD, *supra* note 103; C. Jackson, *The Great Lakes: Exploring the Ecosystem, in* RESOURCE POLITICS, *supra* note 64, at 30-37; George Francis, *Ecosystem Management*, 33 NAT. RESOURCES J. 315, 330-40 (1993); Agreement Respecting the Great Lakes Basin Ecosystem, *supra* note 103; Kidd, Integration Paper prepared for State of the Lakes Ecosystem Conference, Sept. 1994, at 29 (on file with the author).

114. *See, e.g.*, African Ministerial Conference on the Environment, Cairo Programme for African Co-Operation, Dec. 16-18, 1985, *reprinted in* 16 ENVTL. POL'Y & L. 27, 28 (1986); DEPARTMENT OF WATER IN ENVIRONMENT AND SOCIETY, UNIVERSITY OF LINKOPING, RIVER BASIN STRATEGY (1984) (containing the proceedings of the International Seminar on the Relevance of River Basin Approach for Coordinated Land and Water Conservation and Management, Linköping, Sweden, June 4-8, 1984).

115. For a description of aquatic ecosystems and their components, *see* NATIONAL RESEARCH COUNCIL, *supra* note 96, at 178-87; WETLAND CREATION AND RESTORATION: THE STATUS OF THE SCIENCE, *supra* note 96. In some cases, the word "ecosystem" has been used in a basin context, but without actually identifying it with the basin. *See* LONG'S PEAK REPORT, *supra* note 106, Recommendation 11, at 8, Recommendations 32, 35, at 11. On the river basin *per se* as ecosystem, see Reynolds, *River Basin as an Ecosystem, in* RIVER BASIN STRATEGY, *supra* note 114, at 217.

116. Draft Article 20 obligates watercourse states to "protect and preserve the ecosystems of international watercourses." *Report of the Commission on the Work of its 46th Session*, Draft Articles on the Law of the Non-Navigational Uses of International Watercourses, International Law Commission, U.N. Doc. A/49/10 (1994), *reprinted in* 24 ENVTL. POL'Y & L. 335, 351 [hereinafter *I.L.C. 46th Session*].

117. On the potentially narrow interpretation of this wording, see the comments of Okidi and Nanda, referring to a previous draft. Okidi, *"Preservation and Protection" Under the 1991 ILC Draft Articles on the Law of International Watercourses*, 3 COLO. J. INT'L ENVTL. L. & POL'Y 143, 173 (1992); Ved Nanda, *The Law of the Non-Navigational Uses of International Watercourses: Draft Articles on Protection and Preservation of Ecosystems, Harmful Conditions and Emergency Situations, and Protection of Water Installations*, 3 COLO. J. INT'L ENVTL. L. & POL'Y 175, 181 (1992).

118. *Water Series No. 1, Protection of Water Resources and Aquatic Ecosystems, Part One, Guidelines on the Ecosystem Approach in Water Management*, Economic Commission for Europe, U.N. Doc. ECE/ENVWA31 (1993) [hereinafter *Guidelines: Ecosystem Approach*].

as a natural unit for integrated ecosystems-based water management.[119] It declared that a river basin covering a large territory might be regarded as an ecosystems continuum, representing at any given time a succession of ecosystems types from headwaters to mouth.[120] Nevertheless, when read in detail, these guidelines can equally be taken as an argument for the basin or for the watercourse. The ecosystem approach is obviously going to be used as cannon fodder on both sides of the debate.

Another concept that is now quite frequently used with no precise definition is that of holistic or integrated management, which has come to be associated with sustainable development. The Dublin Statement on Water and Sustainable Development of 1992 says that effective management of water resources demands a holistic approach, linking social and economic development with protection of natural ecosystems and also linking land and water uses across the whole of a catchment area or groundwater aquifer.[121] The Statement quite definitely supports the river basin as a unit for planning, management, protection of ecosystems and resolution of water conflicts.[122] Although it emphasizes the preparation and implementation of integrated management plans, however, it does not specify what integrated management means.[123]

The experts who prepared proposals on freshwater resources for the United Nations Conference on Environment and Development at Rio de Janeiro in 1992 shed some further light on the subject. They described integrated water resources management as based on "water as an integral part of the ecosystem, a natural resource and an economic good, the quantity and quality of which determines its utilization."[124] They stressed that "integrated water resources management should be carried out at the catchment basin or sub-basin level, taking into account existing interlinkages between surface and ground waters."[125] Furthermore, they outlined four principal objectives to be pursued.[126] Two years later, the

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119. *Id.* § 1.

120. *Id.* § 5.

121. Dublin Statement, *supra* note 89, at 54.

122. *Id.* at 55.

123. *Id.*

124. Protection of the Quality and Supply of Fresh Water Resources: Application of Integrated Approaches to the Development, Management and Use of Water Resources, U.N. Conference on Environment and Development, Agenda Item 21, Ch. 10 § 1, at 22, ¶ 19, U.N. Doc. A/Conf.151/PC/100/Add., *reprinted in* 1 AGENDA 21 & THE UNCED PROCEEDINGS 513, 519 (N.A. Robinson ed., 1992). Such management requires taking into account the functioning of aquatic ecosystems and giving priority to the satisfaction of basic needs and the safeguarding of ecosystems.

125. *Id.* at 519, ¶ 20.

126. The first of these objectives is "to promote a dynamic, interactive, iterative and multi-sectoral approach" to management, integrating technological, socioeconomic,

United Nations Commission on Sustainable Development also recommended integrated management, mobilization and use of water resources in a holistic manner,[127] and urged that special attention be given to the integrated management and conservation of river and lake basins, nationally, internationally and at all appropriate levels.[128] Like the Dublin Statement, however, the Commission did not define its terms. By contrast, the International Law Commission held to a much narrower and more circumspect terminology. In its miscellaneous provisions, the ILC defined management as (a) planning the sustainable development of an international watercourse, and (b) otherwise promoting rational and optimal utilization, protection and control of the watercourse.[129] This was a considerable departure from an earlier draft which defined "joint institutional management" as including "planning of sustainable, multi-purpose and integrated development of international watercourse(s) (systems)."[130]

EXPANSION OF RIVER INSTITUTIONS

The oldest river management bodies were, and many still are, single-purpose. Their mandate has been limited to functions such as regulation of flow and the control of navigation, fisheries, floods and pollution. The forerunners of the modern British river basin entities, for example, were the Commissioners of Sewers whose origins go back to the Middle Ages and who were directed to take care of land drainage.[131] On Europe's two major international rivers, the Rhine and the Danube, navigation commissions have existed since shortly after mid-19th

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environmental and human health considerations. *Id.* ¶ 20(a). Other objectives address planning, based on community needs, full public participation (including women and indigenous peoples) in policy-making, and strengthening the appropriate institutional, legal and financial mechanisms to "ensure that water policy and its implementation is a catalyst for sustainable social progress and economic growth." *Id.* ¶ 20(b)-(d). On paper this is remarkably like the valley authority approach to creating all-purpose basin units, but without the valley authority and with the addition of environmental and some sociological concerns.

127. *Decisions*, U.N. Commission on Sustainable Development, 2nd Sess., U.N. Doc. E/CN/17/1994/L.5 (1994), *reprinted in* 24 ENVTL. POL'Y & L. 266 (1994).

128. *Id.* ¶ 7(c).

129. I.L.C. 46th Session, *supra* note 116, art. 26.2.

130. *See Sixth Report on the Law of the Non-Navigational Uses of International Watercourses*, International Law Commission, U.N. GAOR, 42d Sess., at 20-21, Draft Article 26.1.(d), U.N. Doc. A/CN.4/427 (1990).

131. *See* TECLAFF, THE RIVER BASIN, *supra* note 3, at 124. For a general act consolidating the Commissioners' powers and functions, see Commissioners of Sewers Act, 1532, 23 Hen. 8, ch. 5, Sec. 1 (repealed).

century[132] and some of the fisheries conventions of a few decades later established regulatory bodies.[133] The jurisdiction of navigation and fisheries commissions rarely extended beyond a well-defined segment of waterway but pollution control demanded a broader approach. It prompted one very early application of the river basin concept at the turn of the century in the establishment of local commissions in the Ruhr region of Germany.[134] But the Ruhr associations were concerned also with power generation, drainage, water supply and even regional development. Thus, they became the first examples of basin agencies administering a multi-purpose development of water resources.

In the third decade of this century, basin administration was linked to a broad spectrum of economic and social goals in the Tennessee Valley Authority, which became the prototype for a number of so-called valley authorities in Asia and Latin America.[135] These basin agencies were conceived on a grand scale, with powers going far beyond water management. They were highly autonomous entities, corporate in form, separately funded and responsible to the central government rather than to the water administration or any sector of it.[136] They remained few in number, however, and commissions with a mandate restricted to water resources proved to be more enduring. Even so, organizations with consultative powers are far more numerous than basin authorities in charge of all phases of water resource development.[137]

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132. For a brief history of the Rhine and Danube commissions, see Ludwik A. Teclaff, *Fiat or Custom: The Checkered Development of International Water Law*, 31 NAT. RESOURCES J. 45, 50-56 (1991).

133. Some of the conventions merely called for a meeting or meetings of representatives of the parties. *See Systematic Index of International Water Resources Treaties, Declarations, Acts and Cases by Basin*, U.N. Food and Agriculture Organization, Annex 4 (Legislative Study No. 15), at 124-25 (1978) for treaties of June 30, 1885, and May 18, 1887, on fishing in the Rhine and its tributaries. Other conventions provided for commissions. *See* Lake Constance convention of July 5, 1893, *id.* at 144; convention of Apr. 11, 1908, on protection of food fish in frontier waters of the United States and Canada, *id.* at 172. The texts of the first three conventions are in LEGISLATIVE TEXTS AND TREATY PROVISIONS CONCERNING THE UTILIZATION OF INTERNATIONAL RIVERS FOR OTHER PURPOSES THAN NAVIGATION 393, 397, 403, U.N. Doc. ST/LEG/SER.B/12 (1963). The U.S.-Canadian food fish convention is in 25 Hertslet C.T. 1206 (E).

134. *See supra* note 34 and accompanying text.

135. *See supra* note 40 and accompanying text.

136. LUDWIK A. TECLAFF, THE RIVER BASIN IN HISTORY AND LAW 130-43 (1967) [hereinafter TECLAFF, THE RIVER BASIN].

137. For examples of the coordinating and consultative type of institution in the United States, India, Argentina, Australia, Mexico, and Japan, see TECLAFF, THE RIVER BASIN, *supra* note 136, at 143-49. More powerful bodies include the Delaware and Susquehanna basin commissions, which have both advisory and executive functions, the French basin committees, and the Spanish hydrographic confederations. *See* PA. STAT. ANN. tit. 32, § 815.101 (Purdon 1967) (Delaware River Basin Compact (1961)); PA. STAT. ANN. tit. 32, § 820.1

Basin commissions have had quite a precarious hold in national water management for a variety of reasons—fear of granting them too much autonomy, inter-agency rivalry and financial difficulties. In some countries, they were never instituted or played only a marginal role.[138] In other countries, they have had their powers curtailed and their regulatory functions transferred to central authorities.[139] Some aspects of management, such as water supply, proved to be resistant to consolidation. The huge municipal water supply entities proliferating throughout the urbanized world demonstrate not only the persistence of purely sectoral administration, but also a total disregard for drainage basin confines.[140] The basin commission form of administration is also challenged by large-scale inter-basin transfers of water for irrigation,[141] which call for management on a regional basis.

On the other hand, the environmental movement has revived the need for river basin institutions. To pollution control and fisheries conservation, which were virtually the only environmental issues recognized until the second half of this century, have been added concerns about other elements of the environment besides water, about aquatic ecosystems, even about the effects of possible future damage to water resources from climate change. Quite a number of basin

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(Purdon Supp. 1995) (Susquehanna River Basin Compact (1968)). On the French basin committees, see Law No. 92-3, Jan. 1992, 10 A.L.D. 104 (Feb. 13, 1992), J.O. 187 (Jan. 4, 1992) (Fr.), modifying that country's 1964 law. On the Spanish hydrographic confederations, see Basic Water Act of Aug. 2, 1985, R.A.L. 1985 (Sp.); Royal Decree 927/1988, July 29, 1988, B.O.E. No. 209, Aug. 31, 1988 (Sp.).

138. Although there are a few quite powerful commissions in the United States, most were meant to supplement rather than supplant the general pattern of water management by agencies either of the federal government or of political subdivisions. Interstate compacts have been popular for coordinating the water policies of several states occupying parts of the same river basin. However, a number of them entrust implementation to a meeting of state officials or, if they do provide for commissions, limit those commissions' powers by requiring virtual unanimity on decisions. *See* U.S. DEPARTMENT OF INTERIOR, DOCUMENTS ON THE USE AND CONTROL OF THE WATERS OF INTERSTATE AND INTERNATIONAL STREAMS (T. Witmer ed., 1956), for the Belle Fourche, La Plata, South Platte, Colorado, Republican, Snake, Canadian, Costilla Creek, Rio Grande, and Upper Colorado compacts.

139. For example, the water basin authorities in England and Wales had their water supply functions privatized and their regulatory functions handed over to a National Rivers Authority, operating with the assistance of ten regional advisory committees. *See, e.g.*, Water Act 1989, ch. 15, arts. 4, 11 (Eng.).

140. See LUDWIK A. TECLAFF, WATER LAW IN HISTORICAL PERSPECTIVE 119-24 (1985) [hereinafter TECLAFF, WATER LAW].

141. *See, e.g.*, the California State Water Project, the Arizona water project, the Israeli National Water Carrier, and the Australian Snowy Mountains project. William E. Warne, *California Pioneers New Water Development Concepts*, 2 NAT. RESOURCES J. 248 (1962); ISRAEL MINISTRY OF AGRICULTURE, ISRAEL'S WATER ECONOMY (1973); SNOWY MOUNTAINS AUTHORITY, THE SNOWY MOUNTAINS (1963).

commissions have simply added these concerns to their existing responsibilities.[142]

In international river basins, however, there are still many instances of areally and functionally limited administration. Despite the pronouncements of international organizations, the urging of global and regional agencies, and the recommendations of conferences as to the desirability of a river basin approach to multi-state water management (all within the past half-century), the majority of institutions created during that period have been single-purpose and confined to single waterways or portions of waterways. Some deal only with fisheries,[143] some with pollution,[144] some with water apportionment,[145] power production,[146] or the construction of waterworks.[147] In several instances, their jurisdiction is limited to frontier waters.[148]

Some major international rivers have several commissions, each with a different mandate and jurisdiction. Recognizing this situation, the

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142. *See, e.g.*, the Delaware River Basin Commission, created by the Delaware River Basin Compact. 32 PA. STAT. ANN. tit. 32, § 815.101 (Purdon 1967) (Delaware River Basin Compact (1961)).

143. Agreement Regarding Fishing in the Fishing Area of the Naatamo (Neiden) Watercourse, June 9, 1964, Fin.-Nor., 503 U.N.T.S. 205, *reprinted in* BURCHI, TREATIES: EUROPE, *supra* note 105, at 165; Fisheries Convention, Mar. 19, 1986, Italy-Switz., Recueil officiel des lois fédérales 539 (1989) (Switz.), *reprinted in* BURCHI, TREATIES: EUROPE, *supra* note 105, at 418. The Finnish-Norwegian agreement provides only for consultations between local bailiffs and fishery inspection officials, but the Italian-Swiss convention creates a commission which has power to require the restoration of damaged habitat and the submission of plans for any works which interrupt or modify the natural course of the waters subject to the convention.

144. One commission addressing pollution is the Elbe River Commission, created by the Convention on the International Commission for the Protection of the Elbe, Oct. 8, 1990. *See* BURCHI, TREATIES: EUROPE, *supra* note 105, at 40.

145. Two commissions dealing with apportionment are the Permanent Joint Technical Commission for Nile Waters and the Permanent Indus Commission. The former was provided for in the Agreement for the Full Utilization of the Nile Waters, Nov. 8, 1959, United Arab Republic-Sudan, 453 U.N.T.S. 51, the latter by the Indus Waters Treaty, Sept. 19, 1960, India-Pak., 419 U.N.T.S. 126.

146. *See, e.g.*, the Permanent Engineering Board established under the Columbia River Basin Treaty, Jan. 17, 1961, U.S.-Can., 15 U.S.T. 1555, T.I.A.S. No. 5638, 542 U.N.T.S. 244.

147. The International Boundary and Water Commission, United States-Mexico (IBWC), for instance, is basically an engineering body, charged with planning, constructing and operating dams, storage and diversion structures and flood-control works, under the 1944 treaty. *See* Treaty Respecting Rio Grande, Colorado and Tijuana, U.S.-Mex., Feb. 3, 1944, 59 Stat. 1219 [hereinafter *Treaty of 1944*]. Its functions have been somewhat enlarged to encompass pollution control by the Agreement on Cooperation for the Protection and Improvement of the Environment in the Border Area, Aug. 14, U.S.-Mex., T.I.A.S. No. 10827.

148. One example is the Finnish-Swedish Boundary Rivers Commission, which operates under the Agreement Concerning Frontier Rivers, Sept. 16, 1971, Fin.-Swed., 825 U.N.T.S. 191. Another is the International Boundary and Water Commission, *supra*, note 147, which has wide-ranging responsibilities, but a very narrow area of jurisdiction.

1992 Helsinki Convention prescribed that where two or more joint bodies exist in the same catchment area, they must endeavor to coordinate their activities so as to prevent, control and reduce transboundary impact within that catchment area.[149] Ideally, this should amount to a basin approach and individual bodies may be able to achieve by linkage what they could not achieve separately. For example, the Berne Agreement of 1963,[150] establishing the International Commission for the Protection of the Rhine Against Pollution, required that body to collaborate with other international commissions created for the Rhine tributaries and estuary.[151]

A few international commissions, which originally had a non-basin mandate, acquired basin-wide responsibilities later. An outstanding example is the International Joint Commission, United States-Canada (I.J.C.), which, at its inception and for a long time afterward, had jurisdiction only over frontier waters.[152] What changed the Commission's role was not water resources development, but its concern over the deteriorating condition of the Great Lakes. It was the I.J.C.'s own environmental studies and recommendations that laid the basis for the Great Lakes water quality agreements of 1972 and 1978.[153] The agreements provided the commission with additional wide-ranging powers and responsibilities as well as with subordinate institutions whose activities embrace tributary waters and land-use.[154]

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149. Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki Convention), Mar. 17, 1992, U.N. Doc. E/ECE/1267, Art. 9.5, 31 I.L.M. 1312, *reprinted in* [Reference File] INT'L ENV'T REP. (BNA) 41:3051 [hereinafter *Helsinki Convention*].

150. Agreement Concerning the International Commission for Protection of the Rhine Against Pollution (Berne Agreement), Apr. 29, 1963, U.N. Doc. A/CN.4/274, vol. I, at 128 (German version). The English translation of the text is in A.J. PEASLEE, INTERNATIONAL GOVERNMENT ORGANIZATIONS 430 (rev. 3d ed. 1976).

151. *Id.* at art. 10. The Protocol of Signature accompanying the Agreement specifies collaboration with the international commissions for the Moselle, Saar, and Lake Constance, as well as with the Central Commission for the Navigation of the Rhine.

152. Its jurisdiction and powers, as originally set forth, were circumscribed by the Boundary Waters Treaty of 1909, Article 2 of which excluded from the definition of boundary waters rivers that flow across the United States-Canada border. Boundary Waters Treaty, Jan. 11, 1909, U.S.-U.K. (Canada), 36 Stat. 2448 (1909).

153. Great-Lakes Water Quality Agreement, U.S.-Can., Apr. 15, 1972, 23 U.S.T. 301, 24 U.S.T. 2268, T.I.A.S. No. 7312, 7747; Great Lakes Water Quality Agreement, U.S.-Can., Nov. 22, 1978, 30 U.S.T. 1384, T.I.A.S. No. 9257. *See* INTERNATIONAL JOINT COMMISSION, REPORT, POLLUTION OF LAKE ERIE, LAKE ONTARIO, AND THE INTERNATIONAL SECTION OF THE ST. LAWRENCE RIVER (1970). *See also* Leonard B. Dworsky, *Ecosystem Management: Great Lakes Perspectives*, 33 NAT. RESOURCES J. 347, 349-50 (1993), for a tabulation of events leading to incorporation of the ecosystem approach.

154. These subordinate agencies include the Pollution from Land-Use Activities Reference Group (PLUARG), the Water Quality Board, the Upper Lakes Reference Group,

Nearly all the basin institutions created as such from the start have been established at the instigation or under the aegis of the United Nations and its agencies. The earliest, viewed as a role model, was the Committee for Coordination of Investigation of the Lower Mekong, created in 1957 to promote, coordinate, supervise and control the planning and development of water resource projects in the four-state lower Mekong basin.[155] Despite war and political conflict in Southeast Asia, it has continued to function and to make adjustments to its original mandate and objectives.[156] The Lower Mekong Committee is a multinational body with an unusual internal organization, several levels of representation (national and international), and a large professional staff, embracing many disciplines.[157] Quite different is the arrangement for the eight-state Amazon Basin established by the treaty of 1978.[158] Although the treaty provided for a permanent national commission (a planning body), implementation is entrusted to the foreign ministers of the signatories and to a council of high-level diplomatic representatives of the basin states.[159]

The commissions for African river basins range between the two foregoing examples in jurisdiction and powers. In the Niger basin, the original commission was reorganized in 1980 as the Niger Basin Authority, composed of high officials of the basin states.[160] It has the responsibility to promote cooperation for the integrated development of the Niger basin in water resources and many other fields, from agriculture to transportation, but, except in a few cases, the basin states do not have to seek the Authority's advice before embarking on new projects.[161] At the other end of the spectrum is the Organization for

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and the Science Advisory Board.

155. Statute of the Coordinating Committee of the Lower Mekong, *reprinted in* LEGISLATIVE TEXTS AND TREATY PROVISIONS CONCERNING THE UTILIZATION OF INTERNATIONAL RIVERS FOR OTHER PURPOSES THAN NAVIGATION 267-70, U.N. Doc. ST/LEG/SER.B/12 (1963). *See* TECLAFF, THE RIVER BASIN, *supra* note 136, at 170-73; G. Radosevich, *Implementation: Joint Institutional Management and Remedies in Domestic Tribunals* , 3 COLO. J. INT'L ENVTL. L. & POL'Y 261, 263-66 (1992) (articles 26-28, 30-32). The Statute has recently been replaced by a new agreement. Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin, Cambodia-Laos-Thail.-Vietnam, Apr. 5, 1995, 34 I.L.M. 864 (1995).

156. It has several times revised and updated the original basin plan and principles for utilization of the basin's waters. Radosevich, *supra* note 155, at 264-65.

157. *Id.* at 264; *see also* TECLAFF, THE RIVER BASIN, *supra* note 136, at 172.

158. Treaty for Amazonian Co-Operation, July 3, 1978, 17 I.L.M. 1045.

159. *Id.* at art. XXIII.

160. Convention Creating the Niger Basin Authority, Nov. 21, 1980, *reprinted in* U.N. DEPARTMENT OF TECHNICAL CO-OPERATION FOR DEVELOPMENT, TREATIES CONCERNING THE UTILIZATION OF INTERNATIONAL WATER COURSES FOR OTHER PURPOSES THAN NAVIGATION: AFRICA 56, U.N. Doc. ST/ESA/141 (1984) [hereinafter TREATIES: AFRICA].

161. Agreement Concerning the River Niger Commission, Nov. 25, 1964, 587 U.N.T.S.

Management of the Senegal River (OMVS), the first international river basin entity with executive capacity.[162] It not only has the power to approve a project, but may be charged with actual management.[163] Heavy emphasis on the environment makes the Action Plan for the Zambezi (ZACPLAN) unusual in its scope and aims,[164] but the bodies created to guide and coordinate planning are quite limited in powers and execution of the Plan is left to the existing national institutions of the basin states.[165]

CONCLUSION

The river basin concept has come full circle in this century. It has been a fulcrum for water resource development and, sometimes, all-embracing economic development as well. It has provided a context for protection of the aquatic environment through the ecosystem approach. Now it is accommodating multipurpose use and environmental concerns under the umbrella of sustainable development and integrated management. After the passage of seven decades or so, however, it is legitimate to ask: Has this concept of resource management found widespread acceptance, or merely sporadic adoption here and there? Is it working, and what is its future?

In domestic law, it does seem that management by basin or sub-basin units continues to gain adherents. Indeed, most of the recommendations and guidelines of international organizations have been directed at countries for internal consumption.[166] These organizations have also given much encouragement to adoption of the basin concept for

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8507, at 19, art. 12. The text is also in TREATIES: AFRICA, *supra* note 160, at 14.

162. *See* Convention Creating the Organization for the Development of the Senegal Basin (OMVS), Mar. 11, 1972, *reprinted in* TREATIES: AFRICA, *supra* note 160, at 21.

163. *See id.*, at arts. 1, 8, 11, 13, 14.

164. *See* Agreement on the Action Plan for the Environmentally Sound Management of the Common Zambezi River System, May 28, 1987, 27 I.L.M. 1109, Annex 1, The Zambezi Action Plan (ZACPLAN). The Action Plan covers a huge spectrum of environmental problems, including deforestation and soil erosion, pollution, waterborne diseases, degradation of the natural resource base, flood plain management, and protection of wetlands. Id.

165. *See id.* Annex 11, §§ 11, 12.

166. *See, e.g., Report of the United Nations Water Conference, Mar del Plata*, U.N. Doc. E/CONF.70/29 (1977) [hereinafter *Mar del Plata Report*]. Recommendation D.48(d) exhorts countries to consider "as a matter of urgency and importance the establishment and strengthening of river basin authorities." *Id.* at 33. *See also* UNITED NATIONS, ECONOMIC COMMISSION FOR EUROPE, RECOMMENDATION TO ECE GOVERNMENTS CONCERNING RIVER BASIN MANAGEMENT, U.N. Doc. E/ECE/WATER/9/Annex 2, Preamble (1971), *reprinted in* LAW OF INTERNATIONAL WATER RESOURCES 193 (Caponera comp., 1980) (FAO Legislative Study No. 23), *and in* Guidelines: Ecosystem Approach, *supra* note 118.

international rivers and lakes.[167] The International Law Association endorsed the concept nearly forty years ago, identifying principles of customary international law that govern the use of a basin's waters and thereby forming the basis for a holistic approach to management.[168] These principles—cooperation, neighborliness (or *voisinage)* and the community of interest of riparian states[169] coalesce into a matrix of mutual legal obligations that overlap the physical reality of the basin. In theory. On the level of state practice, however, the claim of states to almost total control of waters within their territories, spelled out in some older treaties,[170] has persisted. Even countries which have organized their own domestic water resources by basin units reject the basin approach in an international context because of its land management implications—as is evident in the deliberations of the International Law Commission.[171]

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167. *See* Mar del Plata Report, *supra* note 166, Resolution VII, at 77 (on river commissions); U.N. DEPT. OF TECHNICAL CO-OPERATION FOR DEVELOPMENT, EXPERIENCES IN THE DEVELOPMENT AND MANAGEMENT OF INTERNATIONAL RIVER AND LAKE BASINS, PROCEEDINGS OF THE UNITED NATIONS INTERREGIONAL MEETING OF INTERNATIONAL RIVER ORGANIZATIONS, DAKAR, SENEGAL, 5-14 MAY 1981, U.N. Doc. ST/ESA/120, 1983 [hereinafter EXPERIENCES]; U.N. DEPARTMENT OF TECHNICAL CO-OPERATION FOR DEVELOPMENT, RIVER AND LAKE BASIN DEVELOPMENT, PROCEEDINGS OF THE UNITED NATIONS INTERREGIONAL MEETING ON RIVER AND LAKE BASIN DEVELOPMENT WITH EMPHASIS ON THE AFRICA REGION, ADDIS ABABA, ETHIOPIA, OCT. 10-15, 1988, U.N. Doc. ST/TCD/13, at 74, 95 (1990).

168. *See, e.g., Report of the Fifty-Second Conference Held at Helsinki, 1966,* at 484, International Law Association (1966), *reprinted in* ILA, HELSINKI RULES ON THE USES OF THE WATERS OF INTERNATIONAL RIVERS (1967).

169. On *voisinage* (neighborliness), see E. Kaufmann, *Règles générales du droit de la paix,* 54 HAGUE ACADÉMIE DE DROIT INTERNATIONAL, RECUEIL DES COURS 390 (1935); Juraj Andrassy, *Les relations internationales de voisinage,* 79 HAGUE ACADÉMIE DE DROIT INTERNATIONAL, RECUEIL DES COURS 108 (1951). On the community of interests of riparian states, see the *River Oder* Case, Territorial Jurisdiction of the International Commission of the River Oder, 1929 P.C.I.J. (ser. A) No. 23.

170. For example, it is so spelled out in Art. II of the Boundary Waters Treaty of 1909 between the United States and Great Britain (Canada). *See* Boundary Waters Treaty, *supra,* note 152. An example of recent unilateral action was Slovakia's decision to continue construction of the Gabčikovo dam, despite intense opposition from Hungary, and to divert the Danube to Slovak territory. This matter is now before the International Court of Justice. *See* Gabčikovo-Nagymaros Project (Hungary/Slovakia), 1993 I.C.J. Reports 319 (Order of 14 July 1993); *see also* Documents Concerning the Dispute Between Hungary and the Slovak Republic on the Danube Project, 32 I.L.M. 1247 (1993), especially the Text of Hungarian Declaration Terminating Treaty, *id.* at 1260. Hungary claims that the barrage is causing and will cause ecological and environmental damage, that diverting the course of the Danube is dangerous, and that it violates Hungary's territorial integrity.

171. For an analysis of national attitudes to the drainage basin approach or attempted substitutes for it, expressed in the United Nations Sixth Committee and the International Law Commission, see J. Wescoat, *Beyond the River Basin: The Changing Geography of International Water Problems and International Watercourse Law,* 3 COLO. J. INT'L ENVTL. L. & POL'Y 301, 306-17 (1992).

Institutions in charge of water resource management display a wide variety of forms and functions, sometimes encompassing land use in their mandate.[172] As the perception of the river basin as ecosystem gains ground, new functions will be added or devolve on basin authorities. In some cases, the expansion will occur as a matter of fact, whenever the need arises. In others, existing powers of monitoring, planning, and advising will be reinterpreted so as to harmonize activities that affect the interplay of elements constituting the river basin ecosystem. Multiplying institutions to cope with new problems should be avoided because basin authorities are already in place and frequently have built up an expertise in dealing with complex resource management.[173] International river entities are remarkably durable bodies, surviving war, political disagreement among riparian states, the breakup of empires and the vicissitudes of economic, social and cultural change. Many do an excellent job in their recommendatory and consultative roles, and a few have urged that a basin approach be adopted where none existed before.[174]

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172. Examples include the Niger Basin Authority, *supra*, note 160, the Mekong Committee, *supra*, note 155, and the entities responsible for carrying out the ZACPLAN for the Zambezi, *supra*, note 164. The International Joint Commission, Canada-United States, is another institution involved to some extent in land use through its agencies, Pollution from Land-Use Activities Reference Group ("PLUARG"), which has reported on pollution from land-use activities, and the Science Advisory Board, which has reported on nuclear generating stations in the Great Lakes basin and on means for identifying natural heritage areas. T. COLBORN ET AL., GREAT LAKES, GREAT LEGACY 9, 33-35, 42, 61, 147, 195 (1990).

173. There were reportedly some 90 multipartite and bipartite commissions in the late 1970s. *Final Report of the Rapporteur to the International Law Commission on the Non-Navigational Uses of International Watercourses, reprinted in* 24 ENVTL. POL'Y & L. 367, n.308 (1994), citing International Law Commission Secretariat, Annotated List of Multipartite and Bipartite Commissions Concerned with Non-Navigational Uses of International Watercourses (April 1979, unpublished). At the time that list was being prepared, two new commissions were created in Africa, for the Gambia and Kagera basins. *See* Treaties: Africa, *supra* note 160 at 32, 42, 70. They were followed in 1987 by the establishment of coordinating entities for the Zambezi basin under the ZACPLAN. *See supra*, note 164. More recently, new institutions have been created in Europe for the Elbe, Maas, Scheldt, and Danube rivers. *See* Convention on the International Commission for the Protection of the Elbe, Oct. 8, 1990, at art. 2(j), *reprinted in* BURCHI, TREATIES CONCERNING THE NON-NAVIGATIONAL USES OF INTERNATIONAL WATERCOURSES-EUROPE 40 (1993); *infra* note 175 (Maas, Scheldt, and Danube). In Africa, the newest entity is the Namibia-South Africa Permanent Water Commission. *See* Agreement on the Establishment of a Permanent Water Commission, Namib.-S. Afr., Sept. 14, 1993, 32 I.L.M. 1147 (1993). The Preamble states that the aim of this agreement is to promote regional water resource development on the basis of the Helsinki Rules.

174. The Permanent Joint Technical Commission for Nile Waters, in the lower Nile Basin, and the Technical Committee for the hydrometeorological survey project of the upper Nile basin, have together recommended the formation of a consolidated nine-state Nile basin commission. *See* EXPERIENCES, *supra* note 167, at 163, 295-96, 402. The IJC's own studies and recommendations laid the foundation for the basin and ecosystem approach to pollution

Environmental concerns—especially the concept of preserving and restoring habitat—have given a new focus to the river basin and emphasized its true nature. The fact that a recent framework treaty for protection of transboundary waters has, within two years, prompted the signing of a pair of international agreements that had been stalled in negotiation for the past quarter of a century is evidence of the latest trends in state practice.[175] Pollution control, ecosystem protection and the possibility of global climate change are not the only elements in the continuing redefinition and elucidation of the river basin concept. Outright shortage of water is an even more potent reason for resorting to this natural unit for the equitable management of an increasingly scarce resource in many parts of the globe. Conflict over water threatens in regions of the world's oldest civilizations, the Middle East and North Africa.[176] Rivers such as the Colorado, in areas of much newer settlement, are long since oversubscribed and their waters spread too

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control in the Great Lakes. *See supra*, note 153.

175. The framework treaty is the Helsinki Treaty of 1992 for the Protection of Transboundary Watercourses and International Lakes. *See supra* note 149. Apparently it was the turning point for the signing of treaties on Apr. 26, 1994, establishing the International Maas Commission and the International Scheldt Commission. Agreement on the Protection of the Rivers Meuse and Scheldt, Belg.-Fr.-Neth., Apr. 26, 1994, 34 I.L.M. 851 (1995). These are truly modern agreements, providing not only for pollution control (which might have been the sole consideration had they been signed two decades ago), but also for protection of the North Sea and the river ecosystems. 17 INT'L ENV'T. REP. (BNA) 394 (1994). Another recent agreement which owes much to the 1992 Helsinki Treaty is the multilateral Danube River Protection Convention of 1994. *See* Convention on Cooperation for the Protection and Sustainable Use of the Danube River, June 24, 1994, [Reference File] INT'L ENVTL REP. (BNA) 35:0251 (1996).

176. There is improvement, but also regression, in this region. On the one hand, Israel, Jordan, and the Palestine Liberation Organization, in their peace negotiations, have made significant progress toward resolving their problems in sharing water resources. *See* Israel-Jordan: Common Agenda for the Bilateral Peace Negotiations, Sept. 14, 1993, 32 I.L.M. 1522 (1993); Israel-Palestine Liberation Organization: Declaration of Principles on Interim Self-Government Arrangements, Sept. 13, 1993, Annex III, 32 I.L.M. 1525, 1537 (1993); Treaty of Peace, Isr.-Jordan, Oct. 26, 1994, 34 I.L.M. 43 (1995). On the other hand, Sudan made an ominous threat in July 1995 to cut off Nile waters to Egypt. *See* Walker, *Egypt Warns Sudan Over New Threat to Cut Nile Waters*, TIMES (London), July 4, 1995, at 11. Possibilities for similar high-handed action exist elsewhere in the region. For recent works on the subject, see Dante A. Caponera, *Legal Aspects of Transboundary River Basins in the Middle East: The Al Asi (Orontes), the Jordan and the Nile*, 33 NAT. RESOURCES J. 629 (1993); Eyal Benvenisti & Haim Gvirtzman, *Harnessing International Law to Determine Israeli-Palestinian Water Rights: The Mountain Aquifer*, 33 NAT. RESOURCES J. 543 (1993); Aaron Wolf, *Water for Peace in the Jordan River Watershed*, 33 NAT. RESOURCES J. 797 (1993); Tarasofsky, *International Law and Water Conflicts in the Middle East*, 23 ENVTL. POL'Y & L. 70 (1993); Joffe, *The Issue of Water in the Middle East and North Africa*, *in* RESOURCE POLITICS: FRESHWATER AND REGIONAL RELATIONS 65 (Thomas & Howlett eds., 1993); WATER AND PEACE IN THE MIDDLE EAST (Isaac & Shuval eds., 1994) (Studies in Environmental Sciences No. 58).

thin.[177] Increasing weight in natural resource policy is now given to the "precautionary principle,"[178] which, in essence, means not waiting until all the facts are in before taking action to prevent future harm. The river basin concept is, in itself, a precautionary principle, capable of sustaining us in the 21st Century, soundly established in theory and gaining in practice.

177. *See* Garner & Ouellette, *Future Shock? The Law of the Colorado River in the Twenty-First Century*, 27 ARIZ. STATE L.J. 469 (1995); TECLAFF, WATER LAW, *supra* note 140, at 228; Carrier, *The Colorado: A River Drained Dry*, NAT'L GEOGRAPHIC, June 1991, at 4; *and* Edward P. Glenn *et al.*, *Cienega de Santa Clara: Endangered Wetland in the Colorado River Delta, Sonora, Mexico*, 32 NAT. RESOURCES J. 817 (1992).

178. On the precautionary principle, see, e.g., Hickey & Walker, *Refining the Precautionary Principle in International Environmental Law*, 14 VA. ENVTL. L. J. 423 (1995).