



Winter 1982

The Law of International Aquifers

Robert D. Hayton

Recommended Citation

Robert D. Hayton, *The Law of International Aquifers*, 22 Nat. Resources J. 71 (1982).
Available at: <https://digitalrepository.unm.edu/nrj/vol22/iss1/6>

This Article is brought to you for free and open access by the Law Journals at UNM Digital Repository. It has been accepted for inclusion in Natural Resources Journal by an authorized editor of UNM Digital Repository. For more information, please contact amywinter@unm.edu, lsloane@salud.unm.edu, sarahrk@unm.edu.

By Robert D. Hayton*

The Law of International Aquifers**

I. INTRODUCTION: THE "DISCOVERY" OF INTERNATIONAL AQUIFERS

To specialists in water resources it seems not at all remarkable that a round table discussion should take place on the topic "Problems of International Aquifers." To the non-specialist, however, the term "aquifer" is still strange; an "international aquifer," something scarcely comprehensible. Moreover, when the concept and even a few of its implications are explained to our colleagues in foreign offices, brows furrow and pulses quicken. Anxiety syndromes appear, as one or more probable threat to a State's complete freedom of action, its self-sufficiency, its unfettered sovereignty, looms into view from the dark and mysterious bowels of the earth.

Perhaps that suggestion of fearful reaction is an exaggeration. Nonetheless, the pall of apprehension before the unknown and the invisible is common. Of course, with respect to acceptance of the concept of shared natural resources—in general terms—there has been notable progress. In some sectors and in some countries we are working with enlightened leadership willing to hear the expert out and even to entrust transnational negotiations to people fully qualified on the technical aspects, or at least willing to instruct the foreign office professionals to study the subject matters involved more thoroughly and to heed the advice and concerns of their specialist counselors.

Water resources specialists have, to be sure, grown accustomed to the general ignorance about the characteristics and behavior of water, not to mention the enigma of *ground* water. Such lack of comprehension can still be found, unfortunately, in administrative bureaus, in the courts, in legislatures and around the international conference

*Professor, International Law and Political Science, Doctoral Faculty, the City University of New York/Hunter; Chairman, Working Group on Underground Waters, International Law Association Committee on International Water Resources Law. The original version of this paper was presented at a Round Table on The Problems of International Aquifers held in Strasbourg, April 3, 1980, under the joint auspices of the Louis Pasteur University's Institut de Mécanique des Fluides and IWRA.

**A shorter version of this study was scheduled to appear in the September 1981 issue of WATER INTERNATIONAL, Journal of the International Water Resources Association (IWRA).

table. Many officials required to deal with the subject have played the game in the familiar way, that is, they have "mastered" some of the new vocabulary: "drainage basin," "optimum utilization," "pollution abatement," "equitable apportionment" and "integrated management," among other frequently uttered terms. High-sounding resolutions may be drafted, and even treaties concluded, sometimes with quite limited understanding of the ramifications of the language employed, and often with a lack of awareness of the costly deficiencies—the requisites for proper management of the resource—that will result from what has *not* been stated. In addition, States, understandably unsure of the future and wary of all new commitments, frequently so qualify the operative language as to render such pronouncements or agreements legally innocuous.

Thus, while no longer a great novelty, a multinational meeting on international aquifers still takes place "on the frontier", if not in a no man's land. With notable exceptions, non-specialized economists and lawyers have only in recent years begun to pay significant attention to international fresh-water resources generally. Adding to their burdens an additional "chapter" on *l'eau souterraine internationale* portends eye-opening learning experiences. Generally speaking, most *international* lawyers, on the whole more comfortable with the traditional concepts and concerns of their discipline (rarely science or mathematics related) have not been very receptive to the idea that they must understand at least fundamental notions about the hydrologic cycle, the chemistry and physics of water pollution and, perhaps above all, the complex interaction between surface waters and ground waters.¹ For them, and for many of our colleagues in other disciplines, something termed "international aquifer" is indeed a major and unsettling discovery.

On the other hand, the hydrologists, hydraulic engineers, hydrogeologists and geographers have been attempting for some time to get the attention of the lawyers and administrators in order to deliver the message about the importance of groundwater, shared and otherwise. Lacking still are durable working relationships between the scientific and technical and the legal and social science communities in order that our policies, our implementing rules and regulations, and our institutional structures might be made more responsive to the challenging tasks now at hand and to the needs of the future. This

1. Reference to maritime and atmospheric waters is deliberately excluded here, in spite of the fact that the many interactions between fresh water, and atmospheric water and surface water have inescapable significant meaning for the specialist. It is still too early to force upon most policy makers the implications of the *entire* hydrologic cycle, taken as a whole.

meeting is a concrete step in that direction, welcomed by all who have labored in the past to bridge these gaps.

The purpose of this study is to present an accounting of the efforts made to date at the international level, both intergovernmental and nongovernmental, that may be bringing us closer to the day when consideration of transnational groundwater can be studied and acted upon in conjunction with surface water and within intergovernmental institutions tailored to the purpose. At such time conjunctive use and integrated protection of groundwater and surface water may become a reality from the planning stage to the delivery of water services. The "state of the art" when the International Law Association adopted the now famous Helsinki Rules will be briefly set forth followed by a tracing of the activities and partial changes in perceptions about natural resources shared by two or more States focusing on the gradual recognition of transnational groundwater as a physical reality and as a problem that must be addressed in a cooperative and collaborative spirit.

II. PERCEPTIONS AT THE INTERNATIONAL LEVEL AS OF 1966

A. *The Helsinki Rules*

In August of 1966, in Helsinki, Finland, the major international nongovernmental organization devoted to international legal matters, the International Law Association (ILA), in full conference, approved a set of rules concerning the Uses of the Waters of International Rivers, known as the "Helsinki Rules."² When the Association's special committee made its final report in Helsinki, after a decade of study and advancing the drainage basin approach, there were still doubters present. There were those who, for example, questioned whether tributaries to the main stream should be regarded as "international" for international law purposes. There were charges that these Helsinki Rules were in many respects *de lege ferenda* and not simply or purely *de lege lata*.³ But there were also those who thought

2. INT'L L. ASS'N, REP. OF THE 52ND CONFERENCE xi, 447-533 (1967). The Helsinki Rules were designed to serve where the States concerned ("basin States") had *not* achieved agreement or a binding customary regime (see Art. I). They also provide a point of departure, or guidelines, for those who are charged with negotiating agreements and may be relied upon as "residual rules" to govern matters not dealt with by particular agreements or local custom.

3. The Committee took the position that it was propounding rules declaratory of existing customary, or general, international law, not rules that would be "desirable" or ideal. Since the ILA is nongovernmental, the method is called "restatement," after United States usage, rather than "codification." Some articles were, on the other hand, intended to be recommendations, as shown by the deliberate use of the verb "should," instead of language of obligation, in those articles.

the Rules too weak, especially the pollution articles. Each chapter of the Rules having been thrashed out, refined and explained in Committee and in several earlier ILA Conferences, the Helsinki attendees finally gave very broad support to the final version.⁴

The "equitable utilization" doctrine embraced at Helsinki has become widely accepted, if not fully comprehended. The importance of pollution control was also realized, but the subject was still too new and unprecedented at the inter-State level to allow very firm provisions to be set forth as declaratory of then-existing legal norms. Doctrinal controversy persisted, mostly outside the ILA, about the validity of, and the need for, the drainage basin concept, the discussants rarely envisaging more than the surface catchment area. It is safe to say that most of the participants in the Conference at Helsinki did not lay special stress on the phrase in Article II which defined an international drainage basin as "including . . . underground waters."⁵ In fact, only Messrs. Macallum of Canada and Cano of Argentina addressed themselves to that aspect in the final debate.⁶

Given the threshold quality of the Committee's espousal of the groundwater dimension, it should not be surprising that the Committee's commentary to Article II lists no authorities for recognizing underground flows and sets forth only these words of cursory exposition:

. . . BASIC ELEMENTS. An international drainage basin is the entire area, known as the watershed, that contributes water, both surface and underground, to the principal river, stream or lake or other common terminus.

Due to certain geological features, underground waters may occasionally flow in a direction different from, or have an outlet different from that of the surface waters of the same area. Furthermore, in rare instances underground waters appear to form indistinct underground fields without ascertainable limits.

4. The ILA published a separate pamphlet containing the Rules and the Committee's commentary to each rule. INT'L L. ASS'N, HELSINKI RULES ON THE USES OF THE WATERS OF INT'L RIVERS (1967) [hereinafter INT'L L. ASS'N, HELSINKI RULES]. For the only authorized translation of the Rules and the commentary into Spanish, see INSTITUTO DE ECONOMICA, LEGISLACION Y ADMINISTRACION DEL AGUA, REGLAS DE HELSINKI, SOBRE LOS UNOS DE LAS AGUAS DE LOS RIOS INTERNACIONALES, INELA/Dc/Tr/76 (1976).

5. Art. II reads in full: "An international drainage basin is a geographical area extending over two or more States determined by the watershed limits of the systems of waters, including surface and underground waters, flowing into a common terminus." INT'L L. ASS'N, HELSINKI RULES, *supra* note 4, at 7-8.

6. INT'L L. ASS'N, REP. OF THE 52ND CONFERENCE, *supra* note 2, at 459-460, 472-474. The ILA Committee members, however, knew full well that the inclusion of groundwater was a significant step. Ambassador Cano was a member of the Committee; the writer headed the Committee's Secretariat.

The underground waters constituting part of the drainage basin described in this article are those that contribute to its principal river, a stream or lake or other common terminus.⁷

The general comment preceding these statements in the commentary did emphasize that Article II's concept "encompasses *all waters* included in the *entire system*" and that the basin

is an indivisible hydrologic unit which requires comprehensive consideration in order to effect maximum utilization and development of any portion of its waters. This conclusion is particularly significant when it is recognized that a State, although not riparian to the principal stream of the basin, may nevertheless supply substantial quantities of water to that stream; such a State thus is in a position to interfere with the supply of water. . . .

Therefore, in order to accommodate potential or existing conflicts . . . and to provide the optimum rational development of a common resource for the benefit of each State in whose territory a portion of the system lies, the drainage basin approach has become a necessity.⁸

The commentary to the Helsinki Rules' Article III defining "basin State" justifies the new term, and abandonment of the term "riparian," by pointing out that groundwater contributions "may flow from a State without reaching the surface in its territory into the territory of other States . . . where they contribute substantially to the surface flow. . . ." "Riparian" denotes, of course, that "the territory of the State so described touches a river flowing on the surface of the drainage basin." The Helsinki Rules "adopt the term 'basin State' as a comprehensive one to include all States whose territories contribute waters to the international basin, whether or not 'riparian.'"⁹

It having been established that "underground waters" are included, references in later articles of the Rules comprehend more than was perceived at first reading even by some specialists. (For example, "basin waters," "contribution of water by each basin State" and "past utilization of the waters of the basin.") In short, the incorporation of groundwater was formally declared, but in practical terms the

7. INT'L L. ASS'N, HELSINKI RULES, *supra* note 4, at 8. The existence of transboundary aquifers without connection with overlying surface waters, and inflows from surface to underground waters were perceived but not fully appreciated at the time by the drafters of the commentary.

8. *Id.*

9. *Id.* at 9. Almost invariably (unauthorized) translators of the Helsinki Rules into foreign languages have employed equivalents of "riparian" for "basin state" in the translations, missing this critical distinction and misleading their readers.

legal aspects of transnational groundwater were still strange, uncharted territory.

The importance of looking further into the international groundwater matter was not lost on the Conference, however. When a successor Committee on International Water Resources Law was created in 1966 by the ILA Executive Council, pursuant to the express recommendation of the Conference at Helsinki, a special Working Group on Underground Waters was set up within the new Committee.

A brief examination of the basis available to the ILA "Rivers Committee" will complete this assessment of the state of the topic from the legal point of view as of 1966.

B. State Practice Prior to 1966

In fact, in legal doctrine and in observable State relations there was little in the way of clear and specific foundation to justify the ILA's logical and credible leap forward. But the record is not entirely bare, at least in the field of bilateral treaties.¹⁰

A number of agreements had come into existence in the Middle East and North-African arid zones, because of the critical nature of any fresh water supply. Surface streams, if any, were generally intermittent and unreliable, or their waters were unhealthy. For example, in 1888 France, for Djibouti, and Great Britain, for Somalia, entered into an agreement assuring the common status of the Hadou well. In determining boundaries and in other special circumstances, such as the establishment of mining rights, the use of springs or groundwater was mentioned, if not regulated, in agreements. There is also a 1925 agreement between Italy and Egypt regarding the Ramba Well. Turkey and the U.S.S.R. entered into a Convention and Protocol in 1927 dealing with frontier waters that included groundwater.

Following the Second World War, many new treaties affecting water resources were concluded, a few of which expressly recognize or treat groundwater. The utilization of springs in the greater Gorizia Commune area was regulated by the Peace Treaty of 1947 between Italy and the Allies. In the 1950's Luxembourg, the German Federal Republic (Land Rhineland-Palatinate) and France concluded agreements that expressly incorporated concern for damage to, or the level of, groundwater. And a Greek-Yugoslav *Procès-verbal*, in 1957, recorded as "useful" the study of the groundwater level, "which will

10. For a detailed examination of the agreements involving groundwater, particularly as related to pollution, see Teclaff, *et al.*, *Transboundary Ground Water Pollution: Survey and Trends in Treaty Law*, 19 NAT. RES. J. 629 (1979). For a more general treatment, see Caponera, *et al.*, *Principles for International Groundwater Law*, 18 NAT. RES. J. 589 (1978) and works cited therein.

permit acquisition of an adequate grasp of the influence of groundwaters on the level of the [Dojran] lake and vice versa.”¹¹ Several East European “water economy” and “frontier waters” treaties involve ground waters, including the Polish-Soviet Union Agreement of 1964.¹² The Agreements between Hungary and Yugoslavia (1955), Yugoslavia and Albania (1956) and Bulgaria and Yugoslavia (1958) not only expressly include groundwater but clearly take a “systems approach” to the problems.¹³

It should be noted that except for those few surviving agreements about individual wells in arid areas, the mention or treatment of groundwater in treaties was clearly ancillary to the concern for some surface water feature, and in no event is there any manifestation that a whole international aquifer was intellectually comprehended, much less embraced by the treaty. Of the hundreds of pre-1966 agreements affecting water, a mere handful recognize the existence of underground waters.

III. INTERNATIONAL DEVELOPMENTS SINCE 1966

Despite the logically compelling case for the inclusion of groundwater in any conceptualization of water resources development, use, protection or regulation, representatives of most States have only recently become minimally aware of water behavior and have, in most instances, been resisting shortsightedly any implication of state responsibility for pollution of, or other damage to, transnational aquifers. Many States still are not disposed to admit that groundwater can be a shared resource and even endeavor to insist on their “sovereign right” to treat groundwater as something not connected with surface water.

However, even in 1966 another cognizable current was portending gradual acceptance of the all-inclusive, plural “water resources” approach, often manifested under more general headings of environmental protection and shared natural resources. The Helsinki Rules themselves, albeit unofficially, weighed heavily in fueling this movement away from the legal rules which were unmindful of physical

11. Sec. B, part II d, Procès-verbal, as reproduced in French in United Nations Legislative Series, *Legislative Texts and Treaty Provisions, Concerning the Utilization of International Rivers for Other Purposes than Navigation*, ST/LEG/SER.B/12, Apr. 1964, at 816 (Sales No. 63.v.4) [hereinafter U.N. Legislative Series].

12. The exchange of hydrogeological data is provided for and the parties seek to protect groundwater from “depletion and pollution.” Agreement Concerning the Use of Water Resources in Frontier Waters, July 17, 1964, Poland-U.S.S.R., 552 U.N.T.S. 175.

13. The Agreements are reproduced in the Legislative Series, *supra* note 11, No. 228, at 831, No. 128, at 441; and No. 161, at 558, respectively.

realities and of optimum utilization needs involving the water sector. Various international community organs and conferences have repeatedly endorsed at least the rhetoric of this "new" kind of international responsibility where resources are in fact shared by two or more States. The vital linkages were suddenly "discovered" between water and food production, water and public health, water and deforestation—even water and recreation.

A. *The ILA Work Continued*

The decision of the International Law Association to appoint a new Committee on International Water Resources Law under the chairmanship of Judge Eero Manner of Finland, sustained the organization's momentum in this field and has resulted in a number of additional reports and special rules beyond the scope of the original Helsinki Rules.¹⁴

The ILA Committee's special Working Group on Underground Waters has not yet completed its labors. The members deliberately began their work with a period of study of all aspects of the special characteristics and behavior patterns of groundwater with the assistance of technical experts. Not until there was a sense of quite thorough appreciation for the technical and the economic problems in principle and in practice did the Group venture to consider tentative proposals for legal rules applicable to international aquifers.

The Working Group has also profited from strong opinions of its members and of the members of the full Committee. One view has been that perhaps the Helsinki Rules had gone as far as the International Law Association could accurately go at this juncture, if one accepted the position that the mission of the Committee was to "restate," that is, unofficially codify, *existing* general international law. The paucity of reported and readily observable practice and the questionable employment of scattered bilateral agreements as some evidence of emerging international custom forced the Working Group to comb the records for each and every morsel of State practice, including general principles of law, agreement, and doctrine.¹⁵

At the outset of the Working Group's efforts, very little had appeared in the learned journals touching on international groundwater. The unhappy choice between preparation of a report focusing on the

14. For the Committee progress reports and for final reports from the Committee, based on the work of Working Groups, and the approving Conference Resolutions, see INT'L L. ASS'N, REPS. OF CONFERENCES, for the years 1968, 1970, 1974, 1976, 1978, and 1980.

15. On the question of the legitimacy of taking into account various categories of "proof," see Hayton, *The Formation of Customary Rules of International Drainage Basin Law*, in THE LAW OF INTERNATIONAL DRAINAGE BASINS 834-895 (A. Garretson, R. Hayton, C. Olmstead eds. 1968).

hydrologic cycle and national legislation and practice, on the one hand, or a set of purely recommendatory articles for future guidance (but without any claim to being descriptive of norms having binding force) on the other hand, was resisted as premature. Favoring further study and the "ripening" of known impending international aquifer problems, it was felt that with more persistence a modest set of legally binding principles, reinforced by analogous developments with respect to surface sweet water, maritime waters, atmospheric pollution and transnationally shared resources generally, could in time be produced. It was further maintained that the international climate was, of necessity, becoming gradually more propitious in the face of new doctrinal writings, belated awareness of the significance of the interrelationships between the various "kinds" of water and pressures on States for enhanced economic and social development and "quality of life." There seemed to be hope that at long last there would be firm and irresistible recognition of the legitimate interests of other States in the underground waters that lie under boundaries or move beyond one's own territory, which recognition imports concomitant limitations upon each individual State's right to deal with such an obviously shared resource as it alone sees fit. It should be noted, nonetheless, that the struggle for this recognition is not yet over.

Water resources have always been regarded by knowledgeable and forthright persons as the shared resource *par excellence*. Only a few States continue to hide behind the lack of an "officially approved" or accepted definition of shared resources in order to avoid responding to the exigencies of international cooperation in the water resources field. Those few that do continue to contest "international," "shared" or "transnational" characterization also exercise inordinate influence in intergovernmental forums, given the practice in recent years of making decisions in public international organizations by consensus.¹⁶

16. See as a prime example of the ability of a very small number of States to block "progress," as well as the reluctance of many other States to act decisively, the discussion in the 34th United Nations General Assembly on the question of adoption of the fifteen Draft Principles on Natural Resources Shared by Two or More States, developed and adopted by consensus by the Intergovernmental Working Group of Experts established in 1975 by the United Nations Environment Programme and proposed by the Governing Council of UNEP for adoption by the General Assembly in May, 1978. A/34/557 and Corr. 1; A/34/837, A/C.2/34/SR.28, SR.30, SR.31, SR.57; G. A. Res. 34/186 of Dec. 18, 1979; UNEP Governing Council decision 6/14 of May 19, 1978, 33 U.N. GAOR, Supp. (No. 25) U.N. Doc. A/33/25 (1978). The Working Group's Final Report (1978) was accompanied by various reservations and declarations, including statements by 4 experts to the effect that the principles were to be regarded as recommendations only; one expert reserved his position with respect to all of the principles. In the 1978 session, experts from 26 governments took part. Moreover, the Working Group had, "for want of time," not entered "into an in-depth discussion of the question of the definition of shared natural resources, and therefore, did not reach any conclusion." UNEP/IG.12/2.

The "climate" with respect to general principles applicable to the development, utilization and conservation of the water resources in international, or shared, aquifers, is expected to improve during the 1980's. Additional governmental experience with the increasingly stark realities of our deteriorating groundwater conditions plus the continued efforts of groups of experts may combine to create a willingness to admit the need to deal with the problems through transnational cooperation and collaboration. As private professional groups put forward well considered, carefully drafted and adequately explained norms for international groundwaters, such norms will of course not of themselves forge "the law" on the subject, but the labors of these associations may encourage more members of the international community to accept *official* proposals from the United Nations International Law Commission, which has the topic of "the non-navigational uses of international water courses" under active consideration. Thus, the International Law Association's Working Group on Underground Waters continues to seek accurate formulations of principles and rules, buttressed by a background study, that would apply to the international aquifers isolated from superjacent streams as well as to those that actively interact with the waters of a surface basin.

B. The Work of the International Law Commission

The United Nations General Assembly recommended in 1970 that the International Law Commission (ILC) take up the study of the law of the non-navigational uses of international watercourses with a view to its progressive development and codification. The Commission added the subject to its work program in 1971 and began active consideration of the topic in 1974. The Special Rapporteur's first report was submitted to the Commission in 1976.¹⁷ From the beginning, difficulties arose with respect to the scope of the term "international watercourses"; a few ILC members even maintained that the only acceptable definition would be that adopted at the Congress of Vienna in 1815.¹⁸

The Commission expects in due course to bring forth a set of draft

17. The history of the topic within the General Assembly and the ILC, down to December, 1979, is summarized in UNITED NATIONS, THE WORK OF THE INT'L L. COMM'N 91-94 (3d ed. 1980). See also 35 U.N. GAOR, Supp. (No. 10) 237, U.N. Doc. A/35/10 (1980) and documents cited therein, for a more detailed statement. The ILC is the U.N.'s expert body of international lawyers, 25 in all, elected for 5 years by the General Assembly.

18. See p. 4 of U.N. Doc. A/CN4/332 dated April 24, 1980 and pp. 18-28, Corr. 1 of U.N. Doc. A/CN4/320.

articles in final form which will then be referred to the General Assembly. There the decision will be made unless the Assembly should in effect reject the draft or should decide to give it only recommendations.¹⁹ The express inclusion of groundwater in the ultimate resolutions or convention is by no means assured, but some hesitating steps as discussed below have already been made in that direction.

In 1977 a new Special Rapporteur was appointed. His first report was submitted in 1979, containing an examination of the subject from the scientific as well as from the legal point of view and some tentative draft articles for discussion. The following year, after the discussion in the Commission and in the Sixth (Legal) Committee of the General Assembly, the Special Rapporteur's second report was prepared and submitted. These reports, the Special Rapporteur's statements introducing them, and their consideration by the ILC and the General Assembly merit our attention.²⁰

The first chapter of the first Report of Special Rapporteur Stephen Schwebel,²¹ considered at the Commission's 31st session, 1979, sets forth in detail some of the salient characteristics of water's behavior, and includes a thorough examination of the hydrologic cycle.²² While a review of this portion of the Report can not be undertaken here, its importance as the first conscientious attempt formally to convey the hydrological "facts of life" to an official organ charged with the progressive development and codification of international law should not be underestimated. Moreover, the treatment is sound and cites authoritative technical works.

What is even more worthy of note is the special emphasis placed on the groundwater aspect of the process.²³ The Rapporteur flatly states that "[w]hile surface runoff is the most visible source of moisture for watercourses, it is less important than groundwater, which is believed to constitute 97 percent of the water on earth excluding the oceans, ice caps and glaciers."²⁴ The Report continues with a quotation explaining the mechanism of groundwater contribution to stream flow. The quotation closes with the statement that ". . . groundwater flow represents the main long-term component of total runoff

19. For a fuller description of the alternatives and the process, see THE WORK OF THE INT'L L. COMM'N, *supra* note 17, at 11-12; STATUTE OF INT'L L. COMM'N, art. 23.

20. Only those portions of the Commission's work bearing on groundwaters will be taken up here.

21. U.N. Doc. A/CN.4/320 (1979), reprinted in [1979] Y.B. of INT'L LAW COMM'N Vol. II, Part I [hereinafter Yearbook].

22. *Id.* at 6-12.

23. *Id.* at 9-12.

24. *Id.* at 9, para. 17.

and is particularly important during dry spells when surface runoff is absent."²⁵

The Special Rapporteur does not fail to mention the occurrence of confined aquifers and cites the enormous aquifer under the Sahara that is believed to reach from the Atlas mountains into Libya. The danger of saline water intrusion is discussed. Recharge, influent seepage, effluent seepage and data collection are also taken up. The author then concludes on this note:

Accordingly, the contribution of groundwater to watercourses must be taken into account in framing principles to govern the uses made of watercourses. At an elementary level, the amount of groundwater moving into an international watercourse has to be included in calculating the total volume of flow of the watercourse. At the level of water resources management, it is necessary in framing principles regarding the use of water to give consideration to the effects of a contribution of groundwater to a watercourse. It is necessary to consider as well the effects of the existence of available reserves of groundwater, and of the contribution of water flowing in watercourses to the quantity of groundwater.²⁶

It must be remembered that the Special Rapporteur is by no means a free agent in determining the scope of his subject, nor is the International Law Commission entitled to ignore the terms of reference approved for this topic by the General Assembly. Before the General Assembly charged the Commission with this new matter, there was extensive controversy in the Sixth Committee. Not only were objections raised to express mention of the Helsinki Rules—which had incorporated the “controversial” drainage basin concept, expressly including groundwaters—but some delegates argued that the topic was not even ripe for consideration by the ILC. In the end a compromise was reached, postponing such hard questions for a later day.²⁷ The topic was styled “Law . . . of International Watercourses.” That term allowed a few representatives to maintain that the General Assembly meant uses of the *course* in which the water flowed and not the uses of the water! It is obvious the Rapporteur faces formidable obstacles and has been, in the judgment of the author, extraordinarily forthright. Moreover, he took a thoroughgoing systems approach in

25. R. WARD, *PRINCIPLES OF HYDROLOGY* 240 (2d ed. 1975).

26. Yearbook, *supra* note 20, at 12, para. 21.

27. G.A. Resol. 2669 (XXV) 8 Dec. 1970 Resol. adopted by G.A. during its 25th Session, 15 Sept.-17 Dec. 1970, U.N. G.A.O.R.: Twenty-fifth Session, Supp. No. 28 (CA/828) 1971, p. 127. On behalf of the U.N. General Assembly the ILC is charged with the progressive development, as well as the codification of the topics taken up. See U.N. CHARTER art. 13, para. 1, and STATUTE OF THE INT'L L. COMM'N art. 1, para. 1.

his second set of draft articles submitted to the Commission.²⁸ His is a long and arduous process of education and explanation, firmly grounded in practice, science and doctrine. The Commission is an expert, not a legislative body; its final recommendations must be on the basis of broad consensus among the 25 members.

Stressing the difference between most international law topics and one such as water resources, requiring close correlation with the "laws" of science and engineering, Mr. Schwebel has called for a panel of technical water resources experts to advise the Commission, a proposal not yet acted upon by the Commission. He subtly draws, too, the comparison between the outsized efforts being made by the international community with respect to the Law of the Sea and the backward-looking tendency in the equally vital field of fresh water. Mr. Schwebel sets out and documents the widespread and rather longstanding acceptance of the basin concept in expert circles. He brings to bear the recommendations of the 1977 United Nations Water Conference and other intergovernmental bodies in an effort to demonstrate to the Commission Members the international community's realization of the need for clear and updated universal principles and rules governing the waters of "international watercourses."

In the Special Rapporteur's Introductory Statement to his first Report to the Commission, he again gave attention to groundwater aspects by implication:

. . . If the Commission, in the face of the demonstrations of hydrologic science, in the face of what is becoming a fresh water crisis, and in spite of the progressive trends of international law in this sphere, trends which it may be added, have been especially manifest in some developing countries, particularly in Africa, were to adhere to the concepts of the Congress of Vienna, it would open itself to the charge of regressive rather than progressive development of the law. It would open itself to the charge in the world scientific community that it had failed to take account of the unity of the drainage basin, of the fact that a change in the quantity or quality of water or rate of flow in one part of a basin may and often does affect—and sometimes very seriously affects—water in other parts of that basin. It would open itself to the charge in the engineering and water management community that it had failed to deal with the physical realities of water on the scale which engineering and management must if they are to do their jobs properly.²⁹

28. U.N. Doc. A/CN.4/332 (1980), at 18-45.

29. S. M. SCHWEBEL (Special Rapporteur), INTRODUCTORY STATEMENT TO THE INTERNATIONAL LAW COMMISSION ON THE LAW OF THE NON-NAVIGATIONAL USES OF INTERNATIONAL WATERCOURSES 14, 14A (1979), mimeo.

Whether his arguments will ultimately be persuasive is yet to be known. Most Members of the International Law Commission, though technically not representing their countries, in fact reflect the official views of the States from which they come and many are likely to insist on maintaining them.

On the other hand, the Special Rapporteur's general approach, as modified in his Second Report,³⁰ found favor at the Commission's 1980 session. After discussion, the Commission referred the revised draft articles to its Drafting Committee. The result, approved by the Commission and submitted to the U.N. General Assembly's Thirty-fifth Session for interim consideration, takes the form of six articles, with commentary, and a Note of tentative understanding regarding the still vexatious matter of scope.

It is in the Note of tentative understanding that the Commission took its boldest step so far on this topic, because of the Special Rapporteur's preference for "system." The Note in its entirety reads as follows:

A watercourse system is formed of hydrographic components such as rivers, lakes, canals, glaciers and *groundwater* constituting by virtue of their physical relationship a unitary whole; thus, any use affecting waters in one part of the system may affect waters in another part.

An "international watercourse system" is a watercourse system, components of which are situated in two or more States.

To the extent that parts of the waters in one State are not affected by or do not affect uses of waters in another State, they shall not be treated as being included in the international watercourse system. Thus, to the extent that the uses of the waters of the system have an effect on one another, to that extent the system is international, but only to that extent; accordingly, there is not an absolute, but a relative, international character of the watercourse.³¹

The draft articles themselves contain no reference to groundwater and need none so long as international aquifers are comprehended in the definition of international watercourse system employed throughout the tentatively adopted articles. For example, ". . . a State in whose territory part of the waters of an international watercourse system exists is a system State."³² And it is implicit that the waters in an international aquifer are a shared natural resource, on one condition:

30. U.N. Doc. A/CN.4/332 (1980).

31. Report of the International Law Commission on the work of its thirty-second session, 5 May-25 July 1980, 35 U.N. GAOR, Supp. (No. 10) 247, U.N. Doc. A/35/10 (1980). The international watercourses topic is Chap. V of the *Report* (see pp. 237-315).

32. *Id.* at 255.

To the extent that the use of waters of an international water-course system in the territory of one system State affects the use of waters of that system in the territory of another system State, the waters are, for the purposes of the present articles, a shared natural resource.³³

Both the systems approach and the relativity of the status of being, or not being, "international" waters were submitted to considerable comment and criticism in the General Assembly during the Sixth Committee's consideration of the ILC's annual Report.³⁴ As is customary, however, the Sixth Committee took no formal position on the Commission's draft articles, in light of their tentative nature and the fact that additional articles are planned. The plenary adopted a resolution approving the Commission's planned 1981 program of work and recommended, as to the watercourses topic, that the Commission proceed with "the preparation of draft articles."³⁵

C. *Other Developments Since 1966*³⁶

Leading up to the just described actions in the United Nations International Law Commission have been other developments of major

33. *Id.* at 275-76.

34. The writer refrains from extended comment on most aspects of the Report as not germane to the consideration of international aquifers but commends to the reader not only the 1980 Report of ILC but the reports and Introductory Statement of the Special Rapporteur, cited above, and the Special Rapporteur's extensive third report on the topic (A/CN.4/348, 11 Dec. 1981, in press).

35. G.A. Res. 35/163, adopted by consensus on Dec. 15, 1980.

36. Because the meeting at which this paper was presented was held in the seat of the Council of Europe and was attended by specialists fully cognizant of the developments that have taken place in that region with respect to transnational groundwaters, the author's obligation was to fill in the rest of the picture. Nonetheless, the non-European reader-specialist may be keenly interested in the references to subterranean waters in the regional positions and documents developed at the level of "Europe" since 1965. It can be safely said that in Europe the need to protect groundwater from contamination is urgently felt and the interactions with surface water as well as between fresh and maritime waters (including groundwater) are generally better recognized and appreciated than in any other region of the world. Thus, see esp. "Guiding Principles Applicable to Fresh Water Pollution Control" adopted by the Consultative Assembly of the Council of Europe as Recommendation 436 (1965) (para. 2 of Preamble: "The purpose of water pollution control is to preserve, to the maximum extent possible, the natural qualities of surface and underground waters in order to safeguard public health and to permit their use. . . ." Part I, para. 7: "Both for surface and for ground waters regulations should be established prohibiting the discharge or deposit, without prior administrative authorization, of any substance of a kind which pollutes such waters." However, in Part II, "International aspects," express mention is made only of "surface waters" where "territories are separated or crossed by the same water course. . . ."); The European Water Charter of 1967 (proclaimed in Strasbourg on 6 May 1968), adopted by the Consultative Assembly of the Council as Recommendation 493 (1967) and by the Committee of Ministers as Resolution (67)10 (second para. of II: "Surface and underground waters should be preserved from pollution." Second para. of VII: "It is essential to know surface and underground water resources, bearing in mind the water cycle, the quality of water and its utilization." Second para. of XI: "Within a drainage basin, all uses of surface

significance bearing upon the appreciation of, and international recognition of responsibilities for, shared natural resources, among which the water resources of international aquifers perform must be included.³⁷

The United Nations Conference on the Human Environment, held in Stockholm in 1972, has had a lasting impact on international policy. From its famous, 26-point Declaration on the Human Environment, Principles 21 and 22 are undoubtedly applicable to transnational groundwater problems. Principle 21 declares that "States have . . . the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States. . . ."³⁸ Principle 22 adds that "States shall co-operate to develop further the international law regarding liability and compensation for the victims of pollution and other environmental damage

and underground waters are interdependent and should be managed bearing in mind their interrelationship."); Draft European Convention on the Protection of Fresh Water against Pollution, adopted by the Consultative Assembly as Recommendation 555 (1969) (Art. 1 (b): "'waters' means internal waters, whether on the surface or underground"). However, the Council of Europe's Committee of Ministers did not approve that draft and set up an *Ad Hoc* Committee of Experts which prepared, in 1974, a new draft European Convention which contains no express reference to groundwater and defines "international watercourse" as "any watercourse, canal or lake which separates or passes through the territories of two or more States. . . ." Art. 1(a). Consultative Assembly of the Council of Europe, Statutory Report, Communication on the activities of the Committee of Ministers, Doc. 3239, p. 39. *See also*, Recommendation 629 (1971) of the Consultative Assembly on the pollution of the Rhine valley water-table (para. 6: ". . . the Rhine valley-water-table is not only the most important fresh water reservoir in Europe but also the indivisible asset of a number of European countries;" para. 7: ". . . pollution increasingly threatens this vital fresh water reserve. . . .") and, most important, the 17 Dec. 1979 Directive of the Council (of Ministers) of the European Economic Community, "concernant la protection des eaux souterraines contre la pollution causée par certaines substances dangereuses (80/68/CEE). *Journal officiel des Communautés européennes*, No. L 20/43 (26 Jan. 1980).

37. Because these developments embrace topics for which an extensive literature already exists, and which reach far beyond the field of transnational groundwater, only brief, "reminders" will here be attempted.

38. REPORT OF THE UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT, U.N. Doc. A/CONF. 48/14 (1972); 11 INT'L LEGAL MATERIALS 1416 (1972). Apart from the Declaration, the Conference adopted less well known Recommendations, Nos. 51-55 of which dealt with water, recommending, *inter alia*, that interested governments consider establishing international commissions for water resources common to more than one jurisdiction; a number of principles, including notification to another country long in advance when activities may have considerable environmental effects, optimum utilization, avoidance of pollution, and equitable distribution of net benefits; and 8 "regional" activities, including data collection, analysis and exchange, evaluation of the effects on the environment of existing uses, joint studies of water-related problems (bearing in mind the social, economic and technical water quality control considerations), etc. (Recom. 51). No distinction is drawn between surface water and groundwater, that is, neither is identified. Action Plan for the Human Environment refers only to "water resources."

caused by activities within the jurisdiction or control of such States to areas beyond their jurisdiction."³⁹

In 1976 the United Nations Conference on Human Settlements called for the satisfaction of basic human needs, among which were listed clean water and sanitation.⁴⁰ But more directly pertinent were the Resolutions and Recommendations of the United Nations Water Conference, held the following year. There, among the types of data the collection of which "needs to be promoted," hydrogeological data is listed.⁴¹ Observation networks and facilities for measuring and recording fluctuations in groundwater quality and level are emphasized in some detail.⁴² Periodic assessments of groundwater resources are recommended.⁴³ In the case of shared resources, co-operation "in the co-ordination, collection and exchange of relevant data" is urged.⁴⁴ On request, international organizations should offer assistance with regards to recording the quantitative and qualitative characteristics of groundwater resources, with respect to the establishment of groundwater data banks, and with respect to "advanced techniques, such as geophysical methods, nuclear techniques, mathematical models, etc."⁴⁵

Under the rubric of "Efficiency and efficacy in regulation and distribution of the resources," the Water Conference recommended, among other things, that:

39. *Id.*, Sec. I. For the U.N. General Assembly's action affirming these Principles from the Stockholm Declaration as the basic norms on the subject, see G.A. Res. 2995 (XXVII) and 2996 (XXVII), approved Dec. 15, 1972. The General Assembly's Charter of Economic Rights and Duties of States echoes these Principles: "In the exploitation of natural resources shared by two or more countries, each State must co-operate on the basis of a system of information and prior consultations in order to achieve optimum use of such resources without causing damage to the legitimate interest of others." G.A. Res. 3281 (XXIX), Dec. 12, 1974, art. 3. "... All States have the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction. . . ." *Id.*, art. 30. See also, Report of the Intergovernmental Working Group of Experts on Natural Resources Shared by Two or More States on the Work of its Fifth Session . . . , approved by the Governing Council of UNEP, May 19, 1978 (GC.6/CRP.2), especially Principles 1, 3, 6, 8 and 12.

40. See Chapter II of *Report of Habitat: United Nations Conference on Human Settlements* (U.N. Sales No. E.76.IV.7).

41. See paragraph 2 of Recommendations in *Report of the United Nations Water Conference*, March 14-25, 1977 (U.N. Sales No. E.77.11.A.12). Also, training programs and facilities for hydrogeologists at professional and subprofessional levels should be established or strengthened. *Id.* at para. 3(a).

42. *Id.* at para. 3(c).

43. *Id.* at para. 3(f).

44. *Id.* at para.3(j).

45. *Id.* at para. 4(b).

(a) Measures be taken to utilize ground-water aquifers in the form of collective and integrated systems, whenever possible and useful, taking into account the regulation and use of surface-water resources.

. . .
 (b) Studies should explore the potential of ground-water basins, the use of aquifers as storage and distribution systems, and the conjunctive use of surface and subsurface resources to maximize efficacy and efficiency; . . .⁴⁶

Under the section of recommendations on "Environment, health and pollution control," the Water Conference called for surveys of present levels of pollution in groundwater resources and the establishment of monitoring networks for the detection of pollution. Research on and measurement of pollution of groundwater by fertilizers and biocides are also recommended. Infiltration should be promoted where that can be done without endangering groundwater (and surface water) resources. Countries are urged to apply land-use planning as a tool for preventing water pollution, "especially in the case of ground water."⁴⁷

Considering "Drought loss management," the Conference recommended that exploration of groundwater be intensified and, on "a regional scale," that large-scale programs for the development of wells and boreholes be undertaken, but avoiding "over exploitation of underground aquifers." The effect of drought on aquifers should be determined, as well as the response of groundwater systems to drought. Also recommended is the study of "the potential role of integration of surface and underground phases of water basins utilizing the stocks of water in ground-water formation in order to maintain a minimum supply. . . ."⁴⁸ Among the twenty-four topics on which research should be promoted, two directly concern our topic: "Artificial recharge of aquifers" and "Contamination of groundwaters."⁴⁹

Section G of the Water Conference Recommendations is entitled "Regional co-operation" and starts off with recommendations about the "Development of shared water resources." In two pages of text, no express mention of groundwater was made; however, the term "drainage basins" was used once.⁵⁰ The Conference Report annexes the recommendations arrived at by the preparatory regional meetings. Express mention of groundwater appears only in the recommendations put forward by Western Asia: as part of a proposed regional

46. *Id.* at para. 10.

47. *Id.* at para. 39(a), (f), (m), (o).

48. *Id.* at para. 68(d), (o), (n).

49. *Id.* at para. 82(g).

50. *Id.* at 51-52.

Water Resources Council, a Committee on subregional streams and underground aquifers "could assist in initiating studies related to streams, wadis or underground aquifers *common to two or more States members* of the Council." Further, it "would co-operate . . . in the gathering and analysis of basic data and the development of guidelines and compacts governing the use of such resources."⁵¹

It is apparent that the United Nations Water Conference gave considerable attention to groundwater matters, and some attention to water as a shared resource, although the connection between shared water and groundwater was not expressly made. The Water Conference also approved ten substantive Resolutions, in which groundwater as such is mentioned only twice, in connection with the role of water in combating desertification (Resolution V). The term hydrogeologist appears once (training programs and facilities for), as does "wells" (again, desertification).⁵² Indeed, for both the Recommendations and the Resolutions many, if not most, of the activities dealt with would be read to include groundwaters by a groundwater specialist. In addition, the Conference speaks of "the Plan of Action on *integrated water resources development and management*" it has recommended.⁵³ The one "international" resolution, number VII, "River commissions," speaks of existing "international *river commissions*," "management and development of international *waters*," "*river-basin organizations*," and countries which "share water resources." No awareness of international aquifers is expressed, but neither are they excluded.⁵⁴

The United Nations Conference on Desertification followed the Water Conference in August and September of 1977. Its Action Plan calls for development and management of water resources, prevention and control of salinization, waterlogging and alkalinization of irrigated lands; and devising strategies with respect to droughts.⁵⁵ Numerous other intergovernmental meetings could be mentioned in this review of recent international attention to integrated non-maritime water re-

51. *Id.* at 65. Emphasis added.

52. *Id.* at 66-81.

53. Resolution VIII, *Institutional arrangements for international co-operation in the water sector*, *Id.* at 78. Emphasis added. But the Resolution itself deals only with co-operation within the United Nations system.

54. *Id.* at 77. Emphasis added. The Resolution recommends meeting between representatives of such commissions, with a view to developing a dialogue among them on ways to exchange their experiences; countries which share water resources but lack basin-wide institutions should be invited to participate. The follow-up on this Resolution includes a United Nations Inter-regional Meeting of River and Lake Organizations to be held in Dakar in May, 1981. Conjunctive use and pollution may be taken up at the Meeting.

55. *Report of the United Nations Conference on Desertification*, Nairobi, Sept. 1977, U.N. Doc. A/CONF.4/36 (1980).

sources management, but an unlikely one should not be overlooked: The Third United Nations Conference on the Law of the Sea. The draft Convention contains fourteen articles with direct bearing on international fresh water.⁵⁶ Above all, the provisions on the protection and preservation of the marine environment contemplate State responsibility for pollution from land-based sources, including rivers and estuaries. While marine pollution emanating from international aquifers is not expressly addressed, such outflows must be deemed included as "land-based sources." While the dangers to health and to a variety of uses "closer to home" are only now gaining concerted attention, obligations under the emerging Law of the Sea give added importance to control measures applicable to groundwater, including international aquifers.⁵⁷

All in all, the "climate" is heating up with respect to water quality, and the serious ramifications of the actual and threatened contamination of our international groundwaters are beginning to loom ominously in the total picture.⁵⁸ Still, the very recent and important Articles on pollution of the Institut de Droit International⁵⁹ make no mention of international aquifers. However, the Preamble to the Institut's Resolution recalls "the obligation to respect the sovereignty of every State over its territory, as a result of which each State has the obligation to avoid any use of its own territory that causes injury in the territory of another State";⁶⁰ the "Resolution shall apply to international rivers and lakes *and to their basins.*"⁶¹

56. U.N. Doc. A/CONF.62/WP.10/Rev.3 (1980) (Articles 66, 67, 194, 197-202, 204, 206, 207, 213 and 235).

57. Preoccupation with land-based sources of pollution of the marine environment is reflected also in the several recent international agreements on regional seas (e.g., Convention on the Protection of the Marine Environment of the Baltic Sea Area, 1974. Helsinki; Kuwait Regional Convention for Co-operation on the Protection of the Marine Environment from Pollution, 1978). The 17 May 1980 Protocol for the Protection of the Mediterranean Sea against Pollution from Land-based Sources expressly contemplates pollution from international water-courses (art. II). 19 INT'L LEGAL MATERIALS 873 (1980).

58. Binational and regional developments have been deleted for lack of space and because some of these, at least the European developments, are quite familiar to the audience to which this study was addressed. *But see, e.g.*, Directive du Conseil (des Communautés Européennes) du 17 décembre 1979, concernant la protection des eaux souterraines contre la pollution causée par certaines substances dangereuses (80/68/CEE), Official Journal of the European Community, No. L 20/43-47, 26 Jan. 1980, especially Articles 3, 4, 5, 7 and 17; Symposium on U.S.-Mexican Transboundary Resources (pt.1), 17 NAT. RES. J. 543 (1977) (pt.2), 18 NAT. RES. J. 109 (1978).

59. *The Pollution of Rivers and Lakes and International Law* 58 *Annuaire* (Session d'Athènes 1979), Part II, 196-203 (in French and English, the French being the authentic text). The Rapport provisoire and Rapport définitif, by M. Salmon, Rapporteur, are contained in Part I. For the discussion within the Institute of the Rapporteur's reports and the voting, see Part I, at 104-157.

60. *See also, Id.* art. 2.

61. *Id.* art. 1, para. 3. Emphasis added. "Hydrographic Basin" and "basin" are used at intervals in subsequent articles, but "les Etats faisant partie d'un même bassin . . ." is trans-

IV. TRENDS IN MUNICIPAL GROUNDWATER REGIMES

Space allows only a summary statement with respect to what has been happening in the field of groundwater law and administration at the national level. Because of the relevance of domestic practice as a possible basis for "general principles of law" applicable at the international level, however, some conclusions should be drawn. There is now a rather extensive literature on "municipal" water law in general and even on groundwater law.⁶² In short, State practice can be quite amply demonstrated.

In most countries the legal regimes governing groundwater are still substantially separate from the legislation or case law governing surface waters. Groundwater rights are usually appurtenances to the land, but even where restrictions, including permit systems, have been imposed, the owner of the overlying land still enjoys a preferred position.⁶³

The trend is, nonetheless, clearly in the direction of severing water rights from the property law concept of "ownership" in the classical, strict sense. In several countries water has been nationalized, removing the ownership issue from the private law arena at least and shifting the emphasis to *use* rights. Today surface waters are nearly everywhere subject to significant use regulation. Groundwater has not been so thoroughly or universally affected, but restrictions are increasing. The impetus for restriction has, perhaps, been abetted more by dis-

lated in the English as "States bordering the same . . . basin"; "co-riparian" ("riverains") appears once, in Article VII, but "States concerned" is the rule. "Transboundary pollution of the basin" is also employed (see Articles VI and VII).

62. See *inter alia*, L. TECLAFF, ABSTRACTION AND USE OF WATER: A COMPARISON OF LEGAL REGIMES (U.N. Sales No. E.72.11.A.10 1972); PROCEEDINGS, International Conference on Global Water Law Systems, held in Valencia, Spain, 1975 (G. Radosevich, ed. 1975) esp. the studies by J. Lopez, B. Wohlwend, H. Richardson, S. Clark, O. Kolbasov, O. Tamir, D. Caponera and S. Burchi, M. Despax, and A. Maktari; D. CAPONERA, WATER LAWS IN MOSLEM COUNTRIES, UNFAO publication, Agricultural Development Papers, No. 43 (Rome, 1954); G. CANO, F. VARGAS, LAS LEYES DE AGUAS EN SUD-AMERICA, UNFAO publication, Agricultural Development Papers, No. 56 (Rome, 1956); WATER LAW IN SELECTED AFRICAN COUNTRIES, UNFAO publication, Legislative Study No. 17 (Rome, 1979); M. SANDOVAL, LEGISLACION DE AGUAS EN AMERICA CENTRAL, CARIBE Y MEXICO, UNFAO publication, Legislative Study No. 8 (Rome, 1975); WATER LAW IN SELECTED EUROPEAN COUNTRIES, UNFAO publication, Legislative Study No. 10 (Rome, 1975; also in French and Spanish); NATIONAL SYSTEMS OF WATER ADMINISTRATION (U.N. Sales No. 74.II.A.10 1974); GROUNDWATER LEGISLATION IN EUROPE, UNFAO publication, Legislative Series No. 5 (Rome, 1964); WATER RESOURCES LAW AND POLICY IN THE SOVIET UNION (I. Fox, ed., 1971); WATER LEGISLATION IN ASIA AND THE FAR EAST, U.N. ECAFE, Part 1 (Water Res. No. 31, U.N. Sales No. 67.11.F.7) and Part 2 (Water Res. No. 35, U.N. Sales No. E.69.II.F.6); LARGE-SCALE GROUND-WATER DEVELOPMENT, U.N. Sales No. 60.II.B.3 1960); INTERNATIONAL ASSOC. FOR WATER LAW, ANNALES JURIS AQUARUM-II, 3 vols. (Caracas, 1976); F. TRELEASE, CASES AND MATERIALS ON WATER LAW (1967).

63. For specifics about various regions of the world and many individual countries, see Hayton, *The Ground Water Legal Regime as Instrument of Policy Objectives and Management Requirements*, II ANNALES JURIS AQUARUM 345 (1976).

covery of toxic contamination in supplies from wells—along with belated cognizance of the gravity of pollution of the underground environment—as much as by depletion.

The growing willingness of communities to exercise some control over groundwater can be seen in the now widespread, quantitative limitations on pumping (as protection against saline intrusion as well as for allocation purposes); health regulations governing sewage disposal systems in relation to wells, isolation of well tops and well pits and water quality standards; landfill controls (where leaching into groundwater may occur); and well spacing and construction standards. Policing of these controls, often difficult and uneven, is chiefly through licensing of drillers (and of landfill and chemical storage sites and operators), individual well drilling permits (with on-site inspections and registering and reporting requirements) and *post hoc* use licenses. Fully modern legislation provides for the establishment of zones of conservation (with diminution of withdrawal rights) or unsuitability. Rational and beneficial use tests and equitable apportionment or “correlative rights” doctrines are beginning to be applied to groundwater users; the conjunctive use approach has become generally accepted in principle, if seldom realized.⁶⁴

In short, general principles of law and administration of groundwater are emerging at the municipal level that should be conducive to recognition of similar needs and methods in the relations between and among States.⁶⁵

V. PROSPECTS AND POSSIBILITIES

Acknowledgement of the transboundary *portée*, or reach, of numerous frontier aquifers is still resisted by many at the political level, while their experts—unless otherwise instructed—may be discussing appropriate measures to meet the obvious (to them) consequential problems of resource utilization and protection, including public health aspects. The steadily growing demand for water, combined with the heightened threats to groundwater quality are, nonetheless, making avoidance of the issue increasingly difficult—whether based upon innocence, pretended denial of the existence of subsurface waters astride the border or arguments of no legal responsibility to one's neighbors with respect to subterranean waters. The geological

64. For a reasoned statement of the essential requirements of ground-water management legislation, see the 8 points set forth in Clark, *Institutional Alternatives for Managing Groundwater Resources: Notes for a Proposal*, 18 NAT. RES. J. 153, 158-160 (1978).

65. See, for one effort in that direction, Hayton, *Institutional Alternatives for Mexico-U.S. Groundwater Management*, 18 NAT. RES. J. 201 (1978).

unity of the above-the-sea continent and the adjacent, submerged land—the continental shelf—has long been accepted. It would be amusing, if it were not so serious, that the even more immediate geological unity of the surface and the subsurface has not been readily admitted.

The more notorious transfrontier pollution incidents and conditions become, the greater the dissemination of basic hydrogeological information, and the more insistent water lawyers and international lawyers are with respect to the “international” character of shared groundwater resources, the sooner will come the day when international aquifers will be accorded equal treatment with the surface waters of international rivers and lakes. Eventually, because of the persistence and special dangers of aquifer contamination and depletion, an international aquifer may come to receive even more attention and inter-State collaboration than surface waters. Until that day comes, water resources specialists of all disciplines must continue to study the increasingly aggravated conditions of these aquifers, to probe for the most appropriate management techniques, and to speak out with facts and doctrine in promotion of optimum utilization and protection, as a whole, of the priceless international aquifers of the world.