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Seventh report on the law of the non-navigational uses of international watercourses, by Mr. Stephen C. McCaffrey, Special Rapporteur

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CONTENTS

* Incorporating documents A/CN.4/436/Corr.1, 2 and 3.

Conventions and treaties cited in the present report**

ABBREVIATIONS

Legislative Texts — United Nations Legislative Series, *Legislative Texts and Treaty Provisions concerning the Utilization of International Rivers for Other Purposes than Navigation* (Sales No. 63.V.4).

AFRICA

Multilateral treaties

	Source
Cameroon, Chad, Dahomey, Guinea, Ivory Coast, Mali, Niger, Nigeria and Upper Volta: Act regarding Navigation and Economic Cooperation between the States of the Niger Basin (Niamey, 26 October 1963)	United Nations, *Treaty Series*, vol. 587, p. 9.
Cameroon, Chad, Niger and Nigeria: Convention and Statutes relating to the development of the Chad Basin (Fort Lamy, 22 May 1964)	United Nations, *Treaties concerning the Utilization of International Watercourses for Other Purposes than Navigation: Africa*, Natural Resources/Water Series No. 13 (Sales No. E/F.84.II.A.7), p. 8.
African Convention on the Conservation of Nature and Natural Resources (Algiers, 15 September 1968)	United Nations, *Treaty Series*, vol. 1001, p. 3.
Burundi, Rwanda and the United Republic of Tanzania: Agreement for the establishment of the Organization for the Management and Development of the Kagera River Basin (Rusumo, 24 August 1977)	Ibid., vol. 1089, p. 165.
Gambia, Guinea and Senegal: Convention relating to the Creation of the Gambia River Basin Development Organization (Kaolack, 30 June 1978)	United Nations, *Treaties concerning the Utilization of International Watercourses for Other Purposes than Navigation: Africa*, Natural Resources/Water Series No. 13 (Sales No. E/F.84.II.A.7), p. 42.
Benin, Cameroon, Chad, Guinea, Ivory Coast, Mali, Niger, Nigeria and Upper Volta: Convention creating the Niger Basin Authority (Faranah, 21 November 1980)	United Nations, *Treaty Series*, vol. 587, p. 56.
Agreement on the Action Plan for the Environmentally Sound Management of the Common Zambezi River System (Harare, 28 May 1987)	*International Legal Materials*, Washington, D.C., vol. 27 (1988), p. 1109.

Bilateral treaty

United Arab Republic and Sudan: Agreement for the full utilization of the Nile waters (Cairo, 8 November 1959)	United Nations, *Treaty Series*, vol. 453, p. 51.

AMERICA

Multilateral treaty

Argentina, Bolivia, Brazil, Paraguay and Uruguay: Treaty of the River Plate Basin (Brasilia, 23 April 1969)	Ibid., vol. 875, p. 3.

** The instruments are listed in chronological order, by continent.

Bilateral treaties

	Source
Great Britain and United States of America: Treaty relating to boundary waters and questions concerning the boundary between Canada and the United States (Washington, D.C., 11 January 1909)	*British and Foreign State Papers, 1908-1909*, vol. 102, p. 137; *Legislative Texts*, p. 260, No. 79.
United States of America and Canada: Treaty relating to the cooperative development of the water resources of the Colombia Basin (Washington, D.C., 17 January 1961)	United Nations, *Treaty Series*, vol. 542, p. 245.

ASIA

Bilateral treaty

India, Pakistan and IBRD: Indus Waters Treaty 1960 (Karachi, 19 September 1960)	Ibid., vol. 419, p. 125.

EUROPE

Multilateral treaty

Belgium, France, Great Britain, Greece, Italy, etc.: Convention establishing the definitive Statute of the Danube (Paris, 23 July 1921)	League of Nations, *Treaty Series*, vol. XXVI, p. 173.

Bilateral treaties

Union of Soviet Socialist Republics and Hungary: Convention concerning measures to prevent floods and to regulate the water regime on the Soviet-Hungarian frontier in the area of the frontier River Tisza (Uzhgorod, 9 June 1950)	*Legislative Texts*, p. 827, No. 227.
Yugoslavia and Hungary: Agreement concerning water economy questions, together with the Statute of the Yugoslav-Hungarian Water Economy Commission (Belgrade, 8 August 1955)	Ibid., p. 830, No. 228.
Yugoslavia and Albania: Agreement concerning water economy questions, together with the Statute of the Yugoslav-Albanian Water Economy Commission and with the Protocol concerning fishing in frontier lakes and rivers (Belgrade, 5 December 1956)	Ibid., p. 441, No. 128.
Yugoslavia and Bulgaria: Agreement (with annex) concerning water economy questions (Sofia, 4 April 1958)	United Nations, *Treaty Series*, vol. 367, p. 89.
Poland and the Union of Soviet Socialist Republics: Agreement concerning the use of water resources in frontier waters (Warsaw, 17 July 1964)	Ibid., vol. 552, p. 175.
Greece and Yugoslavia: Agreement concerning the study of the overall improvement of the Axios-Vardar basin (Belgrade, 12 June 1970)	*Službeni List*, Socijalističke Federativne Republike Jugoslavije, Belgrade, No. 48, text 124, p. 723.
Finland and Sweden: Agreement concerning frontier rivers (with annexes) (Stockholm, 16 September 1971)	United Nations, *Treaty Series*, vol. 825, p. 191.
Italy and Switzerland: Convention concernant la protection des eaux italo-suisses contre la pollution (Rome, 20 April 1972)	*Revue générale de droit international public* (Paris), 3rd series, vol. LXXIX (1975), pp. 265 *et seq.*
Federal Republic of Germany/European Economic Community and Austria: Agreement on cooperation on management of water resources in the Danube Basin (Regensburg, 1 December 1987)	*Official Journal of the European Communities*, vol. 33, 5 April 1990, p. 20.

General conventions

	Source
Treaty of Versailles (Versailles, 28 June 1919)	G.F. de Martens, *Nouveau Recueil général de Traités*, 3rd series, vol. X (Leipzig, Weicher, 1923), p. 323.
Vienna Convention on the Law of Treaties (Vienna, 23 May 1969)	United Nations, *Treaty Series*, vol. 1155, p. 331.
Vienna Convention on the Representation of States in Their Relations with International Organizations of a Universal Character (Vienna, 14 March 1975)	United Nations, *Juridical Yearbook 1975* (Sales No. E.77.V.3), p. 87.
Vienna Convention on Succession of States in Respect of Treaties (Vienna, 23 August 1978)	*United Nations Conference on Succession of States in Respect of Treaties, Official Records, vol. III, Documents of the Conference* (United Nations publication: Sales No. E.79.V.10), p. 185.
Vienna Convention on Succession of States in Respect of State Property, Archives and Debts (Vienna, 8 April 1983)	United Nations, *Juridical Yearbook 1983* (Sales No. E.90.V.1), p. 139.
Vienna Convention on the Law of Treaties between States and International Organizations or between International Organizations (Vienna, 21 March 1986)	A/CONF.129/15.

Introduction

1. With the sixth report[1] the submission of provisions recommended for the Commission's consideration for inclusion in the draft articles on the law of the non-navigational uses of international watercourses was completed.[2] The present report addresses principally the matter of the use of terms and, in particular, the definition of "international watercourse". Before turning to that fundamental question, however, the Commission's attention is drawn to the matter of the order of the articles on the "scope" of the draft and the "use of terms", respectively.

[1] *Yearbook ... 1990*, vol. II (Part One), p. 41, document A/CN.4/427 and Add.1.

[2] For the texts of the draft articles provisionally adopted so far by the Commission (arts. 1-27), see *Yearbook ... 1990*, vol. II (Part Two), pp. 54-57.

CHAPTER I

Structure of part I of the draft articles

2. At present, part I of the draft articles, entitled "Introduction", begins with an article tentatively entitled "Use of terms" (art. 1), which is followed by an article entitled "Scope of the present articles" (art. 2). It is recommended that the Commission consider reversing the order of these articles, so that the first article of the draft would define its scope and the second would define the terms employed.

3. Such a structure would seem more logical and would further seem to be more helpful to the reader than the present organization. The first thing that one would normally want to know about a set of articles is what it covers, not how certain technical terms utilized therein are defined. It is perhaps for this reason that a number of conventions based on Commission drafts have adopted the structure here recommended. Examples include the Vienna Convention on the Law of Treaties, the Vienna Convention on Succession of States in Respect of Treaties, the Vienna Convention on Succession of States in Respect of State Property, Archives and Debts, and the Vienna Convention on the Law of Treaties between States and International Organizations or between International Organizations. In addition, the Commission has followed the same pattern in the two sets of draft articles it has most recently completed: the draft articles on ju-

risdictional immunities of States and their property, the first reading of which was completed in 1986[3] and the draft articles on the status of the diplomatic courier and the diplomatic bag not accompanied by diplomatic courier, the second reading of which was completed in 1989.[4, 5] A final example may be drawn from the Commission's work on this very topic: the set of six draft articles originally adopted by the Commission in 1980 began with article 1, entitled "Scope of the present articles".[6]

4. While changes of this nature have in the past been made principally during the second reading process, there would seem to be no reason why such a change could not be made before the entire set of draft articles is adopted on first reading. It would seem unlikely that a simple reversal of the order of the first two articles of the draft would give rise to confusion on the part of States. Indeed, as indicated above, it is believed that to address the scope of the draft in its first article would be more helpful to the reader than beginning with a list of technical definitions. Those definitions are addressed in the following section of the report.

[3] See *Yearbook ... 1986*, vol. II (Part Two), pp. 8 *et seq.*

[4] See *Yearbook ... 1989*, vol. II (Part Two), pp. 14 *et seq.*

[5] This approach has not been followed in all of the Commission's efforts, however. For example, the Vienna Convention on the Representation of States in their Relations with International Organizations of a Universal Character begins with use of terms and covers the scope of the Convention in article 2.

[6] *Yearbook ... 1980*, vol. II (Part Two), p. 110.

CHAPTER II

Use of terms

5. The present chapter will first deal with the definition of the term "international watercourse" and will then identify several additional expressions the Commission might wish to define in the article on "use of terms".

A. Definition of "international watercourse"

6. Since 1976, there has been "general agreement in the Commission that the question of determining the scope of the term 'international watercourses' need not be pursued at the outset of the work. Instead, attention should be devoted to beginning the formulation of general principles applicable to legal aspects of the uses of those watercourses."[7] In the second (1986) report, the the view was expressed that "leaving this question aside for the time being might well expedite work on the topic" and it was recommended that "the Commission proceed on the basis of the provisional working hypothesis which it developed and accepted in 1980".[8] At its thirty-ninth (1987) session, the Commission adopted the first provisions of the present set of draft articles (arts. 2-7). The Commission at that session decided "to leave aside for the time being the question of article 1 (Use of terms) and that of the use of the term 'system' and to continue its work on the basis of the provisional working hypothesis accepted by the Commission at its thirty-second session, in 1980".[9] The hypothesis 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.[10]

7. Now that the Commission has adopted the bulk of the provisions of the draft, and is in the process of considering those that remain, the time has come to decide upon the scope of the term "international watercourse". Indeed, the Commission's task has been made easier by the very fact that the basic rules of the draft articles are now clear; it remains only to decide upon the scope of their application. There are, in effect, two issues before the Commission in this connection. The first is whether the draft articles should apply to all of the hydrographic components of international watercourses,[11] and to all of the forms of those watercourses,[12] including rivers, their

[7] *Yearbook ... 1976*, vol. II (Part Two), p. 162, para. 164.

[8] See *Yearbook ... 1986*, vol. II (Part One), p. 99, document A/CN.4/399 and Add.1-2, para. 63.

[9] *Yearbook ... 1987*, vol. II (Part Two), p. 25, footnote 83.

[10] *Yearbook ... 1980*, vol. II (Part Two), p. 108, para. 90.

[11] As explained below in connection with the discussion of the hydrologic cycle, a watercourse system will always have certain kinds of components (such as streams, their tributaries and groundwater) and may have others (such as lakes, reservoirs and canals) as well. (This statement does not take into account the case of an aquifer (groundwater) that is unrelated to surface water. Such unrelated groundwater will be discussed later in the present chapter.)

[12] The notion of a "form" of international watercourses is here utilized to refer to certain components of a watercourse system that may or may not be present in any given drainage basin. These would include lakes, reservoirs and canals. The term "form" thus refers to possible components of a watercourse system other than those that are present in every case (see footnote 11 above).

tributaries, lakes, canals, reservoirs and groundwater. The second issue is whether, for the purposes of the draft articles, watercourses should be treated as having a "relative" international character.[13]

1. Components of a watercourse to be included in the definition of "international watercourse"

8. Certain aspects of the answer to the first issue are already implicit in many of the provisions of the draft that have been adopted so far, at least with respect to surface waters. Perhaps the most prominent of these aspects is that the spatial scope of the articles is not necessarily confined to watercourses, or parts thereof, situated in the immediate border region. Unless the scope of the draft articles was limited to contiguous watercourses and boundary lakes—a suggestion that has not been made in the Commission, to the knowledge of the present writer—the rules of the draft by their very nature will require watercourse States to consider the possible impact on other watercourse States of activities that may not be in the immediate vicinity of a border. That is to say that the regime of equitable utilization (art. 6), for example, could be upset just as much by activities distant from the frontier on a tributary of, or canal leading into, a boundary-crossing river as by conduct on the river itself in close proximity to the border. The same would be true of the capacity to cause appreciable harm (art. 8). For example, toxic chemicals discharged into a minor watercourse flowing into a boundary lake may ultimately make their way across the lake, causing harm on the other side of the border to another watercourse State.[14] Likewise, the provisions of part III of the draft articles (Planned measures) would be no less applicable to uses of a tributary that was distant from a boundary than to uses of the main stem of a successive river in the border region itself: the question in both cases would be whether the planned measures "may have an appreciable adverse effect upon other watercourse States" (art. 12). The criterion under the draft articles in all of these cases is whether the activity or use in question would amount to an inequitable and unreasonable utilization; would cause appreciable harm to, or might have an appreciable adverse effect upon,[15] other watercourse States; would harm the ecosystem of the international watercourse; or would amount to a condition that might be harmful to other watercourse States.[16] Furthermore, other rights and obligations under the draft articles would also have to apply to portions of an international watercourse other than the main stem in order for them to be meaningful. This is true, for example, of the right to participate in the formulation and conclusion of agreements concerning a part of a watercourse (art. 5, para. 2), the obligation to take into account all factors and circumstances relevant to equitable utilization (art. 7) and the duty to exchange data and information on a regular basis (art. 10).

9. It is proposed that the term "international watercourse" should be defined in a way that makes plain the foregoing implications of the draft articles adopted thus far. A definition of "international watercourse" that focused upon the portion of a stream, lake, or so forth, that formed or crossed an international boundary would seem too narrow to be helpful to those responsible for applying the draft articles. That is, such a definition would not alert the authorities to the implications as described above and the consequent need, *inter alia*, to take into account the potential trans-border impacts of existing or planned activities. Likewise, even a definition of "international watercourse" that referred, for example, to "any watercourse . . . which crosses or forms frontiers between two or more States"[17] could lead to uncertainty and difficulty of application because the precise meaning of the term "watercourse" would remain undefined. It is therefore recommended that the draft articles should include a definition of the term "watercourse" and, for the reasons explained below, it is believed that the rights and obligations of watercourse States under the draft articles would be made most clear, and cooperative planning and management of international watercourses most effective, by defining "watercourse" as, in essence, a *system* of waters consisting of hydrographic components which, by virtue of their physical interrelationship, constitute a unitary whole. This was the approach taken in the tentative working definition, set forth in paragraph 6 above, on the basis of which the draft articles have been prepared. While it has been discussed in previous documents of the Commission,[18] the concept of a "watercourse system" will be revisited briefly in section (*a*) below in order to place these recommendations in context.

(a) *The concept of a "watercourse system"*

10. The starting-point for understanding the functioning of watercourses is the hydrologic cycle. Since this phenomenon was treated extensively in the first report of Mr. Schwebel,[19] only its main features will be summarized here.

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[13] The concept of the "relative international character" of a watercourse stems from the provisional working hypothesis accepted by the Commission as the basis of its work in 1980 (see footnote 10 above).

[14] See, for example, *Ohio* v. *Wyandotte Chemicals Corp.* et al., (*United States Reports of Cases Adjudged in the Supreme Court*, vol. 401 (1971), p. 493 *et seq.*), which was a suit by the State of Ohio (United States of America) against, *inter alia*, a Canadian company that had allegedly dumped mercury into a Canadian tributary of Lake Erie, resulting in damage in and to Ohio. The State of Ohio sought "monetary damages for the harm done to Lake Erie, its fish, wildlife, and vegetation, and the citizens and inhabitants of Ohio".

[15] The "appreciable adverse effect" standard is utilized in part III of the draft articles. See, for example, article 12.

[16] "[C]onditions that may be harmful to other watercourse States" are dealt with in article 26. The list of criteria is not exhaustive, but it is hoped that it illustrates the point.

[17] See ECE, Note by the secretariat on "Possible elements for a draft framework convention on the protection and use of transboundary watercourses and international lakes", document ENVWA/WP.3/R.17, element II, para. 1 (*a*).

[18] See, for example, paragraphs (2)-(8) of the commentary to article 1 as adopted in 1980 (*Yearbook . . . 1980*, vol. II (Part Two), pp. 110-111; and the second report of Mr. Schwebel (*Yearbook . . . 1980*, vol. II (Part One), pp. 167-169, document A/CN.4/332 and Add.1, paras. 53-58).

[19] *Yearbook . . . 1979*, vol. II (Part One), pp. 146-149, document A/CN.4/320, paras. 9-21.

11. Nebel has offered a relatively concise and non-technical description of the hydrologic cycle,[20] with an accompanying diagram (see annex, fig. 1).

12. It may be said in general that water is constantly in motion, whether between gaseous, solid and liquid states or from the mountains to the sea. This fact would seem to mean that any attempt to confine water completely, or to bring it entirely under exclusive dominion and control, would be an exercise in futility. Even

> . . . [t]he apparently inert tumblerful that stands beside a dinner plate may simultaneously convert ice cubes into liquid, release tiny amounts of vapour into the air above it and condense vapour into droplets on its smooth glass sides.[21]

13. In another sense, however, water is the essence of stability:

> The total supply [of water] neither grows nor diminishes. It is believed to be almost precisely the same now as it was 3 billion years ago. Endlessly recycled water is used, disposed of, purified and used again. Last night's potatoes may have boiled in what was, ages ago, the bath water of Archimedes.[22]

14. While "the knowledge that the world supply of this vital substance cannot be depleted should offer comfort",[23] the ever-increasing demands placed on the enduring yet finite resource by the Earth's burgeoning human population[24] require that all possible measures should be taken to ensure that it is conserved. One way in which the Commission can help to promote conservation and protection of freshwater resources is to make responsible governmental officials aware that their international obligations may be affected by the characteristics of water and, specifically, the interrelationship between various components of those watercourse systems, parts of which traverse their borders. This can be accomplished by explicitly recognizing the interrelationship of the relevant components in the draft articles. These components—those that might be described as "terrestrial", as opposed to atmospheric or oceanic—are the subject of the following section.

(b) *Components of a watercourse system*

(i) *General*

15. The various components of a watercourse system may be divided into surface waters and groundwater. Surface waters may take several natural forms, including rivers, lakes and ponds, and various artificial forms, such as canals and reservoirs. Glaciers, which may be conceptualized as surface water in a solid state, are important contributors to some watercourse systems. Groundwater will be discussed further in section (iii) below.

(ii) *The components of a watercourse system illustrated in an international context*

16. John Kolars, an expert in the fields of geography and international watercourses, has prepared a diagram (see annex, fig. 2) which provides a convenient illustration of the manner in which various of the components of a watercourse system are interrelated. It is particularly appropriate for the Commission's purposes, since it places the hypothetical system in an international context.[25] In his explanation of the diagram[26] he demon-

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[20] "The water cycle, also called the hydrological cycle, . . . basically consists of water entering the atmosphere through evaporation and returning through condensation and precipitation. However, there are additional aspects that bear more consideration.

"*Water into the atmosphere*

"Since oceans cover about 70 per cent of the Earth's surface, it is not surprising that the largest amount of water vapour enters the atmosphere by evaporation from the ocean surfaces. Additional water evaporates from lakes, rivers, moist soil, and other wet surfaces; over vegetated land, large amounts of water enter the atmosphere by transpiration from plants. The combination of both evaporation and transpiration is called evapotranspiration.

". . .

"*Water over and through the ground*

"Water from precipitation landing on the ground may follow two alternative pathways. It may soak into the ground, infiltration, or it may run off the surface, runoff . . . Runoff flows over the surface into streams and rivers which make their way to the ocean, or other points of evaporation. All ponds, lakes, streams, rivers and other waters on the surface are referred to as surface waters.

"For water that infiltrates, there are also two alternatives. Water may be held in the soil, the amount depending on the water-holding capacity of the soil . . . This water, called capillary water, returns to the atmosphere by way of evapotranspiration.

"Infiltrating water that is not held in the soil is called gravitational water because it is pulled by gravity and trickles or percolates down through pores or cracks in the earth. Sooner or later, however, gravitational water comes to an impervious layer of rock or dense clay. Free water accumulates, completely filling all the cracks, pores, and spaces above such an impervious layer. This accumulated water is called groundwater, and its upper surface is the water table . . . Gravitational water becomes groundwater as it hits the water table in the same way rainwater becomes lake water as it hits the surface of the lake. Wells must be dug to below the water table; then groundwater, which is free to move, seeps into the well and fills it to the level of the water table.

"Underground rock layers frequently slope, causing groundwater to move slowly like great underground rivers. The layers of porous material through which groundwater moves are called aquifers. The actual location of aquifers is complex. Layers of porous rock are often found between layers of impervious material and the entire formation may be folded or fractured in various ways. Thus groundwater may be found at various depths between layers of impervious rock. Also, the recharge area, the area where water actually enters an aquifer, may be many miles from where it is withdrawn.

"*Summary of the water cycle*

"In summary, the water cycle always consists of evaporation, condensation and precipitation. But in completing the cycle there are three principal 'loops': (1) the surface runoff loop, in which water runs off the surface and becomes part of the surface water system; (2) the evaporation-transpiration loop, in which water enters the soil and is held as capillary water and then returns to the atmosphere by way of evaporation from soil or through absorption by plants and transpiration; and (3) the groundwater loop, in which water enters and moves through the earth, finally exiting through springs, seeps, or wells, thus rejoining the surface water system." (B. J. Nebel, *Environmental Science*, 3rd ed., Englewood Cliffs (N.J.), Prentice-Hall, 1990, pp. 194-198).

[21] L. B. Leopold and K. S. Davis, *Water* (New York, Time, 1966), p. 33.

[22] Ibid.

[23] Ibid.

[24] In 1968, the United Nations estimated that, at then current rates of increase, the world's population would exceed 6 billion by the year 2000 (*World Population Prospects as assessed in 1968* (United Nations publication, Sales No. 72.XIII.4)).

[25] "Hydro-geographic background to the utilization of international rivers in the Middle East", in American Society of International Law, *Proceedings of the 80th Annual Meeting*, Washington, D.C., 9-12 April 1986, pp. 250 *et seq.*

[26] "Stream flow begins with natural precipitation at the headwaters of one country. Water may be impounded for the generation of hydropower with some possible loss through evaporation off reservoir sur-

(*Continued on next page*)

strates how different components of a watercourse system interact with each other. Against this background, the following section will take a closer look at one of these components, groundwater, which it is believed merits the special attention of the Commission.

(iii) *Groundwater and its importance*

a. *The quantity of groundwater*

17. Perhaps the most astonishing feature of groundwater is its sheer quantity in relation to surface water. It has been estimated that 76 per cent of all fresh water on Earth is "locked" in polar ice-caps and glaciers. Of the world's fresh water 13 per cent is located between 800 and 4,000 metres below the Earth's surface, while 10 per cent is found within 800 metres of ground level. Lakes contain only 0.33 per cent, soil moisture 0.18 per cent, the atmosphere 0.036 per cent and rivers a comparatively minuscule 0.004 per cent of the world's fresh water.[27] Thus, groundwater constitutes approximately 97 per cent of the fresh water on Earth, excluding polar ice-caps and glaciers. The volume of groundwater alone lends weight to the argument for including it within the scope of the draft articles, for it is bound to be subject to increasing demands by watercourse States in the coming years and decades.

b. *The use of groundwater*

18. Even today, however, groundwater is relied upon heavily to satisfy basic human needs. According to a study recently prepared by the Secretariat at the request of the present writer—which he commends to the Commission's attention—a majority of the world's population is currently dependent upon groundwater.[28] In many countries, however, the percentage is even higher. Groundwater is, in fact, the only source of water in many arid and semi-arid regions, where it is vitally important to development and, indeed, to human life itself.[29] For example, "[s]urface waters are in short supply in most of Africa", and "today even most of Africa's principal cities are heavily dependent upon groundwater".[30] It has been concluded that the recent sharp increase in the use of groundwater in Africa "goes hand in hand with the continent's rapid entry into the modern world", and "is almost always one of the fundamental conditions for economic and social development, for it is an essential factor in the life or survival of many existing centres of population and a fundamental condition for the establishment of new centres".[31] The great aquifers of north-eastern Africa provide a concrete illustration:

> Groundwater is regarded as the only hope for development in many desert regions, such as Libya and the northern Sudan. The underground flow from the Sudan's Nubian sandstone formations into Egypt has been estimated at over seven million cubic metres annually; it is of good quality and was not taken into account in the Egypt-Sudan 1959 treaty on the division of Nile waters.[32]

19. In the Eastern Mediterranean and Western Asia there has also been "a rapidly increasing demand for water, especially groundwater, which is the only source of water supply in most of the region".[33] In the Indus basin, running from India into Pakistan, the interaction between surface water and groundwater gives rise to problems of a different sort:

> The Indus valley is one of the world's largest irrigated regions. The principal canals traverse recharge areas and so plentifully supply the underground waters that the high water table has caused salinization of the soil, a serious problem calling for special withdrawals from the better quality reaches of the aquifer to lower the water table, and the application of these waters to surface use according to a carefully designed scheme.[34]

20. Groundwater is relied upon heavily in the Americas as well. In Mexico, "where desert and arid and semi-arid conditions prevail over two thirds of the territory,

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(Footnote 26 continued.)

faces. This is particularly true in mountain catchment areas, where there are good dam sites for hydropower purposes. Water then continues downstream to the next reservoir, which is used to generate electricity and also serves to irrigate fields. Similar evaporation losses can occur from these reservoir surfaces. Losses also can occur from fields through evapotranspiration and through leakage from ditches, etc. Return flows may or may not be unacceptably polluted. Farther downstream pumpage from independent aquifers irrigates additional fields and provides some return flow which may increase downstream quantities but may also increase their salinity. Losses also occur through local evapotranspiration. Return seepage from fields may restore some depletion due to pumping but may also pollute spring waters. Excessive pumping may diminish spring flow across the international border. (Lag time because of storage capacity of the aquifer as well as difficulty of observation may make cause and effect difficult to establish in this case.) In the next downriver country similar occurrences are repeated, all of which can have implications for countries farther downstream. At all points along the river changes in the same amounts and quality of water may affect domestic and industrial use. These situations can and do occur in numerous permutations and combinations." (Loc. cit., pp. 257-258).

[27] *The New Encyclopaedia Britannica*, 15th ed. (Chicago, University of Chicago, 1987), vol. 20, p. 789.

[28] "The law of international ground water", United Nations, Office of Legal Affairs, Codification Division, December 1990 (mim.), p. 3 (hereinafter the "Secretariat study").

[29] Ibid., p. 4. See also E. Fano and M. Brewster, "Issues in ground water economics", in United Nations, Department of Technical Cooperation for Development, *Ground Water Economics*, Report of a United Nations International Symposium and Workshop Convened in Cooperation with the Government of Spain, Barcelona (Spain), 19-23 October 1987, document TCD/SEM.88/2, p. 31 (hereinafter "*Ground Water Economics*"). See also the discussion of "the increasingly critical nature of the pressures on groundwater", in R. D. Hayton and A. E. Utton, "Transboundary groundwaters: The Bellagio Draft Treaty", *Natural Resources Journal* (Albuquerque (N.M.)), vol. 29, No. 3 (1989), p. 663, particularly pp. 673 *et seq.*; and the similar discussion in ILA, *Report of the Sixty-second Conference, Seoul, 1986* (London, 1987), pp. 231 *et seq.* (hereinafter the "ILA, Seoul report"), particularly pp. 238-241.

[30] ILA, Seoul report (see footnote 29 above), p. 239. The report continues: "Many of these urban areas are on or near the coast; overpumping has already led to saltwater intrusion where the aquifers are linked to the adjacent seas."

[31] *Ground Water in North and West Africa*, Natural Resources/Water Series No. 18 (United Nations publication, Sales No. 87.II.A.8), p. 17.

[32] ILA, Seoul report (see footnote 29 above), pp. 238-239. See generally R. B. Salama, "Ground water resources of Sudan" (United Nations Water Conference, document E/CONF.70/TP27), and *Ground Water in North and West Africa* (footnote 31 above).

[33] *Ground Water in the Eastern Mediterranean and Western Asia*, Natural Resources/Water Series No. 9 (United Nations publication, Sales No. 82.II.A.8), p. 4. This rapid increase "has been brought about due to industrial development and urbanization, especially following the discovery of huge reserves of oil..." Secretariat study (see footnote 28 above), p. 6.

[34] ILA, Seoul report (see footnote 29 above), p. 238.

groundwater is a priceless resource . . .''[35] In the United States, subterranean sources supply half of all drinking water, and even in Canada, "a predominantly humid country where surface water is extremely abundant, groundwater accounts for more than 10 per cent in urban, rural and individual water supply, and it is also increasingly utilized for irrigation and industrial use.''[36] The same is true in other humid (that is to say, non-arid) parts of the world, where groundwater has come into increasing demand as supplies of surface water have been depleted or contaminated.[37]

21. Groundwater accounts for 70 per cent of all drinking water in European Community countries.[38] The percentage is significantly higher in Germany and the Benelux countries, reaches 93 per cent in Italy,[39] and has been reported to be as high as 98 per cent in Denmark.[40]

c. *Characteristics of groundwater*

22. While the general characteristics of groundwater have already been noted,[41] two of them deserve particular emphasis. The first is that while its flow is slow in comparison with that of surface water, groundwater "is constantly in motion . . . It may move only a few thousandths of a centimetre per day in soil and some fine-grained pervious rocks, to as much as several thousands of metres in fissured geologic formation.''[42] While it may not move quickly, however, "[m]ost of the rainfall which percolates through the soil layer to the underlying groundwater will eventually reach the main stream channels . . .'' [43,44]

23. A second characteristic of groundwater that bears emphasis is that while it may, in exceptional cases, exist in areas where there is virtually no surface water,[45] it is normally closely associated with rivers and lakes. This interrelationship, which was touched upon in connection with the discussion of the hydrologic cycle (para. 11 above), has often been ignored by planners, legislators and lawyers:

> We have been discussing groundwater more or less as if it were separate and distinct from the rest of the hydrologic cycle. Such segregation has been common among hydrologists as well as the general public, and is reflected in legislation, in the division of responsibility among government agencies, in development and regulation . . . Any water pumped from wells under equilibrium conditions is necessarily diverted into the aquifer from somewhere else, perhaps from other aquifers, perhaps from streams or lakes, perhaps from wetlands—ideally, but not necessarily, from places where it was of no use to anyone. There are enough examples of streamflow depletion by groundwater development, and of groundwater pollution from wastes released into surface waters, to attest to the close though variable relation between surface water and groundwater.[46]

24. These two features of groundwater—its mobile nature and its interrelationship with surface water—indicate that actions of one watercourse State with respect to its groundwater (such as pumping) may affect groundwater or surface water in another watercourse State. The reverse is also true. For example, pollution of surface water in State A may contaminate groundwater in State B.[47] One expert has identified four different situations in which groundwater in one State may be related to ground or surface water in another State:

> (i) . . . where a confined aquifer is intersected by an international boundary . . .;
>
> (ii) where an aquifer lies entirely within the territory of one State but is hydraulically linked with an international river. Here it is necessary to distinguish between the situations where the river is influent and where it is effluent. Thus,
>
> — if one is dealing with an influent river and the aquifer lies in the downstream State, the use of the river water by an upstream State may affect the recharge regime; and
>
> — if the river is effluent, excessive withdrawals from the aquifer feeding it may reduce the volume of flow in the latter.
>
> . . .
>
> (iii) where the aquifer is situated entirely within the territory of a single State and is linked hydraulically with another aquifer in a neighboring State, the connection may arise through the presence of a semi-permeable layer of, for example, clayey loam.
>
> . . .
>
> (iv) where an aquifer is situated entirely within the territory of a given State but has its recharge zone in another State.[48]

25. Because surface water and groundwater cannot be separated factually, these components of watercourse systems should not, in the view of water resource specialists, be treated separately for legal and planning purposes. This latter point is the subject of the following section.

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[35] *Ground Water in the Western Hemisphere*, Natural Resources/Water Series No. 4 (United Nations publication, Sales No. 76.II.A.5), p. 2.

[36] Ibid.

[37] *Ground Water Economics*, op. cit., p. 31.

[38] Secretariat study (see footnote 28 above), p. 3, citing L. A. Teclaff and E. Teclaff, "Transboundary ground water pollution: survey and trends in treaty law'', *Natural Resources Journal* (Albuquerque (N.M.)), vol. 19 (1979), p. 629.

[39] Secretariat study (see footnote 28 above), p. 3.

[40] Ibid., p. 4. The study quotes OECD, *Water Resource Management, Integrated Policies* (Paris, 1989), p. 117.

[41] See footnote 20 above.

[42] *The New Encyclopaedia Britannica*, op. cit., p. 781.

[43] R. Ward, *Principles of Hydrology*, 2nd ed. (London, McGraw-Hill, 1975), p. 241.

[44] The movement of groundwater is illustrated in the diagrams contained in the annex to this report (figs. 3-5).

[45] Groundwater may be "free'' or "confined''. In the case of free groundwater, the upper boundary of the saturation zone is the water-table; in the case of confined groundwater, on the other hand, the upper boundary is formed by a dense stratum of rock (*The New Encyclopaedia Britannica*, op. cit., p. 780). "[Confined] aquifers, like the one stretching across the Sahara desert from Libya to the Atlas mountains, can be very large. Confined aquifers are rare, however . . .'' (*Yearbook . . . 1979*, vol. II (Part One), p. 148, document A/CN.4/320, para. 19).

[46] H. E. Thomas and L. B. Leopold, "Ground water in North America'', *Science* (Washington, D.C.), vol. 143, No. 3610 (1964), pp. 1001 *et seq.* See also article 2 (Hydraulic interdependence) of the Rules on International Groundwaters (hereinafter the "Seoul Rules''), and accompanying commentary (ILA, Seoul report (footnote 29 above), pp. 259-267). The Seoul Rules are discussed later in this report (paras. 46-47).

[47] This interrelationship is expressly recognized in article 2 of the Seoul Rules (see footnote 46 above), which is reproduced in footnote 89 below.

[48] J. A. Barberis, *International Groundwater Resources Law*, FAO, Legislative Study No. 40 (1986), p. 36.

d. *The importance of including groundwater in water resources planning and management*[49]

26. The need to take into account groundwater resources, and their interaction with surface waters, in efforts to achieve optimum utilization at the drainage basin level has been recognized at a number of meetings held under United Nations auspices. One of the conclusions reached by the group of government officials and international experts at the Interregional Meeting on River and Lake Basin Development with Emphasis on the Africa Region, held at Addis Ababa in 1988, was the following:

It is recommended that:

. . .

2. Governments recognize that the system approach to the management of a basin's water resources is the necessary point of departure for regulating and managing the resources, given the interdependence and diversity of the components of the hydrologic cycle—surface water, underground water, the water-atmosphere interface and the fresh water-marine interface . . .[50]

27. The same basic point was emphasized at the Interregional Meeting of International River Organizations held in Dakar in 1981. At that meeting,

The failure, with notable and noted exceptions, to recognize the interrelationships between surface waters and groundwaters—even where the system State agreements employ language that does not exclude groundwater—was cited. Official awareness of the interaction of the "underground environment" with the surface (and the atmosphere) is only recently becoming widespread. Conjunctive use and protection of the shared groundwater resources and the shared surface-water resources in the same system will become imperative in many basins, as it has become in many internal basins, if the needs of our populations are to be met.[51]

One of the conclusions reached at the Dakar meeting was therefore that "those cooperating States that have not yet included groundwater as a part of the shared water resources system need to recognize this part of the hydrologic cycle as intimately linked to the quantity and quality of their shared surface waters . . ." One of the rapporteurs at that meeting pointed out that it may take contamination of water in one hydrographic component by that in another to make the interrelationship evident:

Given the continued spread of contamination, ultimately the existence and importance of groundwater resources shared between two or more States, and their interconnection often with surface streams and lakes, will not be deniable, nor will it be possible to exclude shared underground waters from efforts to achieve optimum utilization and the conservation and protection of fresh water resources, most of which in fact lie below the surface.[52]

28. The need to include groundwater in water resources planning and management is well summed up in the report of the Seminar on the Role of Groundwater in Optimal Utilization of Hydraulic Resources:

Surface and groundwater sources cannot be considered as separate entities if proper management of the total water supply is to be achieved. Maximum efficiency and productivity with minimum deleterious effects, caused by man, can be achieved by intelligent management and assessment of water resources on a basin-wide basis.[53]

29. Various international organizations have recognized the importance of including groundwater in water resources planning and management efforts. ECE has adopted a number of declarations and decisions embodying this principle. The 1980 Declaration of Policy on Prevention and Control of Water Pollution, including Transboundary Pollution, states, in principle 1, that:

The rational utilization of water resources, both surface and underground, as a basic element in the framework of long-term water management, should be viewed as an effective support to the policy of prevention and control of water pollution . . .[54]

In 1982, ECE adopted a Decision on International Cooperation on Shared Water Resources. In the first preambular paragraph of the decision, ECE recognized "the growing significance of economic, environmental and physical interrelationships between ECE countries, in particular where streams or lakes and related groundwater aquifers cross or are located on international boundaries".[55] In its Declaration of Policy on the Rational Use of Water, ECE adopted in 1984 a set of Principles of Rational Use of Water.[56] One of those principles states, *inter alia*, that "special emphasis should be given to: . . . (*e*) Coordinated utilization of both surface water and groundwater, taking into account their close interrelation".[57] Finally, in its recently adopted Charter on Groundwater Management, ECE calls for integrated water management, including both surface water and groundwater, "while taking into account the distinguishing features of groundwater as compared to surface water which necessitate special protective measures for aquifers".[58]

30. In its 1978 Recommendation on Water Management Policies and Instruments, the OECD Council stated that one of the main objectives of water management is "to safeguard and improve the hydrological cycle in general . . ."[59] In that document, the Council recommended that member countries take into account a number of principles "in their national and, where possible, in their international water management policies". The first such principle is that:

1. Water resources, both surface (lakes, rivers, estuaries and coastal waters) and underground, should be managed on the basis of

[49] See generally the section on integrated water resources management in the Secretariat study (footnote 28 above), pp. 16 *et seq.*

[50] *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, 10-15 October 1988, Natural Resources/Water Series No. 20 (United Nations publication, Sales No. E.90.II.A.10), p. 18.

[51] *Experiences in the Development and Management of International River and Lake Basins*, Proceedings of the United Nations Interregional Meeting of International River Organizations, Dakar, 5-14 May 1981, Natural Resources/Water Series No. 10 (United Nations publication, Sales No. 82.II.A.17), p. 11, para. 32.

[52] Ibid., pp. 72-73.

[53] *Ground Water Seminar in Granada*, Report of the FAO/UNDP/Government of Spain Seminar on the Role of Groundwater in Optimal Utilization of Hydraulic Resources, Granada (Spain), 1971, p. 16.

[54] ECE Declaration of Policy on Prevention and Control of Water Pollution, including Transboundary Pollution, adopted by ECE at its thirty-fifth session (1980) in decision B (XXXV), reproduced in ECE, *Two Decades of Cooperation on Water*, document ECE/ENVWA/2 (1988), p. 3.

[55] Ibid., decision D (XXXVII), p. 8.

[56] Ibid., decision C (XXXIX), p. 12.

[57] Ibid., principle 3, p. 15.

[58] United Nations publication, Sales No. E.89.II.E.21, p. 2.

[59] Recommendation adopted on 5 April 1978, C(78)4(Final), reproduced in OECD, *OECD and the Environment* (Paris, 1986), p. 46.

long-term water management plans so as to follow an integrated approach regarding all relevant aspects of water quantity and quality, abstraction and discharge, supply and protection.[60]

A set of explanatory notes is appended to the recommendation, the first of which reads in part as follows:

1. Underground and surface waters constitute a closely interrelated hydrologic system which should be managed as a single entity in order to prevent uncontrolled pollution and depletion of these resources. In particular, all quantitative and qualitative aspects, and the activities of abstraction and discharge, are so interdependent that they should be managed in an integrated manner and should not be dissociated; thus they should whenever possible be under the same authority and fully coordinated.[61]

31. Finally, ILA included in its 1986 Seoul Rules[62] an article (art. 4) which encourages States to manage ground and surface water in an integrated manner.[63] This provision follows logically from the comprehensive approach taken by ILA in its Helsinki Rules on the Uses of the Waters of International Rivers,[64] adopted in 1966. The commentary to those Rules contains the following passages which explain why it is necessary for the legal regime of international watercourses to cover the entire system of waters:

[C]oncern is no longer limited to the navigable portion of the international river, but rather encompasses all waters included in the entire system . . .

The drainage basin is an indivisible hydrologic unit which requires comprehensive consideration in order to effect maximum utilization and development of any portion of its waters.[65]

32. Perhaps with the assistance of meetings and drafts such as those mentioned above, States are increasingly including groundwater within the scope of their agreements concerning international watercourses. Examples of these agreements will be noted in section *e.* below.

e. *Groundwater in State practice*

33. The present section will first review illustrations of international agreements relating to groundwater. It will then discuss briefly a case involving groundwater decided according to principles of international law.

i. International agreements[66]

34. Perhaps because the characteristics and extent of groundwater have until recently been little understood, this integral part of watercourse systems has often been ignored in State treaty practice concerning international freshwater resources. Nevertheless, a number of international agreements do address groundwater, or at least include it within their scope. One study contains a compilation of treaties concerning international groundwater[67] which are arranged in the following categories: international agreements concerning the use of wells and springs in frontier areas; frontier waters agreements indirectly protecting ground waters; comprehensive agreements specifically including ground waters within their scope (5 agreements); and agreements recognizing the effects of surface water development on ground waters, and of ground water development upon surface waters (10 agreements). It may be surprising that some of these treaties date back to the early part of the present century.

35. Yugoslavia is party to several agreements (with Albania, Bulgaria, and Hungary, respectively) which apply to "all water economy questions, measures and works on watercourses which form the State frontier and watercourses and water systems intersected by the State frontier, and in particular to "Questions of groundwater".[68] The Yugoslav agreements with Albania and Hungary define the expression "water system" to mean "all watercourses (surface or underground, natural or artificial), installations, measures and works which may affect watercourses from the standpoint of water economy, and installations forming or intersected by the State frontier" (art. 1, para. (3)). Similarly, the 1964 Treaty between Poland and the Soviet Union defines "frontier waters" to include "groundwaters intersected by the State frontier" (art. 2, para. 3) and provides that the parties will cooperate with regard to "The protection of surface and ground waters against depletion and pollution" (art. 3, para. 7).[69]

36. The 1968 African Convention on the Conservation of Nature and Natural Resources recognizes the importance of common groundwater resources in article V, paragraph 2:

Where surface or underground water resources are shared by two or more of the Contracting States, the latter shall act in consultation, and if the need arises, set up inter-State Commissions to study and resolve problems arising from the joint use of these resources, and for the joint development and conservation thereof.

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[60] Ibid., p. 47.

[61] Ibid., p. 48.

[62] See paras. 46-47 below.

[63] Article 4 reads as follows:

"Article 4. Groundwater management and surface waters

"Basin States should consider the integrated management, including conjunctive use with surface waters, of their international groundwaters at the request of any one of them." (ILA, Seoul report (see footnote 29 above), p. 272.

[64] ILA, *Report of the Fifty-second Conference, Helsinki, 1966* (London, 1967), pp. 484 *et seq.* (hereinafter the "Helsinki Rules").

[65] Ibid., article II, comment (*a*), p. 485.

[66] See generally the compilation of treaties relating to groundwater in L. A. Teclaff and A. E. Utton, *International Groundwater Law* (New York, Oceana Publications, 1981), p. 189; the analytical survey of treaty provisions concerning groundwater in J. Barberis, op. cit., pp. 20 *et seq.*; and the section on State practice concerning transboundary groundwater in the Secretariat study (footnote 28 above), pp. 13-16.

[67] *International Groundwater Law*, op. cit., pp. 193 *et seq.*

[68] The quotation is from the agreement between Hungary and Yugoslavia of 8 August 1955 (art. 1, para. (2) (*g*)); the other agreements mentioned contain similar language. For example, the agreement between Bulgaria and Yugoslavia of 4 April 1958 refers to "The study and utilization of groundwater . . ." (art. 1, para. (2) (*f*)).

[69] See also the 1972 Convention between Italy and Switzerland concerning the protection of frontier waters against pollution, which provides for the establishment of a joint commission to investigate the pollution of surface and groundwaters; and the Agreement concerning frontier rivers of 16 September 1971 between Finland and Sweden, the provisions of which apply, *inter alia*, to "measures taken in any waters which may affect groundwater conditions" (chap. 3, art. 1). The latter treaty (but not the provision in question) is summarized in *Yearbook . . . 1974*, vol. II (Part Two), p. 319, document A/CN.4/274, paras. 307-321.

37. Aquifers are an important water source in the arid region along the border between Mexico and the United States of America.[70] In an effort to control the adverse effect which pumping near the border by one country has on the other, a 1973 agreement between Mexico and the United States limits groundwater pumping to 160,000 acre-feet (197,558 cubic metres) annually within five miles (eight kilometres) on either side of the Arizona-Sonora boundary.[71] The agreement further requires the two countries to consult each other "prior to the undertaking of any new development of either the surface or the ground water resources . . . in its own territory in the border area that might adversely affect the other country".[72]

38. The case reviewed in the following part of this section involves allegations of just such actions having trans-border effects, and illustrates the complex interplay between surface water and groundwater.

ii. The *Donauversinkung* case

39. In 1927 the German Staatsgerichtshof ruled on a case in which the German States of Württemberg and Prussia sued the State of Baden, seeking relief from the phenomenon of the "sinking of the Danube", or *Donauversinkung*.[73] In deciding the case, the Staatsgerichtshof applied rules of international law, it having found that it was impossible to apply the municipal law of one of the federal states, and that there were no applicable provisions of the German Constitution.[74] The facts of the case were as follows: after emerging from the Black Forest, the Danube in its upper reaches passes the Swabian Jura mountains between Baden and Württemberg, the latter State lying downstream of the former. While in the State of Baden, the Danube

> . . . loses during certain periods of the year a considerable part of its water in consequence of the water sinking under the bed of the river and flowing to the lower levels of the Lake of Constance and of the Rhine. The reason for this loss of water . . . is the geological composition of the banks and of the bed of the river. They are composed of chalk through the cracks and pores of which the water of the Danube in this section flows south in subterranean passages in order to emerge eventually as the source of the river Aach in Baden.[75]

In hydrologic terms, the flow from the Danube into the aquifer would be described as "influent" flow, or seepage, and that from the aquifer into the Aach as "effluent" flow.[76] As the above passage makes clear, the infiltration of the Danube waters occurred in Baden, and the waters reappeared in the same state but flowed into a different drainage basin, that of the River Rhine; they did not return to the Danube basin. The court described the source of the River Aach, formed by Danube waters, as "one of the most powerful in Germany. As [a] result, the River Aach, in . . . its short course through Baden terminating in the Lake of Constance, is very rich in water which is extensively utilized for industrial purposes".[77] In Württemberg, on the other hand, "in a portion of the river extending from 10 to 12 kilometres, there occurs, for varying periods of time, a so-called total sinking of the Danube, that is, a complete drying up of the river. The number of days on which the river was thus dried up was 309 in 1921, 29 in 1922, 148 in 1923."[78]

40. Württemberg asked the court to grant an "injunction restraining Baden from constructing and maintaining certain [works] . . . as well as for an order instructing Baden to render possible, by removing the natural obstacles which accumulate in the bed and on the banks of the river . . ., an unimpeded flow of water". For its part, Baden requested an injunction restraining Württemberg from constructing and maintaining certain works that were allegedly intended to prevent the natural flow of the Danube waters to the Aach. Prussia, which was then downstream of Württemberg and was also injured by the loss of water from the Danube, intervened in the suit on the side of Württemberg.

41. The court held that "Baden must refrain from causing such increase in the natural sinking of the waters of the Danube as is due (*a*) to the artificially erected . . . works . . . and (*b*) to the accumulation of sand and gravel in the bed of the Danube . . ., but that it is not bound to undertake the responsibility for the permanent improvement of the bed of the river;"[79] and that Württemberg was required to refrain from causing such decrease in the natural sinking of Danube waters as was due to certain works and artificial damming of avenues of sinking.

42. In its decision, the court made several interesting statements concerning relevant legal principles and the manner in which they applied to the case before it:

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[70] For a survey of the literature concerning groundwater between Mexico and the United States of America, see J. Barberis, op. cit., p. 60, footnote 74, referring to 15 studies.

[71] Exchange of notes between the United States and Mexico of 30 August 1973 confirming minute No. 242 of the International Boundary and Water Commission, setting forth a permanent and definitive solution to the international problem of the salinity of the Colorado River, Mexico City and Tlatelolco, United Nations, *Treaty Series*, vol. 915, p. 203; *United States Treaties and Other International Agreements*, vol. 24, part two (1973) (Washington D.C., United States Government Printing Office, 1974), p. 1968.

[72] A. W. Rovine, *Digest of United States Practice in International Law 1973* (United States Department of State, Washington D.C., 1974), p. 426.

[73] *Streitsache des Landes Württemberg und des Landes Preussen gegen das Land Baden, betreffend die Donauversinkung*, German Staatsgerichtshof, 18 June 1927, *Entscheidungen des Reichsgerichts in Zivilsachen (Berlin)*, vol. 116, appendix, pp. 18 *et seq.* The report of the case upon which the following discussion is based is found in *Annual Digest of Public International Law Cases, 1927 and 1928*, A. McNair and H. Lauterpacht, eds. (London, Longmans, 1931), p. 128. The case is discussed in Lederle, "Die Donauversinkung", *Annalen des Deutschen Reichs, 1917* (Munich, 1917), p. 693. See also the discussion of this case in J. Barberis, op. cit., pp. 40-41.

[74] The court found that "[t]he members of the [German] Federation have, subject to considerable limitations, preserved their position as independent States . . . [I]n matters subject to State legislation they may, subject to the confirmation of the *Reich*, conclude treaties with foreign Powers. In so far, therefore, as these States act as independent communities, i.e., in matters reserved for their exclusive competence, their relations are governed by international law . . ." (*Annual Digest* . . . (see footnote 73 above), p. 130). Today the two States of Baden and Württemberg are combined, forming the *Land* of Baden-Württemberg.

[75] Ibid., p. 128.

[76] R. Ward, op. cit., p. 194.

[77] *Annual Digest* . . . (see footnote 73 above), pp. 128-129.

[78] Ibid., p. 129.

[79] Ibid.

C. *The rule of international law as to the utilization of the flow of international rivers. The duty to abstain from injurious interference.* . . . The exercise of sovereign rights by every State in regard to international rivers traversing its territory is limited by the duty not to injure the interests of other members of the international community . . . No State may substantially impair the natural use of the flow of such a river by its neighbour. This principle has gained increased recognition in international relations . . . The application of this principle is governed by the circumstances of each particular case. The interests of the States in question must be weighed in an equitable manner against one another . . .

D. *The duty to perform positive acts.* The above principle merely prohibits artificial alterations in the flow of the river. It follows that every State must submit to the natural flow of the water in spite of its consequences. Barring an express contractual undertaking, no State is under a duty to interfere, in favour of another State, with the natural flow of the water . . . The sinking of the Danube is a natural, though rare, phenomenon, and Württemberg and Prussia must submit to it. They cannot demand from Baden that it should close the cracks which suck away the water of the Danube. Neither is Baden bound to counteract such diminution in the waters of the Danube as is due to the natural enlargement of and accretion to the banks. It is only within certain closely defined limits that Baden is bound to act in a positive manner.

The principle that a State is under no duty to regulate, in the interest of another State, the natural phenomena affecting an international river, is subject to one limitation grounded in the modern practice of States in regard to rivers. Rivers, including those which are non-navigable, are today no longer merely the product of natural forces. Their banks are inhabited, and it is in the interest of the inhabitants, both in the upper and lower parts of the rivers, that the banks be strengthened and that the flow of the water be subject to regulation, not only on account of possible inundation, but as a matter of normal policy. Thus, while a State is under a duty to abstain from altering the flow of the river to the detriment of its neighbours, it must not fail to do what civilized States nowadays do in regard to their rivers. If a Government fails to undertake, or even prohibits, measures which it must be expected to undertake in accordance with generally recognized rules of law and economic policy—with the intention or with the result that the interests of persons outside its territory are thereby injuriously affected—then such an attitude cannot be regarded as being in accordance with the nature of a community of nations. This ceases to be a mere passive attitude, and becomes an unlawful furthering, through acts of omission, of certain natural events. This duty to perform positive acts has been clearly recognized in regard to the requirements of navigation on international rivers. There is no reason why it should not apply to questions relating to the utilization of the flow of rivers for industrial purposes.[80]

It will be noted that the legal principles applied by the court are generally consonant with those contained in the draft articles adopted so far—especially those on equitable utilization and the obligation not to cause appreciable harm. The court's discussion of the duty to regulate natural phenomena through the performance of positive acts goes somewhat beyond the article proposed on the regulation of international watercourses (art. 27); the analysis is instructive, however, as it illustrates the manner in which regulatory measures can benefit watercourse States.

43. The agreements referred to in the first part of this section do not all evidence an appreciation of the close interrelationship between surface waters and groundwaters of the kind involved in the *Donauversinkung* case; but they do demonstrate that States have for some time been aware of the importance of protecting groundwater resources. Recent efforts by groups of experts to enhance such protection are dealt with in the next section of the report.

[80] Ibid., pp. 131-132.

f. *Drafts relating specifically to transboundary groundwater*

44. A number of aquifers relied upon by human populations are intersected by international boundaries. Some of the most important are situated in North Africa, where they may underlie as many as four or more States.[81] This fact, together with the interrelationship between surface waters and groundwaters discussed above, has led various organizations and groups of experts to prepare draft rules or agreements concerning international, or transboundary groundwaters. In the words of R. D. Hayton, Rapporteur for the efforts of ILA in this field,

> The growing groundwater crisis, the legal implications of surface-underground interactions, and the characteristics of aquifers and their waters have moved States generally to prescribe uncommon measures internally and, now, to call for analogous treatment for those transboundary aquifers already under stress.[82]

45. Indeed, the Helsinki Rules defined the term "international drainage basin" as being "determined by the watershed limits of the system of waters, including surface and *underground waters**, flowing into a common terminus."[83] Thus, groundwater was expressly included within the scope of that important set of draft rules concerning international watercourses.

i. Seoul Rules

46. The Seoul Rules adopted by ILA in 1986,[84] consist of four articles. These articles deal specifically with aquifers that are intersected by international boundaries (art. 1),[85] since, under article II of the Helsinki Rules,

[81] Examples are the Nubian sandstone aquifer beneath portions of Chad, Egypt, Libya and the Sudan; the aquifer in the northern Sahara basin shared by Algeria, Tunisia and Libya; the Chad aquifer underlying parts of Chad, Niger, the Sudan, the Central African Republic, Nigeria and Cameroon; and the Maestrichian basin shared by Senegal, Gambia, Guinea-Bissau and Mauritania. See the Secretariat study (footnote 28 above), p. 10, citing Caponera and Alheritiere, "Principles for international groundwater law", *Natural Resources Journal* (Albuquerque, N.M.), vol. 18 (1978), pp. 590 *et seq.*; A. E. Utton, "The development of international ground water law", ibid., vol. 22 (1982), pp. 100 *et seq.*; and United Nations, Department of Technical Cooperation for Development, *Transnational Project on the Major Regional Aquifer in North-East Africa, Egypt and the Sudan, Project findings and recommendations*, document DP/UN/RAB-82-013/1, p. 7.

[82] ILA, Seoul report (see footnote 29 above), p. 244. Hayton has explained to the present writer that the word "uncommon" as used here refers to the fact that it is still relatively unusual for States to recognize the interdependence of surface waters and groundwaters and the special characteristics of groundwater and aquifers.

[83] Article II, p. 484 (see footnote 64 above).

[84] ILA, Seoul Report (see footnote 29 above), pp. 251 *et seq.*

[85] Article 1 provides as follows:

> "*Article 1. The waters of international aquifers**
>
> "The waters of an aquifer that is intersected by the boundary between two or more States are international groundwaters and such an aquifer with its waters forms an international basin or part thereof. Those States are basin States within the meaning of the Helsinki Rules whether or not the aquifer and its waters form with surface waters part of a hydraulic system flowing into a common terminus."

"* The term 'aquifer' as here employed comprehends all underground water bearing strata capable of yielding water on a practicable basis, whether these are in other instruments or contexts called by another name such as 'groundwater reservoir', 'groundwater catchment area', etc., including the waters in fissured or fractured rock formations and the structures containing deep, so-called 'fossil waters'." (Ibid., p. 251.)

these would not have been covered unless they constituted a part of a system of waters, "including surface . . . waters . . ."[86] The articles provide that the States within whose territories such groundwaters are located are "basin States" within the meaning of the Helsinki Rules (art. 1). In the light of its direct bearing upon the decision currently before the Commission, it perhaps bears emphasis that by including States that share an international aquifer within the term "basin States", this key provision makes the Helsinki Rules applicable to the use of international groundwaters; it thus represents the considered judgement of ILA and its committee of specialists on international water resources law that the rules governing surface waters are applicable not only to the entire *system* of waters, including groundwater—a fundamental principle underlying the Helsinki Rules[87]—but also to those groundwaters which do not "form with surface waters part of a hydraulic system flowing into a common terminus".[88] This would support the inclusion of groundwater in the Commission's draft articles, whether or not it was related to surface water.

47. Special concern with international groundwater is further demonstrated in the provisions of the Seoul Rules dealing with hydraulic interdependence (art. 2),[89] protection of groundwater (art. 3),[90] and groundwater management and surface waters (art. 4),[91] some of which have been referred to earlier in the present report.

[86] See footnote 83 above. Thus the Seoul Rules both apply the Helsinki Rules to aquifers that are not related to significant international surface waters and prescribe specific rules concerning international groundwater, whether or not related to surface water.

[87] See footnotes 64 and 83 above.

[88] See article 1 (footnote 85 above) and article 2, paragraph 2 (see footnote 89 below) of the Seoul Rules.

[89] Article 2 provides as follows:

"*Article 2. Hydraulic interdependence*

"1. An aquifer that contributes water to, or receives water from, surface waters of an international basin constitutes part of that international basin for the purposes of the Helsinki Rules.

"2. An aquifer intersected by the boundary between two or more States that does not contribute water to, or receive water from, surface waters of an international drainage basin constitutes an international drainage basin for the purpose of the Helsinki Rules." (ILA, Seoul Report (see footnote 29 above), p. 259.)

[90] Article 3 provides as follows:

"*Article 3. Protection of groundwater*

"1. Basin States shall prevent or abate the pollution of international groundwaters in accordance with international law applicable to existing, new, increased and highly dangerous pollution. Special consideration shall be given to the long-term effects of the pollution of groundwater.

"2. Basin States shall consult and exchange relevant available information and data at the request of any one of them:

"(*a*) for the purpose of preserving the groundwaters of the basin from degradation and protecting from impairment the geologic structure of the aquifers, including recharge areas;

"(*b*) for the purpose of considering joint or parallel quality standards and environmental protection measures applicable to international groundwaters and their aquifers.

"3. Basin States shall cooperate, at the request of any one of them, for the purpose of collecting and analysing additional needed information and data pertinent to the international groundwaters or their aquifers." (Ibid., p. 268)

[91] See footnote 63 above.

ii. Bellagio Draft

48. Another major effort to formulate legal rules concerning the use, protection and management of international groundwater resources is the Bellagio Draft Agreement concerning the Use of Transboundary Groundwaters.[92] Prepared by an independent group of international experts, it consists of a complete draft treaty containing 20 articles, together with supporting commentaries. Article II (General purposes), provides that "[t]he Parties recognize their common interest and responsibility in ensuring the reasonable and equitable development and management of groundwaters in the border region for the well-being of their Peoples" (para. 1).[93] The draft contemplates the establishment or utilization of a joint commission[94] for the implementation of the provisions of the articles (art. III). It further provides, *inter alia*, for the establishment and maintenance of a database (art. V), water quality protection (art. VI), the establishment of transboundary groundwater conservation areas (art. VII), the preparation of comprehensive management plans (art. VIII), measures to deal with public health emergencies (art. IX), planning for drought (art. XII), public participation (art. XIII), accommodation of differences (art. XV) and resolution of disputes (art. XVI).

49. The Bellagio Draft represents an important set of proposed rules and institutional mechanisms for the rational use, protection and management of international groundwater resources. It reflects the belief of a multidisciplinary group of water resource specialists[95] that international groundwater must be included within water resources planning and management efforts if it is to be utilized in an equitable and reasonable manner by the States concerned.

2. Use of the "system" or related concepts in international agreements

50. The concept of a "watercourse system" is not a new one. The expression has long been used in international agreements to refer to a river, its tributaries and related canals, and has even been used in some rather venerable treaties in the sense here proposed, namely as the entire set of terrestrial hydrologic components forming a unitary whole.

51. The Treaty of Versailles contains a number of references to "river systems". For example, in declaring various rivers to be "international", the Treaty refers to "all navigable parts of these river systems . . . together with lateral canals and channels constructed either to duplicate, or to improve naturally navigable sections of the specified river systems, or to connect two naturally navi-

[92] Hayton and Utton, loc. cit.

[93] Ibid., p. 682.

[94] Should a joint commission already exist, the draft contemplates that its "powers and functions may readily be expanded to deal with the added responsibilities of transnational groundwater". (Comment 1 to article III) (Ibid., pp. 684-685).

[95] Those participating in the preparation of the draft or earlier formulations are listed in Hayton and Utton, loc. cit., p. 666, footnote 2.

gable sections of the same river'' (art. 331).[96] While the article in question is concerned with navigational uses, there is no doubt that equitable utilization could be affected, or appreciable harm caused, through the same system of waters by virtue of their very interconnectedness.

52. Provisions similar to those of the Treaty of Versailles may be found in the 1921 Convention instituting the definitive Statute of the Danube. That agreement refers, in article 1, to the ''internationalized river system'', which article 2 defines to include ''[a]ny lateral canals or waterways which may be constructed . . .''

53. More recently, the 1950 Convention between the Union of Soviet Socialist Republics and Hungary refers in articles 1 and 2 to ''the water systems of the Tisza river basin''. It has already been seen that a series of Yugoslav treaties (see para. 35 above) concluded in the mid-1950s include within their scope, *inter alia*, ''watercourses and water systems'' and, in particular, ''groundwater''. The broad definition of the expression ''water system'' under two of those treaties, to include ''all watercourses (surface or underground, natural or artificial)'', has been noted above (ibid.).

54. The Indus Waters Treaty of 1960 also utilizes the system concept. In the preamble to that agreement, the parties declare that they are ''desirous of attaining the most complete and satisfactory utilisation of the waters of the Indus system of rivers . . .'' The treaty applies to named rivers, their tributaries and any connecting lakes (art. 1, para. 3), and defines the term ''tributary'' broadly as follows:

> The term ''Tributary'' of a river means any surface channel, whether in continuous or intermittent flow and by whatever name called, whose waters in the natural course would fall into that river, e.g., a tributary, a torrent, a natural drainage, an artificial drainage, a *nadi*, a *nallah*, a *nai*, a *khad*, a *cho*. The term also includes any subtributary or branch of a subsidiary channel, by whatever name called, whose waters, in the natural course, would directly or otherwise flow into that surface channel.'' (art. 1, para. 2).

55. Among more modern treaties, the Agreement on the Action Plan for the Environmentally Sound Management of the Common Zambezi River System, and the Action Plan annexed thereto, are noteworthy for their holistic approach to international water resources management. In article 1, paragraph 1, of the Agreement the parties declare that they adopt ''the Action Plan for the Environmentally Sound Management of the Common Zambezi River System''. The article further provides that ''[t]he region covered by the Zambezi Action Plan encompasses the territories within or related to the Zambezi river basin . . .'' (para. 2). The Action Plan itself (para. 15) states its objective as being to overcome certain enumerated problems and thus to promote the development and implementation of environmentally sound water resources management in the whole river system. It will contribute to the incorporation by the river basin States of environmental considerations in water resources management while increasing long-term sustainable development in the river basin. To this end, the Plan sets forth actions to be taken in the areas of environmental assessment, environmental management, environmental legislation and supporting measures.

56. This brief survey should not be concluded without mention of other agreements using an approach that is related to the ''system'' concept, namely, that of the drainage basin. Reference to these treaties does not overlook the rejection, early in the Commission's discussions on this topic, of the drainage basin as the basis for its work. That decision, however, was based on the view of certain Governments and Commission members that the drainage basin was an unsuitable basis because it implied that the draft articles would apply to land territory as well as to watercourses. The decision was taken notwithstanding the fact that, as the articles adopted so far demonstrate, it is almost impossible to exclude totally actions on land from the scope of the draft (except to the extent that they would have no effect, through an international watercourse, upon another watercourse State).[97]

57. Certain of the agreements referred to earlier in this section employ the concept of the river ''basin''.[98] Other prominent examples include the 1963 Act regarding Navigation and Economic Cooperation between the States of the Niger Basin,[99] the 1964 Convention and Statutes relating to the development of the Chad Basin, the 1977 Agreement for the establishment of the Organization for the Management and Development of the Kagera River Basin, the 1978 Convention relating to the Creation of the Gambia River Basin Development Organization, the 1969 Treaty of the River Plate Basin, and the 1961 Treaty relating to cooperative development of the water resources of the Columbia River basin.[100] In employing the concept of a river or drainage basin, these

[96] See also, for example, article 362, which refers to ''the Rhine river system''. Further, in the River Oder case (*Territorial Jurisdiction of the International Commission of the River Oder, Judgment No. 16, 1929*), PCIJ held that the international regime of the River Oder extended, under the Treaty of Versailles, to ''... all navigable parts of these river systems ... together with lateral canals or channels constructed either to duplicate or to improve naturally navigable sections of the specified river systems ...'' (*P.C.I.J., Series A, No. 23*). The case is discussed in *Yearbook ... 1986*, vol. II (Part One), p. 113, document A/CN.4/399 and Add.1-2, para. 102.

[97] It is clear, for example, that appreciable harm caused to watercourse State A by waste discharged into a watercourse from a plant located on the bank of the watercourse in State B would be covered by the draft articles. The draft articles (*in fine*, part III) would also apply to such a plant that was being planned in watercourse State A. It seems equally clear that the draft articles would apply, for example, to harm caused to State A by a plant located not on the bank of the international watercourse in State B, but at a distance therefrom, where the plant discharged toxic waste onto the land, and the waste made its way into the watercourse, ultimately harming State A.

[98] See the excerpts from the 1950 Convention between the Soviet Union and Hungary and the Zambezi River Agreement. See also, for example, the 1970 Agreement between Greece and Yugoslavia concerning the study of the overall improvement of the Axios/Vardar basin, summarized in *Yearbook ... 1974*, vol. II (Part Two), p. 319, document A/CN.4/274, para. 305; and the Agreement between the Federal Republic of Germany and the European Community, on the one hand, and the Republic of Austria on the other, on cooperation on management of water resources in the Danube Basin.

[99] See also the Convention creating the Niger Basin Authority.

[100] See also the 1944 exchange of notes relating to a study of the use of the waters of the Columbia River Basin, United Nations, *Treaty Series*, vol. 109, p. 191. It is interesting to note that at least one of the States through whose territory the watercourse in question flows has used the term ''system'' in referring to international watercourses. See ''Legal aspects of the use of systems of international waters with reference to the Columbia-Kootenay river system under customary international law and the Treaty of 1909'', Memorandum of the [United States] State Department, 85th Congress, Second Session, document No. 118 (Washington, D.C., 1958), p. 89.

agreements treat the water resources within a particular watershed as a unitary whole, for purposes of protection, planning, management and development. The same would be true of the international watercourse system approach.

58. These treaties demonstrate that States recognize in their practice the importance of dealing with international watercourse systems in their entirety. International organizations and independent experts have reached similar conclusions, as shown in the following section.

3. Use of the "system" or related concepts in other international instruments, drafts and studies[101]

59. As early as 1958, ILA adopted its New York resolution, which includes the following "principle of international law" that is of direct relevance to the question of the definition of "international watercourse":

> A system of rivers and lakes in a drainage basin should be treated as an integrated whole (and not piecemeal).[102]

This approach was confirmed in the Helsinki Rules, which employ the expression "system of waters" in defining the term "international drainage basin".[103]

60. The Institute of International Law has also followed a holistic approach in its drafts concerning international watercourses. Article 1 of the 1961 Salzburg resolution on the use of international non-maritime waters provides:

Article 1

> The present rules and recommendations apply to the use of waters which are part of a river or of a watershed extending upon the territory of two or more States.[104]

The term "watershed" may be considered in hydrologic terms to be equivalent to "drainage basin" or "watercourse system". Perhaps influenced by the Helsinki Rules, the Institute's Athens resolution on the pollution of rivers and lakes and international law, adopted in 1979, provides that it applies "to international rivers and lakes and to their basins".[105]

61. Another early effort by a private group of legal experts that is worthy of note is a resolution adopted in 1957 by the Inter-American Bar Association at its Buenos Aires meeting. The resolution begins with the following paragraph, which defines its scope:

> [T]he following general principles, which form part of existing international law, are applicable to every watercourse or system of rivers or lakes (non-maritime waters) which may traverse or divide the territory of two or more States; such a system will be referred to hereinafter as a "system of international waters".[106]

62. ECE has adopted a variety of declarations, decisions and recommendations concerning the use and protection of fresh water,[107] many of which expressly refer to the different components of a watercourse system or use the term "drainage basin". For example, the Declaration of policy on the rational use of water, adopted in 1984, states that:

> In formulating and adopting a future-oriented national water policy . . . special emphasis should be given to: . . . (*e*) Coordinated utilization of both surface water and groundwater, taking into account their close interrelation . . .[108]

In addition, the recommendations to ECE Governments on long-term planning of water management urge that the "river basin be considered as the general basis for the long-term planning of national water management . . ." They go on to recognize that "in the case of transboundary river basins the active cooperation of riparian countries is therefore necessary and useful . . ."[109] Finally, mention should be made of the work of ECE on the subject of the "ecosystems approach to water management".[110] This approach, which "has been discussed in scientific circles for well over a decade, . . . provides a holistic way of viewing planning, research and management of water resources, taking into account not only the sustainability of such resources but the environment as a whole".[111]

63. It has already been noted that a number of meetings held under United Nations auspices have recognized the need to take into account the interdependence of the various components of watercourse systems in efforts to achieve optimum utilization at the drainage basin level.[112] Certainly one of the most resounding endorsements of the system approach in recent years by such a meeting takes the form of one of the recommendations made by the group of government officials and international experts at the Interregional Meeting on River and Lake Basin Development held at Addis Ababa in 1988. According to that recommendation:

> Governments recognize that the system approach to the management of a basin's water resources is the necessary point of departure for regulating and managing the resources, given the interdependence and diversity of the components of the hydrologic cycle—[including] surface water, [and] underground water . . .[113]

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[101] See generally, McCaffrey, "International organizations and the holistic approach to water problems", in *The International Law of the Hydrologic Cycle* (*Natural Resources Journal* (Albuquerque, N.M.), vol. 31, No. 1 (1991)).

[102] ILA, *Report of the Forty-eighth Conference, New York, 1958* (London, 1959), annex II, p. 99, "Agreed principles on international law", principle 1.

[103] See the wording of article II of the Helsinki Rules (footnote 64 above).

[104] *Annuaire de l'Institut de droit international* (Basel), vol. 49, part II (1961), p. 87.

[105] *Yearbook of the Institute of International Law* (Basel), vol. 58, part II (1980), p. 197.

[106] Inter-American Bar Association, *Proceedings of the Tenth Conference held at Buenos Aires from 14 to 21 November 1957* (2 vols.) (Buenos Aires, 1958), reproduced in *Yearbook . . . 1974*, vol. II (Part Two), p. 208, document A/5409, para. 1092.

[107] See generally ECE, *Two Decades of Cooperation on Water* (see footnote 54 above).

[108] Ibid., pp. 19-20.

[109] Ibid., p. 49.

[110] See, for example, the revised draft report prepared by government rapporteurs at an informal meeting held in Bergen (Norway), from 5-7 June 1989 and submitted to the ECE Working Party on Water Problems (document ENVWA/WP.3/R.7/Rev.1).

[111] Ibid., p. 1.

[112] See footnote 50 above.

[113] *River and Lake Basin Development* . . . op. cit., p. 16.

Another relevant recommendation, which complements the one just excerpted, states:

> Governments recognize that the drainage basin provides the most useful context within which to achieve cooperation and agreement between or among the basin States for integrated development, including the application of legal principles governing an international water resources system and the interrelationships between water, other natural resources and the peoples affected.[114]

64. These recommendations are only the latest in a series of pronouncements by groups and meetings under United Nations auspices. The interdisciplinary Panel of Experts appointed by the Secretary-General pursuant to resolution 1033 (XXXVII) of the Economic and Social Council dated 14 August 1964 recognized that circumstances may force States to limit the territorial extent of their watercourse agreements, but stated that "the 'system' approach, rather than a 'territorial' approach, is the superior concept when dealing with water resources . . ."[115] The experts go on to note that "for groundwater resources, it is widely understood that the hydrologic system of which the international aquifers are a part are to be taken into account".[116]

65. A broad definition of international watercourse is also to be found in the World Bank Operational Directive concerning projects on international waterways, according to which:

> . . . the Bank . . . attaches the utmost importance to riparians entering into appropriate agreements or arrangements for the efficient utilization of the entire waterway system or any part of it . . .
>
> . . .
>
> 2. This directive covers the following:
>
> (*a*) types of international waterways:
>
> (i) river, canal, lake or any similar body of water which forms a boundary between, or any river or body of surface water which flows through two or more States . . .;
>
> (ii) any tributary or any other body of surface water which is a part or a component of any waterway described in (i) above . . .[117]

The scope of the directive's applicability is important inasmuch as later paragraphs require that States proposing a project for Bank funding notify other riparian States of the proposal and follow a set of procedures very similar to those contained in part III of the Commission's draft articles.

66. Finally, the "system" or related concepts have long been employed in a variety of legal and technical works. Only a few representative examples will be noted here. An appropriate place to begin is the seminal work by H. A. Smith who, in stating a set of principles applicable to the uses of such rivers, wrote the following:

> The first principle is that every river system is naturally an indivisible physical unit, and that as such it should be so developed as to render the greatest possible service to the whole human community which it serves, whether or not that community is divided into two or more political jurisdictions. It is the positive duty of every Government concerned to cooperate to the extent of its power in promoting this development . . .[118]

67. The same conclusion was reached by another eminent international lawyer from the United Kingdom of Great Britain and Northern Ireland, and a former member of the Commission, James Brierly:

> The practice of States, as evidenced in the controversies which have arisen about this matter, seems now to admit that each State concerned has a right to have a river system considered as a whole, and to have its own interests weighed in the balance against those of other States; and that no one State may claim to use the waters in such a way to cause material injury to the interests of another, or to oppose their use by another State unless this causes material injury to itself.[119]

68. A holistic approach is also taken by Johan Lammers in his treatise on pollution of international watercourses in which he defines "inland surface waters of an international drainage basin" for the purpose of his study to mean:

> . . . the interconnected system of rivers, lakes, canals or marshes, etc., the waters of which tend to flow into a common terminus and which extends over two or more States. The geographical area which constitutes the drainage basin is not only determined by this interconnected system of inland surface waters but also by the diffused surface water and groundwater which flows into the common terminus. In general the drainage basin, also called the "catchment area" or "watershed", is the area from which all precipitation flows into a common terminus.[120]

69. It is perhaps appropriate to close this section by noting that the term "system" is routinely employed with reference to watercourses in scientific and technical works. W. C. Walton, for example, has written the following:

> All river systems appear to have basically the same type of organization. The river system is dynamic in that it has portions that move and can cause events and create changes. There is not only unity displayed by important similarities between rivers in different settings, but also an amazing organization of river systems.[121]

70. The foregoing survey indicates that the idea of a watercourse as a "system of waters" is by no means novel, either in scientific, technical and legal literature or in State practice. The system is composed of a number of interrelated components which function as a unitary whole. It would seem to follow logically from this scientific fact that legal rules governing the relations of States with regard to international watercourses should take this interrelationship into account, so that the operation of the rules—and thus the protection of fresh water as well as the rights of watercourse States—will not be frustrated. Such frustration would be bound to occur where the scope of the legal regime is not coextensive with the scope of the regime's subject matter. As Kolars' diagram clearly illustrates (see annex, fig. 2), there are many ways in which the non-navigational use of water in one

[114] Ibid.

[115] United Nations, Department of Economic and Social Affairs, *Management of International Water Resources: Institutional and Legal Aspects*, Report of a Panel of Experts, Natural Resources/Water Series No. 1 (United Nations publication, Sales No. 75.II.A.2), p. 48, para. 143.

[116] Ibid., para. 144.

[117] The World Bank Operational Manual, Operational Directive 7.50: Projects on international waterways, April 1990.

[118] *The Economic Uses of International Rivers* (London, King, 1931), pp. 150-151.

[119] *The Law of Nations*, 5th ed. (Oxford, Clarendon Press, 1955), p. 204.

[120] *Pollution of International Watercourses* (The Hague, Martinus Nijhoff, 1984).

[121] *The World of Water* (London, Weidenfeld and Nicolson, 1970), p. 212.

State can have impacts upon another State. The Commission's draft articles should take these ways into account.

71. The following section of the report will deal with a final aspect of the definition of an "international watercourse": "whether, for the purposes of the draft articles, that expression should have a "relative" character.

4. THE CONCEPT OF THE "RELATIVE INTERNATIONAL CHARACTER" OF A WATERCOURSE

72. The third paragraph of the provisional working hypothesis accepted by the Commission in 1980, and again in 1987, as the basis for its work[122] introduced the novel concept of the "relative international character" of a watercourse. This legal fiction did not result from a proposal by the then Special Rapporteur, nor does the Commission's report explain its genesis. The concept would appear to be without precedent in scientific and technical works, in State practice or in legal studies, reports or recommendations. It appears that it may have been intended to limit the scope of the draft articles by excluding "parts of the waters in one State [that] are not affected by or do not affect uses of waters in another State". Thus, for example, if a particular component or part of a watercourse in one State were not affected by uses of the international watercourse in another State, that component or part would not be considered for the purposes of the draft articles as being "included in the international watercourse system".

73. This idea has a superficial appeal. It purports to free sections or components of an international watercourse system from the legal constraints imposed by the draft articles and thus might appear to enhance the freedom of action of watercourse States. It suffers from two fundamental flaws, however, on grounds of which the Commission is urged to abandon the notion of the "relative international character" of a watercourse.

74. The first is that this fluvial theory of relativity comes very close to being incompatible with the hydrologic reality recognized in the first paragraph of the hypothesis—namely, that the hydrographic components of a watercourse system "constitut[e] by virtue of their physical relationship a unitary whole . . ." The suggestion that uses of a part of an international watercourse in State A may have no effect upon another part, situated in State B, does not take into account the interrelationships between different parts and components of a watercourse system discussed in the present report and, as such, may ultimately do more to produce than to avoid intractable disputes between watercourse States, one or more of which has embarked on a course of action in reliance on that suggestion. This effect of the notion of relativity has not escaped notice by members of the Commission. One member remarked in 1980 that "the approach "adopted by the majority would, in treating a watercourse as international for some uses but not for others, lead to uncertainty and difficulty of application".[123]

75. An apt illustration of the difficulty of knowing in advance whether "parts of the waters in one State [would be] affected by or . . . affect uses of waters in another State" is the Flathead River case, which was discussed in the sixth report.[124] It will be recalled that that case involved requests by the Canadian and United States Governments for the International Joint Commission established by the 1909 Boundary Waters Treaty between the two countries to examine and report on the transboundary water quality and quantity implications of a proposed coal mine on Cabin Creek, a tributary of the Flathead River. Specifically, plans called for the mine to be situated on Cabin and Howell Creeks, 10 kilometres (6 miles) upstream of the point at which the North Fork of the Flathead River crosses the international boundary.[125]

76. The Joint Commission found that the two streams which the proposed mine would straddle formed an important spawning and rearing ground for prime game fish in the Flathead River basin. It noted that definitive conclusions concerning effects of the mine upon fisheries in Canada and the United States would require, *inter alia*, more complete data as to the interaction between groundwaters and surface waters in the vicinity of the mine site:

> Understanding fully the degree of impact on fish populations is dependent on further data concerning the inflows and outflows of groundwater and associated chemical and physical pollutants between the stream bed and the mine site, and on measures taken to protect the stream habitat and/or mitigate for productive habitat loss.[126]

77. The Commission nevertheless determined, based on what it regarded as "overwhelming evidence", that a "significant loss of fish population will occur as a result of a combination of the adverse effects of one or more of the predicted changes . . ."[127] It therefore concluded that:

> . . . damage will inevitably occur to this [fish] habitat which would be located in the midst of a major mining development, and consequently to the fishery dependent on that habitat. Furthermore, such losses would be such as to cause a reduction in the quantity and quality of the sport fishing activity in the United States and create a negative impact on the associated economic infrastructure since the affected fish populations migrate for much of their adult lives to United States waters.
>
> . . .
>
> In this case . . . it is not the pollution which crosses the boundary, but rather that the pollution on one side will cause a loss to the fishery, a loss which is felt on the other side of the boundary . . . With respect to the present proposal, the pollution expected to cause these consequences to the fishery would thus clearly constitute a breach of article IV [of the Boundary Waters Treaty].[128]

The Commission noted that article IV of the Boundary Waters Treaty "does not require that the pollution itself cross the boundary, but rather that water which crosses

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[122] See para. 6 above.

[123] See *Yearbook . . . 1980*, vol. II (Part Two), p. 109, para. 94.

[124] See *Yearbook . . . 1990*, vol. II (Part One), p. 70, document A/CN.4/427 and Add.1, paras. 60-61. See also International Joint Commission, *Impacts of a Proposed Coal Mine in the Flathead River Basin*, December 1988 (hereinafter the "Flathead report").

[125] Flathead report, p. 19.

[126] Ibid., p. 7.

[127] Ibid., p. 8.

[128] Ibid., pp. 8-9.

the boundary shall not be polluted in one country to the injury of property on the other side".[129]

78. This case demonstrates that it will not always be clear in advance, even to experts, whether a particular project or use will have negative transboundary effects. Even the admittedly incomplete data on which the Joint Commission based its recommendation was the result of a technical assessment conducted by an interdisciplinary group of experts. Yet, the very uncertainty of transboundary impacts could have exempted the proposed mine completely from the draft articles according to the idea that watercourses may have a "relative international character". A "system" or other hydrology-based approach, on the other hand, would recognize that tributaries (such as Cabin Creek) of a border-crossing watercourse (such as the Flathead River), as well as groundwater that contributes to them, are part of the network of waters that function as a unit physically, and thus must be treated as a unit legally.

79. The second flaw inherent in the notion of relative internationality is potentially even more serious than the first because it could eviscerate entire sections of the draft articles. The hypothesis states in its third paragraph that:

> 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.

From part I of the draft articles, a State would not know whether it was a "watercourse State" within the meaning of article 3 unless it was established that parts of the waters in its territory were affected by or affected uses of the waters in another State. This would in turn throw into doubt the applicability of article 4, as well as the right of the State to participate in the negotiation of any watercourse or system agreement under article 5, paragraph 2, and to become a party to such an agreement.

80. The applicability of the key provisions of part II of the draft articles would likewise be uncertain, for the same reasons. This is true of the obligation of equitable and reasonable utilization and participation (art. 6), the obligation not to cause appreciable harm (art. 8), the general obligation to cooperate (art. 9) and the obligation to exchange data and information on a regular basis (art. 10). It is also true of the provisions of parts IV (Protection and preservation) and V (Harmful conditions and emergency situations).

81. But the incompatibility of the notion of relative internationality with the draft articles is perhaps nowhere more evident than with regard to part III (Planned measures). The whole idea of part III is to prevent harm before it happens and to nip potential problems in the bud, before they grow into serious disputes. The provisions of part III are triggered in the case of "*possible** effects of planned measures" (art. 11) or, more specifically, if "planned measures . . . *may have** an appreciable adverse effect upon other watercourse States . . ." (art. 12). Yet without an *actual** effect having occurred, the watercourse might not be "international" under the third paragraph of the hypothesis, in which case the entire set of draft articles, including part III, would not apply.

82. This is certainly not the effect the Commission intended, but it would seem to follow ineluctably from the terms of the hypothesis. It is understandable that this result may not have been foreseen when the hypothesis was drafted, since the Commission had not at that stage of its work considered the range of provisions that it now has before it in the form of articles already adopted provisionally or proposed.

83. Indeed, the concerns that may have prompted the addition of the idea of relative internationality would seem to have been addressed in the draft articles already adopted provisionally by the Commission. That is, none of the fundamental obligations under the draft articles (in particular those under arts. 6, 8, 23 and part III) would apply unless there was an actual or possible effect upon another watercourse State or the regime of the watercourse (the latter case refers to art. 6). Thus there is no danger of the draft articles applying to activities having no actual or potential effect upon other watercourse States.

84. It is therefore recommended that this portion of the "scaffold" for the Commission's work—the notion of relative internationality—should be allowed to fall away. It is recommended, however, that the remainder should be preserved and incorporated into the finished structure as set out in the draft article proposed in the concluding portion of the present report. Before turning to that proposal, a brief indication will be given of additional terms that could be included in the article on "use of terms".

B. Other terms that could be included in the article

85. The Commission will recall that the draft articles adopted so far, as well as two that have been proposed, contain definitions that could be included in an article on "use of terms". These definitions are listed here for ease of reference: "Watercourse States" (currently defined in art. 3); "pollution" (currently defined in art. 23); "emergency" (currently defined in art. 27); "regulation" (the subject of art. 25 as proposed in the fifth report of the Special Rapporteur);[130] and "management" (the subject of art. 26 as proposed in the sixth report).[131] The draft article proposed below contains only one of these definitions; it is included because of its close relationship with the definition of "international watercourse". The fact that other definitions are not included in the proposed article should not be taken as an indication that their inclusion is not recommended. On the contrary, it is believed that it would be useful eventually to consolidate all definitions in a single article entitled "use of terms". A proposal for at least a portion of that article follows.

[129] Ibid., p. 9.

[130] *Yearbook . . . 1989*, vol. II (Part One), p. 125, document A/CN.4/421 and Add.1-2, para. 140.

[131] *Yearbook . . . 1990*, vol. II (Part One), pp. 48-52, document A/CN.4/427 and Add.1.

C. The proposed article

Article [1] [2].[132] *Use of terms*

ALTERNATIVE A

For the purposes of the present articles:

(*a*) A watercourse system is a system of waters composed of hydrographic components, including rivers, lakes, groundwater and canals, constituting by virtue of their physical relationship a unitary whole.

(*b*) An international watercourse system is a watercourse system, parts of which are situated in different States.[133]

(*c*) A [watercourse][134] **[system] State is a State in whose territory part of an international watercourse system is situated.**

ALTERNATIVE B

For the purposes of the present articles:

(*a*) A watercourse is a system of waters composed of hydrographic components, including rivers, lakes, groundwater and canals, constituting by virtue of their physical relationship a unitary whole.

(*b*) An international watercourse is a watercourse, parts of which are situated in different States.[135]

(*c*) A [watercourse][136] **[system] State is a State in whose territory part of an international watercourse is situated.**

Comments

(1) Two alternatives are offered to define "international watercourse". Alternative A employs the term "international watercourse system" and alternative B uses "international watercourse". The writer is inclined to favour alternative A. Its virtue is that by making the operative term "watercourse system"—a term which would then be used throughout the draft articles—it keeps before the reader the fact that the waters of an international watercourse form a *system*. This will help to reinforce appreciation of the fact that all components of watercourses are interrelated; and thus, by implication, that it is important to take into account the impact of actions in one watercourse State upon the system-wide condition of the watercourse. The advantage of alternative B is that it begins with the term that is contained in the title of the topic—"watercourse"—and defines it as a "system of waters". Thus, it does not repeat the word "system", one of the words that is defined in alternative A.

(2) Finally, both alternatives include a paragraph (*c*), which contains a definition of "watercourse" or "system" State. The expression "watercourse State" is at present defined in article 3. Because this definition is closely related to the definition of "international watercourse" or "watercourse system", it is recommended that it should be moved to the article on use of terms, as proposed above.[137]

[132] Whether this article is numbered "1" or "2" depends upon the Commission's decision on the matter of structure addressed in chapter I of the present report.

[133] This wording follows that of the present article 3, which defines "watercourse States". It recommended that article 3 should be moved to the use of terms article, placing it in paragraph (*c*), as indicated above.

[134] Article 3, as it presently stands, uses the expression "watercourse State".

[135] See footnote 133 above.

[136] See footnote 134 above.

[137] Ibid.

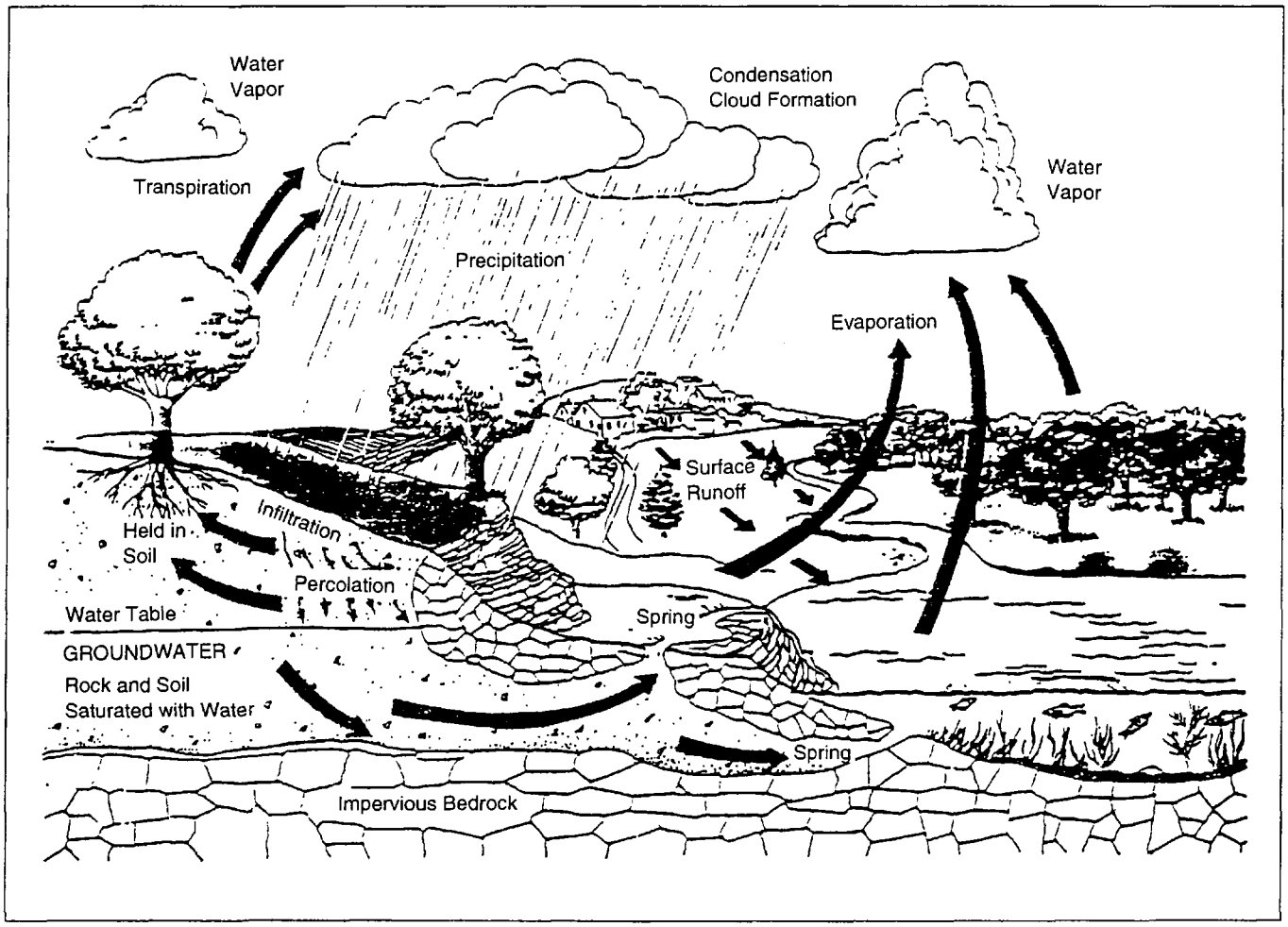
CHAPTER III

Conclusion

86. With the present report, the submission of the provisions which the writer believes should be contained in the Commission's draft articles on the law of the non-navigational uses of international watercourses has been completed.

ANNEX

FIGURE I



Source: Bernard J. Nebel, *Environmental Science: The Way the World Works*, 3rd ed., copyright 1990, p. 196. Reprinted by permission of Prentice-Hall, Englewood Cliffs, N.J.

FIGURE 2

Elements of a hypothetical international river use system

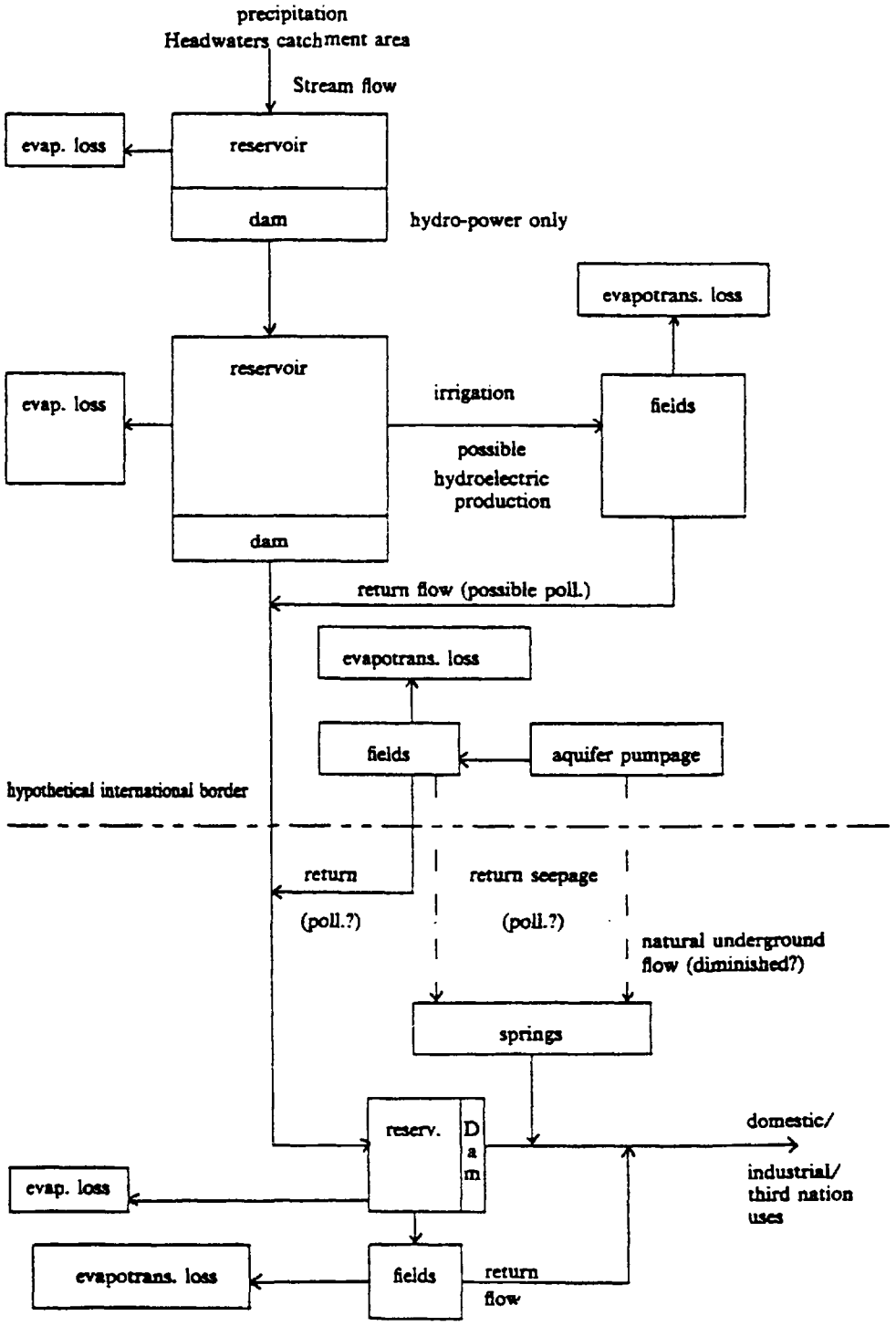
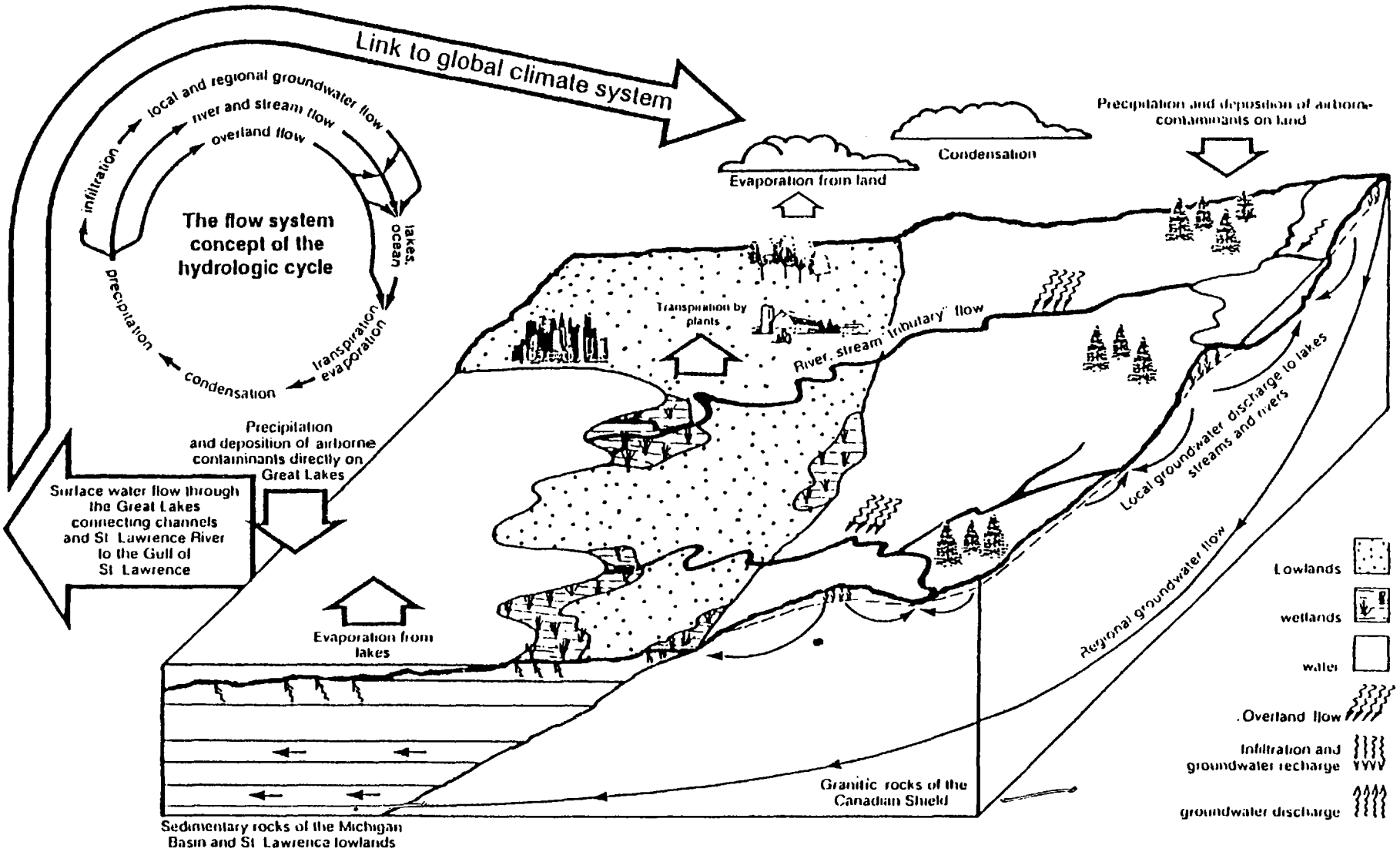


FIGURE 3

The flow system concept of the hydrologic cycle

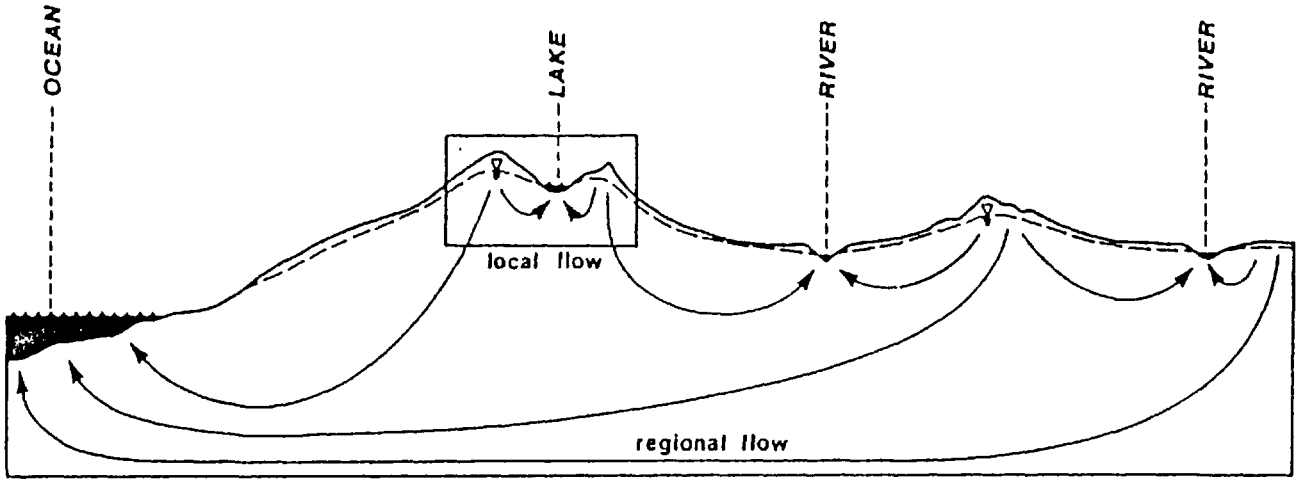


Source: T. Colborn, A. Davidson, S. Green, R. Hodge, I. Jackson & R. Liroff, *Great Lakes, Great Legacy?* 76 (1989). Reprinted by permission of World Wildlife Fund.

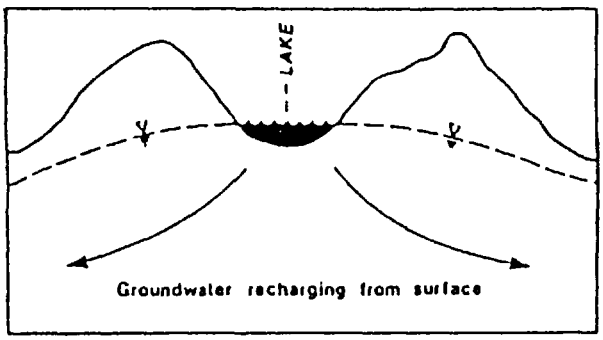
FIGURE 4

Flow system characteristics

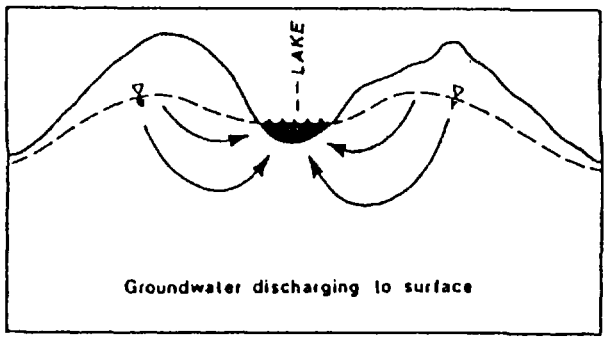
A.—LOCAL AND REGIONAL FLOW SYSTEMS



B.—VALLEY AS A RECHARGE ZONE
(conditions in late summer, early fall)



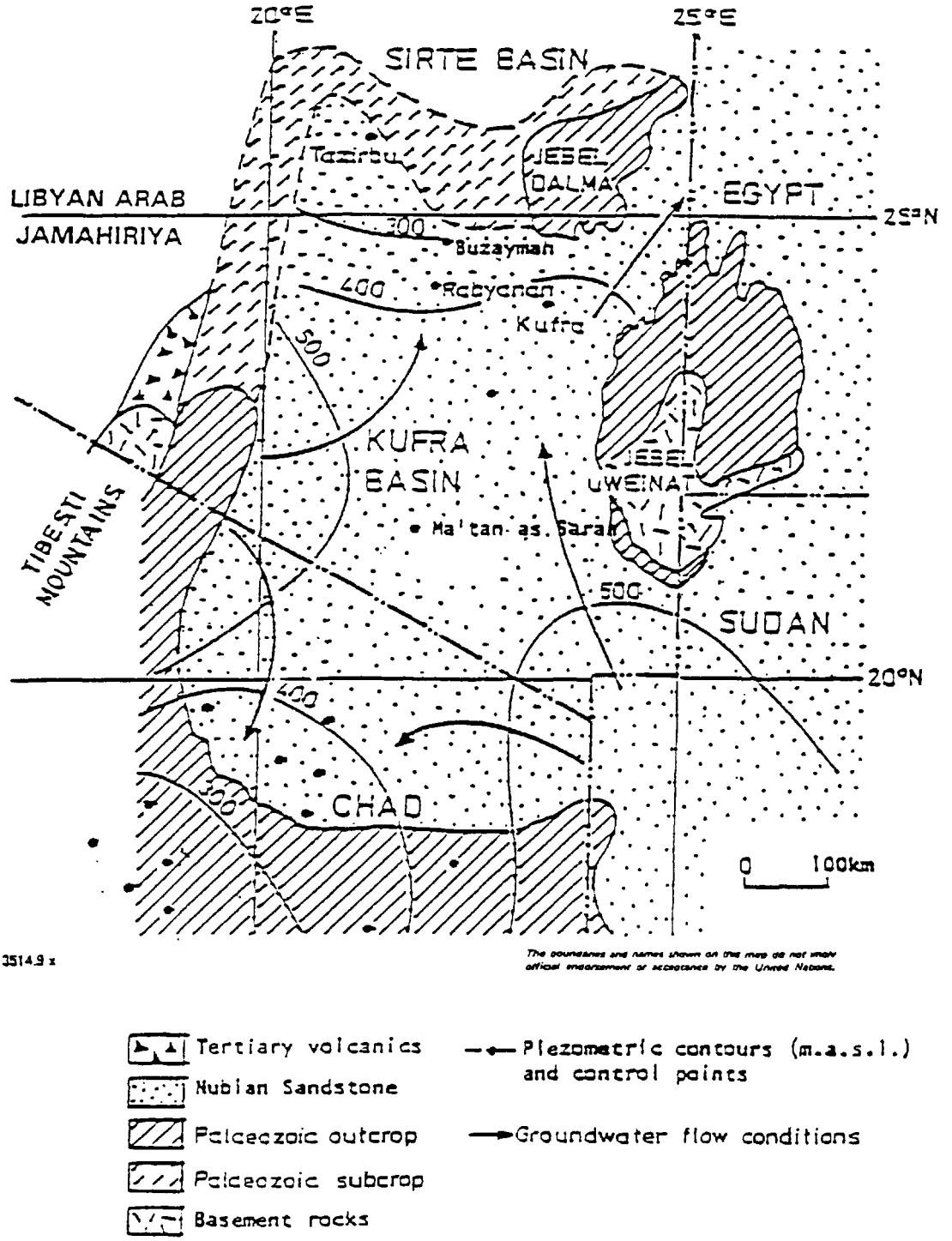
C.—VALLEY AS A DISCHARGE ZONE
(conditions in late winter, early spring)



Source: Province of British Columbia, *Report of the Royal Commission of Inquiry, Health and Environmental Protection, Uranium Mining*, 1 Commr's Rep. 98 (1980). Reprinted by permission of Province of British Columbia, Ministry of Energy, Mines and Petroleum Resources, Communications and Public Affairs Branch.

FIGURE 5

Groundwater head distribution, Kufra basin, Libya



Source: United Nations Department of Technical Cooperation for Development: *Transnational Project on the Major Regional Aquifer in North-East Africa, Egypt and the Sudan*. Technical Report: *Hydrogeology and Economic Potential of the Nubian Sandstone Aquifer*, doc. DP/UN/RAB-82-013/2 p. 37.