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Recommended Citation

Gabriel E. Eckstein, *Commentary on the U.N. International Law Commission's Draft Articles on the Law of Transboundary Aquifers*, 18 Colo. J. Int'l Envtl. L. & Pol'y 537 (2007).

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Commentary on the U.N. International Law Commission's Draft Articles on the Law of Transboundary Aquifers

Gabriel E. Eckstein*

“When the well’s dry, we know the worth of water”¹

ABSTRACT

Ground water is the most extracted natural resource in the world. It provides more than half of humanity's freshwater for everyday uses such as drinking, cooking, and hygiene, as well as twenty percent of irrigated agriculture. Despite our increasing reliance, ground water resources have long been the neglected stepchild of international water law; regulation and management of and information about ground water resources are sorely lacking, especially in the international context. Presently, there is no international agreement squarely addressing ground water resources that traverse an international boundary. Moreover, there is only one treaty in the entire world pertaining to the management of a transboundary aquifer, and few nations possess the relevant technical information necessary to enter into such agreements. The result is overexploitation and degradation of many of the world's

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1. BENJAMIN FRANKLIN, POOR RICHARD'S ALMANAC, 130 (Paddington Press Ltd., 1976) (1746).

transboundary aquifers, and considerable harmful impacts on border communities, economies, and ecosystems dependent on transboundary ground water resources.

Recently, the United Nations International Law Commission embarked on an effort to address this shortcoming and to consider the international law applicable to transboundary aquifers. This undertaking follows and builds on the Commission's prior work on international watercourses, which culminated in the 1997 U.N. Convention on the Non-Navigational Uses of International Watercourses. It also builds on the work of other organizations, including that of the International Law Association and its Helsinki, Seoul, and Berlin Rules. This paper reviews the work of the Commission in its current effort to codify and progressively develop the international law applicable to transboundary ground water resources. It critically assesses the nineteen Draft Articles formulated by the Commission and considers the various legal, scientific, social, and related implications of those articles. Moreover, it assesses the applicability and soundness of the Draft Articles in relation to the science of ground water resources. Ultimately, the challenge before the Commission is to formulate international legal principles and doctrines that will allow States to overcome the unique problems associated with the utilization, management, allocation, and protection of the world's transboundary aquifers. The goal of this study is to generate discussion on this critically important topic and to spur additional commentaries that may aid the Commission in its effort.

I. INTRODUCTION

The value of ground water is difficult to overstate. In the past half-century, exploitation of this "hidden" resource has emerged from its provincial origins to become a highly sophisticated global phenomenon such that today, ground water is the most extracted natural resource in the world.² Ground water now provides more than half of humanity's

2. See S.S.D. Foster & P.J. Chilton, *Groundwater: The Processes and Global Significance of Aquifer Degradation*, 358 PHIL. TRANSACTIONS OF THE ROYAL SOCIETY OF LONDON B: BIOLOGICAL SCIENCES 1957 (2003) available at <http://www.journals.royalsoc.ac.uk/media/11bfddak6p5kth4b2u5m/contributions/5/x/n/6/5xn68w9pm4c0qv6v.pdf> (last visited Mar. 23, 2007) (asserting that ground water "is the world's most extracted raw material"); see also WATER FOR PEOPLE, WATER FOR LIFE, THE UNITED NATIONS WORLD WATER DEVELOPMENT REPORT, 78 (2003) [hereinafter WATER FOR PEOPLE] (discussing the "boom in groundwater resource exploitation" that began in the 1950s); cf. Joseph W. Dellapenna, *The Evolving International Law of Transnational Aquifers*, in MANAGEMENT OF SHARED GROUND WATER RESOURCES: AN ISRAELI-PALESTINIAN CASE WITH AN INT'L PERSP. 209, 212 (Eran Feitelson & Marwan

freshwater for everyday uses such as drinking, cooking, and hygiene, as well as twenty percent of irrigated agriculture globally.³ In the European Union, approximately seventy percent of piped water originates from Europe's numerous aquifers.⁴ In the United States, although the numbers vary among the states due to climatic, topographic, and geographic differences, ground water provides between one-half and ninety-seven percent of drinking water.⁵

Despite our increasing reliance on ground water, regulation and management of and information about ground water resources are sorely lacking, especially in the transboundary context. Few countries have entered into agreements to manage transboundary aquifers and even fewer have the relevant technical information to do so.⁶ The result is overexploitation and degradation of many of the world's aquifers,⁷ and

Haddad eds., 2000) (finding that after World War II, the technology and demand for water made ground water a critical transnational resource).

3. See WATER FOR PEOPLE, *supra* note 2, at 78–80.

4. *Id.* at 78; see also U.N./E.C.E., Task Force on Monitoring & Assessment, *Guidelines on Transboundary Ground Water Monitoring*, VOLUME I: INVENTORY OF TRANSBOUNDARY GROUND WATERS at 21, U.N. Sales No. 9036952743 (1999) (prepared by E. Almássy & Zs. Busás) (explaining that although there is some variability amongst the various regions of the continent, in Europe, between 60 and 99 percent of drinking water comes from ground water resources).

5. See Stefano Burchi, *National Regulation for Groundwater: Options, Issues and Best Practices*, in GROUNDWATER: LEGAL AND POLICY PERSPECTIVES, PROCEEDINGS OF A WORLD BANK SEMINAR 55 (Salman M.A. Salman ed., 1999).

6. See G. Eckstein & Y. Eckstein, *A Hydrogeological Approach to Transboundary Ground Water Resources and International Law*, 19 AMER. UNIV. INT'L L. REV. 201, 224–27 (2003) [hereinafter Eckstein & Eckstein] (discussing the agreements in which ground water is addressed as a secondary or tertiary issue and noting that there is only one treaty that directly addresses the management of a transboundary aquifer—Arrangement on the Protection, Utilization, and Recharge of the Franko-Swiss Genevese Aquifer between the French Prefect de Haute-Savoie and the Swiss Canton of Geneva).

7. Examples of aquifer overexploitation abound. For example, while the Nubian Sandstone Aquifer underlying Egypt, Sudan, Chad, and Libya is extensive, it is a non-renewing aquifer and is undergoing rapid depletion. See A.M. Ebraheem, et. al., *Simulation of Impact of Present and Future Groundwater Extraction from the Non-Replenished Nubian Sandstone Aquifer in Southwest Egypt*, 43 ENVTL. GEOLOGY 188 (2002). Similarly, 100 of the 647 aquifers identified in Mexico are considered overexploited. Karin Kemper, *Groundwater Management in Mexico: Legal and Institutional Issues*, in GROUNDWATER: LEGAL AND POL'Y PERSP., PROC. OF A WORLD BANK SEMINAR 117 (Salman M.A., Salman ed., 1999). In Yemen, a country heavily reliant on ground water, current water management practices are expected to fully expend the water resources of the capital city of Sana'a by 2009, and the rest of the country within 50–100 years. Karen Hedges, *Groundwater Management in Yemen: Legal and Regulatory Issues*, in GROUNDWATER: LEGAL AND POL'Y PERSP., PROC. OF A WORLD BANK SEMINAR 133 (Salman M.A., Salman ed., 1999).

considerable harmful impacts on communities, economies, and ecosystems dependent on ground water resources.⁸

On a global level, numerous efforts have emerged to respond to concerns over water for food production, water-related health issues, environmental deterioration, and water scarcity in general.⁹ Especially

Examples of aquifer degradation are also plentiful. In northern China, nitrates generated from agricultural activities have contaminated the regions ground water and exceed 50 mg/liter in more than half of the locations monitored. While the World Health Organization's drinking water guideline for nitrate is 45 mg/liter, some of the locations evidenced concentrations as high as 300 mg/liter. Payal Sampat, DEEP TROUBLE: THE HIDDEN THREAT OF GROUNDWATER POLLUTION, 154 WORLDWATCH PAPER 19 (Jane Peterson ed., 2000), available at <http://www.worldwatch.org/node/836> (last visited Jan. 17, 2007). Moreover, synthetic volatile organic compounds have contaminated ground water resources worldwide, including in the United States, the Netherlands, and Japan, at levels greater than prescribed safe limits. *Id.* at 29–32.

8. In his First Report on Outlines, UNILC Special Rapporteur Chusei Yamada ominously reported that “[f]ifty per cent of the population in developing countries is currently exposed to unsafe water resources; 6,000 infants in the developing world die every day as a result of dirty, contaminated water . . . We are headed for a world water crisis.” C. Yamada, UNILC Special Rapporteur, *Shared Natural Resources: First Report on Outlines*, U.N. Doc. A/CN.4/533/¶ 21 (2003) available at <http://daccessdds.un.org/doc/UNDOC/GEN/N03/341/92/PDF/N0334192.pdf?OpenElement> [hereinafter *Yamada First Report*]. In the Mexico City region, overexploitation of the Valley of Toluca aquifer, which has both urban and industrial uses in Mexico City and Toluca, has greatly reduced ground water flow into the aquifer-dependent Lerma River ecosystem and has dried out a substantial portion of the wetlands known as Lagoons of Almoloya del Rio. See M.V. Esteller & C. Diaz-Delgado, *Environmental Effects of Aquifer Overexploitation: A Case Study in the Highlands of Mexico*, 29 ENVTL. MGMT. 266–78 (2002) available at <http://www.springerlink.com/content/rcckw10tad7e3knf/fulltext.pdf> (last visited Mar. 20, 2007) (presenting the findings of a study that explores the effects of the intensive exploitation of the Valley of Toluca aquifer).

9. For example, the World Summit on Sustainable Development that was held in Johannesburg, South Africa in 2002, established the following water-related goals and targets: a) “. . . to halve, by 2015, the proportion of people unable to reach or afford access to safe water. . .”; b) “. . . to halve, by 2015, the proportion of people without access to basic sanitation . . .”; and c) “. . . develop integrated water resources management and water efficiency plans by 2005 . . .” *Report of the World Summit on Sustainable Development*, A/CONF.199/20 & A/CONF.199/20/Corr.1 (2002), p. 11, ¶ 8, ¶ 21, ¶¶ 25–26, available at http://www.unctad.org/en/docs/aconf199d20&c1_en.pdf (last visited Jan. 25, 2007) (discussing the goal established at the World Summit on Sustainable Development held in Johannesburg, South Africa, in 2002). Following the Summit and in response to the calls for concrete action, the United Nations Development Programme established the Community Water Initiative, a funding mechanism designed to support sustainable community-based water and sanitation development and management. See U.N. Development Programme, *Community Water Initiative*, available at <http://www.undp.org/water/initiatives/initiative.html> (last visited Jan. 17, 2007). On a national level, in 2005, the United States adopted the Paul Simon Water for the Poor Act,

noteworthy is the work of the United Nations International Law Commission (Commission or UNILC) to articulate and progressively develop the international law applicable to freshwater resources.¹⁰ In 1970, the UNILC was tasked with formulating an international instrument for elucidating and codifying the international law applicable to non-navigational uses of international watercourses.¹¹ While the process took more than twenty-five years,¹² this effort resulted in the well-received 1997 United Nations Convention on the Law of Non-Navigational Uses of International Watercourses (Watercourses Convention).¹³

which was designed to assist developing countries in increasing access to and effective use of safe water and sanitation, improve water resources management, increase water productivity, and increase water security by strengthening cooperation on shared waters. DEP'T OF STATE, BUREAU OF OCEANS AND INT'L SCIENTIFIC AFFAIRS, SENATOR PAUL SIMON WATER FOR THE POOR ACT: REPORT TO CONGRESS 6 (June 2006), *available at* <http://www.state.gov/documents/organization/67716.pdf> (last visited Mar. 20, 2007).

10. The UN International Law Commission is charged by the UN General Assembly to promote "the progressive development of international law and its codification." Statute of the International Law Commission, G.A. Res. 174(II), at art.1 ¶ 1, U.N. Doc. A/519 (Nov. 21, 1947), *available at* http://untreaty.un.org/ilc/texts/instruments/english/statute/statute_e.pdf (last visited Mar. 20, 2007). That mandate is based on the UN General Assembly's authority to "initiate studies and make recommendations for the purpose of . . . encouraging the progressive development of international law and its codification." U.N. Charter, Article 13(1)(a), *available at* <http://www.un.org/aboutun/charter/chapter4.htm>.

11. G.A. Res. 2669, ¶ 1, U.N. GAOR, 25th Sess. Supp. No. 28, at 127, ¶ 1, U.N. Doc. A/8202 (Dec. 8, 1970).

12. In 1970 the UN General Assembly requested that the UNILC address "the law of the non-navigational uses of international watercourses with a view to its progressive development and codification . . ." in 1970. G.A. Res. 2669, U.N. GAOR, 25th Sess. Supp. No. 28, at 127, ¶ 1, U.N. Doc. A/8202 (1970). The UNILC submitted its final Draft Articles to the UN General Assembly in 1994. *2373rd Meeting of the International Law Commission at its Forty-Sixth Session*, ¶ 38, *reprinted in* [1994] Y.B. INT'L L. COMMISSION 296, U.N. Doc. A/CN.4/SER.A/1994. It took the UN General Assembly another three years of review and debate over the language of the treaty before it finalized the instrument. The Convention on the Non-Navigational Uses of International Watercourses was adopted by the UN General Assembly in May 1997 by a vote of 103 in favor to 3 against. *See* G. Eckstein, *Development of International Water Law and the UN Watercourse Convention*, in *HYDROPOLITICS IN THE DEVELOPING WORLD: A SOUTHERN AFRICAN PERSPECTIVE* 81 (Turton & Henwood, eds.) (2002) (hereinafter Eckstein 2002), *available at* <http://www.internationalwaterlaw.org/Articles/HydroPolitics-S-Africa.htm> (last visited Mar. 20, 2007). Although the lengthy process is not necessarily unusual for development of international law, it is certainly indicative of the intricacies of the subject matter as well as of the importance that states ascribed to transboundary watercourses.

13. U.N. Convention on the Law of Non-navigational Uses of International Watercourses, G.A. Res. 51/229, U.N. GAOR, 51st Sess., U.N. Doc. A/RES/51/229 (1997) [hereinafter Watercourse Convention]; *available at*

More recently, the UNILC renewed its effort to build on its watercourses work and consider the international law applicable to transboundary ground water resources. In 2002, the UNILC decided to pursue the topic of "shared natural resources" as part of its ongoing program of work.¹⁴ Under this mandate, Ambassador Chusei Yamada, the Commission's designated Special Rapporteur on the topic, embarked on a rigorous study of the law, science, and policy of ground water globally. His considerable efforts resulted in the production of three reports and three addenda,¹⁵ which laid the groundwork for the

http://www.internationalwaterlaw.org/IntlDocs/Watercourse_Conv.htm (last visited Oct. 13, 2006).

14. See *Yamada First Report*, *supra* note 8, at ¶¶ 1–2 (discussing the UNILC's selection of five topics, including shared natural resources, for its long-term program of work). The UN General Assembly recognized the UNILC's decision in January 2003. See General Assembly Resolution 57/21 (Jan. 21, 2003), ¶ 2, available at <http://www.un.org/Depts/dhl/resguide/r57.htm> (last visited Apr. 11, 2007).

In its initial efforts, the UNILC understood "shared natural resources" to include oil, gas, and "confined" transboundary ground waters. Ambassador Chusei Yamada, the Commission's designated Special Rapporteur for the subject, decided to focus his initial efforts on ground water resources and to consider the topics of oil and gas at a future date. See *Yamada First Report*, *supra* note 8, at ¶ 18; General Assembly Official Records, *Report of the International Law Commission on the Work of its Fifty-Eighth Session, Shared Natural Resources*, 61st Session, Supplement No. 10 (A/61/10) (2006), ¶ 2, at 193, available at <http://untreaty.un.org/ilc/reports/2006/2006report.htm> (last visited Jan. 11, 2007) [hereinafter *Fifty-Eighth Session Report*].

In addition, the Special Rapporteur amended the scope of his study by changing the title of the topic from "shared natural resources" to "transboundary aquifers." He did this, in part, because of concern surrounding the understanding of the term "shared." See *infra* notes 55–72, and accompanying text (discussing the debate over the use of the terms "shared," "international," and "transboundary." He also was motivated to expand the subject matter covered by his study from "confined" transboundary ground waters to all transboundary ground waters. C. Yamada, *Second Report on Shared Natural Resources: Transboundary Groundwaters*, U.N. Doc. A/CN.4/539 (2004), ¶¶ 11, 14 [hereinafter *Yamada Second Report*]. This latter justification was due, in part, to the confusing use of the phrase "confined" ground waters to describe ground water resources that were unrelated to surface waters. Cf. C. Yamada, *Addendum to Second Report on Shared Natural Resources: Transboundary Groundwaters*, U.N. Doc. A/CN.4/539/Add.1 (2004) ¶ 5 (discussing the differences in the definitions employed by the UNILC and hydrogeologists for the phrase "confined aquifer") [hereinafter *Yamada Addendum to Second Report*]. For a discussion of the misunderstanding in the terminology, see G. Eckstein, *A Hydrogeological Perspective of the Status of Ground Water Resources Under the UN Watercourse Convention*, 30 COLUMBIA J. OF ENV'TL LAW 525, 549–51 n. 102 (2005) [hereinafter Eckstein 2005a]. More importantly, it was due to the Special Rapporteur's conviction that any international guidelines or instrument addressing transboundary ground water resources would be woefully inadequate and inappropriate if they only considered one type of transboundary aquifers. See *infra* notes 31–32, and accompanying text.

15. *Yamada First Report*, *supra* note 8; C. Yamada, *Addendum to Shared Natural*

formulation of the nineteen Draft Articles on the law of transboundary aquifers prepared by the UNILC's Drafting Committee. At the UNILC's fifty-eighth session in 2006, the Commission's Drafting Committee adopted those articles after its first reading.¹⁶ While only the first formal step in what may be a lengthy review process, this preliminary adoption represents a milestone in the Commission's endeavor to elucidate and potentially codify the international law applicable to transboundary ground water resources.¹⁷

This study reviews the recent work of the UNILC. Specifically, it critically assesses the Draft Articles on the law of transboundary aquifers adopted by the UNILC and considers the various legal, scientific, social, and related implications of those articles. As adopted, the Draft Articles are divided into five sections: 1) introductory articles on scope and definitions; 2) articles delineating general principles related to States' rights and obligations; 3) articles enumerating specific obligation unique to the subject matter; 4) procedural rules related to planned measures; and 5) a miscellaneous section for additional relevant articles. This study mimics this format in its analysis. Where appropriate, reference is made to the 1997 Watercourse Convention and its relevance to the formulation of the Draft Articles.¹⁸ It is noteworthy that this article builds on previous scholarship that discusses the significance of ground water resources,¹⁹

Resources: First Report on Outlines, U.N. Doc. A/CN.4/533/Add.1 (2003) [hereinafter *Addendum to First Report on Outlines*]; *Yamada Second Report*, *supra* note 14; *Yamada Addendum to Second Report*, *supra* note 14; C. Yamada, *Third report on Shared Natural Resources: Transboundary Groundwaters*, U.N. Doc. A/CN.4/551 (2004) [hereinafter *Yamada Third Report*]; C. Yamada, *Addendum to Third Report on Shared Natural Resources: Transboundary Groundwaters*, U.N. Doc. A/CN.4/551/Add.1 (2005).

16. See *Fifty-Eighth Session Report*, *supra* note 14, ¶ 72, at 184.

17. Toward the close of its 58th Session, the UNILC decided to transmit the Draft Article, through the Secretary General of the U.N. to the State Members of the U.N.. In that transmission, the UNILC also requested that the States submit comments and observations on the Draft Articles to the Secretary General by January 1, 2008. *Fifty-Eighth Session Report*, *supra* note 14, ¶ 73, at 184.

18. Watercourse Convention, *supra* note 13.

19. For articles and reports on the importance of ground water resources, see e.g., Eckstein & Eckstein, *supra* note 6, at 201–03 (noting the growing reliance of nations on ground water as a source of freshwater); Payal Sampat, *Deep Trouble: The Hidden Threat of Groundwater Pollution*, *Worldwatch Paper*, 154 *WORLDWATCH INST.* 1, 10–13 (2000) (discussing the growing global dependence on ground water resources); Robert Hayton & Albert E. Utton, *Transboundary Ground Waters: The Bellagio Draft Treaty*, 29 *NAT. RESOURCES J.* 663, 663, 674 (1989) (asserting that development and population expansion are causing cities throughout the world to become “critically dependent on ground water”); WATER FOR PEOPLE, WATER FOR LIFE, *supra* note 2, at 80 (identifying countries like India, Iran, Bangladesh, and Saudi Arabia which rely heavily on ground water resources for agricultural irrigation, and citing Africa’s “sharp increase”

explicates the science of ground water relevant to ground water law and policy,²⁰ considers the applicability of the Watercourse Convention to ground water resources,²¹ and recounts the historical context as well as the evolution of international water law.²² Accordingly, these topics will not be addressed in this study.

II. INTRODUCTORY DRAFT ARTICLES ON SCOPE AND DEFINITIONS

A. Draft Article 1 – Scope

The present draft articles apply to:

- (a) utilization of transboundary aquifers and aquifer systems;
- (b) other activities that have or are likely to have an impact upon those aquifers and aquifer systems; and
- (c) measures for the protection, preservation and management of those aquifers and aquifer systems.²³

Draft Article 1 defines the subject matter and activities to which all of the Draft Articles on the law of transboundary aquifers apply, and it establishes the bounds of the Draft Articles. To some extent, this

in water demand as an example).

20. For articles that focus on the science of ground water relevant to ground water law and policy, *see e.g.*, Eckstein & Eckstein, *supra* note 6; Eckstein 2005a, *supra* note 14; Stephen Foster, *Essential Concepts for Groundwater Regulators*, in *GROUNDWATER: LEGAL AND POLICY PERSPECTIVES, PROCEEDINGS OF A WORLD BANK SEMINAR 15* (Salman M.A. Salman ed., 1999).

21. For articles that consider the applicability of the Watercourse Convention to ground water resources, *see e.g.*, Eckstein 2005a, *supra* note 14; Eckstein & Eckstein, *supra* note 6; Kevin P. Scanlan, *The International Law Commission's First Ten Draft Articles on the Law of the Non-Navigational Uses of International Watercourses; Do They Adequately Address All of the Major Issues of Water Usage in the Middle East?*, 19 *FORDHAM INT'L L.J.* 2180 (1996).

22. For articles and books that discuss the history and evolution of international water law, *see e.g.*, Stephen C. McCaffrey, *THE LAW OF INTERNATIONAL WATERCOURSES: NON-NAVIGATIONAL USES* (2001); Ludwik A. Teclaff, *Fiat or Custom: the Checkered Development of International Water Law*, 31 *NAT. RES. J.* 45 (1991). For articles that discuss the history and evolution of ground water under international law, *see e.g.*, Eckstein & Eckstein, *supra* note 6; Julio Barberis, *The Development of International Law of Transboundary Groundwater*, 31 *NAT. RES. J.* 167 (1991).

23. *Fifty-Eighth Session Report*, *supra* note 14, ¶ 75, art. 1, at 185.

formulation tracks closely with the format employed in the 1997 Watercourse Convention in that the Watercourse Convention also focused on issues regarding the uses of the resources, including measures of protection, preservation, and management.²⁴

The scope of the Draft Articles, however, diverges from that of the Watercourse Convention in two significant ways. First, the Draft Articles employ the term “utilization” rather than “use.” This is intended to ensure that the mode of use is also encompassed within the scope of the Draft Articles. While “use” relates specifically to the purpose to which the resource is employed, “utilization” is a broader concept that also considers the mechanism and methodology of use.²⁵ For example, water from an aquifer may be used for the purposes of drinking water. The utilization of that aquifer water, however, also would include the manner in which the water was extracted from the aquifer and delivered for the intended purpose.

Second, the scope of the Draft Articles includes category (b), which relates to activities other than the utilization of the resource “that have or are likely to have an impact upon those aquifers and aquifer systems.”²⁶ This formulation recognizes the unique characteristics and fragility of aquifers in relation to surface bodies of water, and considers activities undertaken above or around an aquifer that could adversely impact that aquifer. Examples of activities that are likely to have an impact on aquifers include industrial and agricultural operations in the recharge zones that might cause harmful contaminants to enter the aquifer, as well as construction, forestry, and other activities that could prevent normal aquifer recharge. Significantly, it also encompasses activities in the matrix of the aquifer—such as mining for the mineral content of the aquifer or construction of subway tunnels through the aquifer matrix—which could have a detrimental impact on the aquifer.²⁷ Certainly, a

24. See Watercourse Convention, *supra* note 13, at Art. 1 on Scope.

25. See *Fifty-Eighth Session Report*, *supra* note 14, ¶ 4, at 196 (Commentary on Art. 1).

26. *Fifty-Eighth Session Report*, *supra* note 14, ¶ 75, art. 1, at 185.

27. Paragraph (b) of Draft Article 1 uses the term “impact” in describing the types of activities that are subject to the Draft Articles—only “other activities that have or are likely to have an impact upon those aquifers and aquifer systems.” Although the term “impact,” by itself, does not necessarily denote a positive or negative effect, the word can be interpreted to have a negative connotation if the context in which it is used is negative. Given that the focus of these Draft Articles is on preventing or addressing negative effects on aquifer states as well as the aquifer or aquifer system, the term is understood in its negative sense. See *Fifty-Eighth Session Report*, *supra* note 14, ¶ 7, at 197 (Commentary to Art. 1). Accordingly, the Draft Articles do not address “other activities” that result or are likely to result in a positive effect on “those aquifers and aquifer

necessary component of this category is that a causal link between the activities and the detrimental effect would have to be established.²⁸

The scope of the Draft Articles is not limited to any specific type of aquifer. Initially, when the UNILC embarked on its present effort to clarify and codify the international law applicable to transboundary ground water resources, it limited its work to address those ground water resources not covered by the Watercourse Convention, namely ground water resources unrelated to surface waters.²⁹ While it was never intended to be comprehensive, the Watercourse Convention does apply to certain types of aquifers while excluding others.³⁰ This limited approach to ground water provoked considerable questions regarding the soundness of the Convention, especially in light of hydrologic reality where clearly demarcated aquifer types do not exist.³¹ Accordingly, the Special Rapporteur, with the Commission's support, decided to discard the restrictive criteria and include all transboundary ground water resources in the scope of his work and of these articles.³²

systems." Of course, what constitutes a positive or negative effect may be subject to debate.

28. See *Fifty-Eighth Session Report*, *supra* note 14, ¶ 6, at 196 (Commentary on Art. 1).

29. *Yamada First Report*, *supra* note 8, at ¶¶ 1, 4, 14, 17–19. The intent was to supplement the Watercourse Convention to the extent that the Convention excludes this type of ground water.

30. The Watercourse Convention defines a "watercourse" as "a system of surface waters and ground waters constituting by virtue of their physical relationship a unitary whole and normally flowing into a common terminus." Watercourse Convention, *supra* note 13, at Art. 2. Thus, the Convention applies only to ground water that: 1) is physically part of a *system* of surface and ground waters; 2) is part of a *unitary whole*; 3) normally flows to a *terminus* that is *common* with the hydraulically linked surface water; and 4) has parts of the system located in *different states*. For an analysis of the scope of the Watercourse Convention and its applicability to various types of aquifers, see Eckstein 2005a, *supra* note 14. Significantly, the amount and types of ground waters excluded from this definition is not insignificant and includes both recharging and non-recharging ground water resources that are unrelated to any surface waters. *Id.*

31. See Eckstein 2005a, *supra* note 14, at 529 (noting that "the Watercourse Convention is heavily focused on surface water resources and does not fully address the world's most significant source of freshwater" and that "the treaty leaves considerable gaps and even generates confusion about the applicability and appropriateness of the Convention's principles to the management (use, allocation, development, regulation, conservation, protection, etc.) of numerous transboundary aquifers"); cf. *Yamada Second Report*, *supra* note 14, ¶ 14 (discussing characteristics of the Nubian Sandstone aquifer in which a small portion of the aquifer is hydraulically related to the Nile River, and would be governed by the Watercourse Convention, but where the majority of the aquifer is hydraulically unrelated to the river and, thereby, not subject to the Convention).

32. *Yamada Second Report*, *supra* note 14, ¶ 14. In his First Report on Outlines, the Special Rapporteur recognized that hydrogeology—the science of ground water—treats

B. Draft Article 2 – Use of Terms

For the purposes of the present draft articles:

- (a) “aquifer” means a permeable water-bearing underground geological formation underlain by a less permeable layer and the water contained in the saturated zone of the formation;
- (b) “aquifer system” means a series of two or more aquifers that are hydraulically connected;
- (c) “transboundary aquifer” or “transboundary aquifer system” means, respectively, an aquifer or aquifer system, parts of which are situated in different States;
- (d) “aquifer State” means a State in whose territory any part of a transboundary aquifer or aquifer system is situated;
- (e) “recharging aquifer” means an aquifer that receives a non-negligible amount of contemporary water recharge;
- (f) “recharge zone” means the zone which contributes water to an aquifer, consisting of the catchment area of rainfall water and the area where such water flows to an aquifer by runoff on the ground and infiltration through soil;
- (g) “discharge zone” means the zone where water originating from an aquifer flows to its outlets, such as a watercourse, a lake, an oasis, a wetland or an ocean.³³

ground water resources as a whole and does not distinguish between aquifers that are related or unrelated to surface waters. *Yamada First Report, supra* note 8, ¶ 22. Thereafter, in his Second Report, he questioned the practicability of creating legal distinctions between different types of ground water resources and proposed a scope that does not distinguish between different aquifer types. *Yamada Second Report, supra* note 14, ¶ 14. One of the concerns resulting from the decision to expand the scope of the Special Rapporteur’s work was the potential overlap or conflict between the scope of the present effort and that of the Watercourse Convention. For example, if the present effort results in an international treaty, it would create the possibility that some transboundary aquifers might be subject to both the new instrument and the Watercourse Convention. *See supra* note 32; *see infra* notes 67–68 and accompanying text. Such a dual application conceivably could create conflicting rights and obligations. Nonetheless, in order not to prejudice the final form of the Draft Articles (e.g., guidelines, U.N. General Assembly resolution, international convention, etc.), the UNILC decided to postpone discussion regarding the need to address the potential for such a conflict. *See Fifty-Eighth Session Report, supra* note 14, ¶ 2 (Commentary on Art. 1). If the Draft Articles do develop into a binding international instrument, the new treaty and the Watercourse Convention would have to be harmonized.

33. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 2, at 185–86.

Article 2 of the Draft Articles provides definitions for seven terms employed in the articles. Each will be addressed in turn. While the definitions have been subjected to legal scrutiny, they are technical in nature and intended for use by water engineers, scientists, and water management administrators.³⁴ This is largely based on the Special Rapporteur's effort to seek the counsel of hydrogeologists, water policy specialists, and other experts as well as his desire to ensure that the terminology used and the principles formulated are both technically precise and legally sound.³⁵

1. Aquifer

Of all of the terminology defined, none is as intricate and involved as the definition of the term "aquifer."³⁶ Notably, this definition reflects a compromise between scientists and jurists.³⁷ It provides some of the

34. See William Mansfield, Statement of the Chairman of the Drafting Committee Mr. Roman A. Kolodkin, Shared Natural Resources, 3 (June 9, 2006) (on file with author) (stating that the "draft articles deliberately uses technical terms since they are intended for use by scientific personnel and water management administrators").

35. To his great credit, the Special Rapporteur arranged through the International Hydrological Programme of the UN Educational, Scientific, and Cultural Organization to organize an interdisciplinary panel of specialists to advise him in this task. In addition to international legal experts, the panel is composed of hydrogeologists, water engineers, water policy professionals, international legal experts, and academics, including the present author. See generally *Yamada First Report*, supra note 8, ¶¶ 22–23; *Yamada Second Report*, supra note 14, ¶ 6; and *Yamada Third Report*, supra note 14, ¶¶ 1, 3 (recognizing the "valuable assistance from experts under the auspices of UNESCO").

36. The first definition offered by the Special Rapporteur appears in his Second Report: "a permeable water-bearing rock formation capable of yielding exploitable quantities of water." *Yamada Second Report*, supra note 14, ¶ 16. While accepted by the scientific community, and based on the meaning found in the *International Glossary of Hydrology* (UNESCO-WMO, 2nd ed. 1992), available at <http://www.cig.ensmp.fr/~hubert/glu/aglo.htm> (last visited Jan. 3, 2007), the definition suffered from a number of legal and policy concerns. For example, the use of the term "exploitable" would exclude aquifers that are not "exploitable" in the present (i.e., for technological or economic reasons), but which might be "exploitable" in the future. Similarly, the term "quantities" intimates the present production requirement of a minimum volume of water in order for a water-bearing rock formation to be deemed an aquifer. The effect of such language could jeopardize the future development of water-bearing strata that are not yet exploitable or whose productivity presently is low, but which in the future could become more productive. See G. Eckstein, *Protecting A Hidden Treasure: The U.N. International Law Commission and the International Law of Transboundary Ground Water Resources*, 5 AMER. UNIV. SUSTAINABLE DEVEL. L. & POL'Y 5, 7 (2005) [hereinafter Eckstein 2005b].

37. For example, most hydrogeologic texts define an aquifer in terms of its potential for storing, transmitting, and producing water in usable quantities. See e.g., C.W. Fetter, *APPLIED HYDROGEOLOGY* 110 (3d ed. 1994); see Michael Price, *INTRODUCING GROUND*

precision in terminology and definition needed by regulators, policy-makers, and lawyers to implement the required obligations, as well as the technical concepts and conceptual flexibility needed by ground water scientists and managers of the resource.

Notwithstanding, two concerns exist regarding the definition that require attention. The first regards the unintended consequence of the Commission's decision to exclude the recharge and discharge zones from the definition of aquifer. Since this concern requires combining the definitions of "aquifer," "transboundary aquifer," "recharge zone," and "discharge zone," along with provisions found in Draft Article 10 on recharge and discharge zones, it will be addressed in more detail in the discussion on Draft Article 10³⁸ as well as Draft Article 5(1)(d).³⁹ The analysis shows that aquifers with a recharge or discharge zone in a non-aquifer state would be absolutely excluded from the scope of the Draft Articles, a consequence that was not intended by the Special Rapporteur or the Commission.

The second concern pertains to the dynamic interpretation ascribed to an aquifer that is created by the definition of aquifer in Draft Article 2. Under the definition, a portion of a geologic formation that constitutes an aquifer today, particularly an unconfined aquifer,⁴⁰ might not be

WATER 9 (1996). The current definition, however, no longer refers to yield, quantity, or exploitability—definitional characteristics favored by hydrogeologists. From a strictly legal perspective, such descriptors would exclude aquifers that do not currently yield or produce some quantity of water or which are currently "exploitable" for technological or economic reasons, but which might be capable of such qualities in the future. See Eckstein 2005b, *supra* note 36, at 7. The definition, however, retains the term "permeable," which although may lead to debates over degrees of permeability, is critical to differentiating between a geologic formation that constitutes an aquifer and one that does not.

In contrast, the International Law Association in its 1986 Seoul Rules understood "aquifer" to mean "all underground waters bearing strata capable of yielding water on a practical basis . . . including the waters in fissured or fractured rock formations and the structures containing deep, so-called 'fossil waters.'" INT'L LAW ASS'N, *The Seoul Rules on International Groundwaters*, in REPORT OF THE SIXTY SECOND CONFERENCE 251, art. 1 (1987), available at http://www.internationalwaterlaw.org/IntlDocs/Seoul_Rules.htm (last visited Oct. 13, 2006).

38. See *infra* notes 178–179 and accompanying text.

39. See *infra* notes 107–108 and accompanying text.

40. An unconfined aquifer, also known as a water-table aquifer, is an aquifer bounded by an impermeable base layer of rock or sediments and overlain by layers of permeable materials extending from the land surface to the impermeable base of the aquifer. See Herman Bouwer, GROUNDWATER HYDROLOGY 3–4 (1978) (providing a technical explanation of unconfined aquifers); see also Eckstein & Eckstein, *supra* note 6, at 210–11.

considered an aquifer tomorrow. The definition of an aquifer found in the Draft Article is dependent on the water content of a geologic formation, whether defined by the terms "water-bearing" or "saturated."⁴¹ Aquifers and ground water, however, are typically in a state of flux, meaning that the volume of water contained and/or flowing through the geologic formation is constantly changing. These changes are the result of variations in the amount of water flowing into (recharge) and out of (discharge) the saturated zone. Thus, in the case of an unconfined aquifer, the result is that the location of the water table⁴² will fluctuate in relation to the volume of water that flows into and out of the aquifer matrix. For example, the water table will drop during a drought or when human withdrawals exceed recharge.⁴³ In such cases, the portion of the matrix that is defined as an "aquifer" would decrease in size and area. Conversely, the water table will rise as a result of increased recharge (e.g., due to rainfall) or a reduction in human withdrawals.⁴⁴ In these circumstances, a rise in the water table would increase the size and geography of the saturated zone and, thereby, increase the portion of the geologic formation that conforms to the definition of an "aquifer."

As a result of this "dynamic" interpretation, the physical and geographic demarcation of an unconfined aquifer could fluctuate on a weekly, daily, or even an hourly basis as a result of changes in the rate of withdrawal, large rainfalls, droughts, seasonal and climatic variations, and other factors. While such a dynamic definition is not necessarily objectionable, it reflects the complexities involved in the regulation and administration of ground water resources and is a factor that must be considered and integrated into aquifer management practices. Moreover, it could serve as a complicating factor for aquifer States in their effort to identify the physical scope of a transboundary aquifer underlying their territories.

41. The term "water-bearing" is employed for the purpose of differentiating between geologic formations containing ground water and those containing deposits of oil or gas, while the term "saturated" is used to designate the water in the matrix that is defined as a component of an aquifer. See *Fifty-Eighth Session Report, supra* note 14, ¶¶ 2, 3, at 199 (Commentary on Art. 2).

42. The water table is the top or upper limit of the saturated portion of an aquifer. Price, *supra* note 37, at 6.

43. Cf. H. Bouwer, *GROUND WATER HYDROLOGY* 4 (1978) (noting that the water table in an unconfined aquifer will drop when water is extracted from the aquifer); Michael Price, *Introducing Groundwater*, 111-19 (1996) (discussing the impact of droughts on ground water resources in England).

44. See Fetter, *supra* note 37, at 107-09 (explaining the dynamics of a water table with analogies and noting that continuing rainfall infiltrating the soil will cause the water table to rise).

Additionally, while the intent of the UNILC's effort was to address ground water resources, the phrase "ground water" is not defined and does not appear anywhere in the Draft Articles. In formulating the articles and principles contained therein, Special Rapporteur Yamada opted to focus on "aquifers and aquifer systems" rather than on ground water. He did so following various meetings and discussions with water and legal experts surrounding the scientific and legal meaning of "ground water." He concluded that the term "ground water" was cumbersome and legally imprecise for the purpose of a legal instrument.⁴⁵ In contrast, Yamada found the terms "aquifer" and "aquifer systems," as defined in Draft Article 2,⁴⁶ more technically and legally precise.⁴⁷

In adopting the Special Rapporteur's approach, the UNILC acknowledged the complexity of the subject matter and the need to ensure that the definition was grounded in both sound science and legal analysis. Although some concerns remain with the current definition of the term "aquifer,"⁴⁸ the focus on "aquifer" and "aquifer systems" has a profound and important effect on the interpretation of the other Draft Articles. Rather than merely addressing ground water resources, the language now encompasses the matrix, the water contained therein, and the interrelated strata surrounding the rock formation directly. Arguably, this new language is a considerable step toward developing an interdisciplinary approach to ground water management. From a hydrogeological perspective, it is inconceivable that any authority could manage or regulate ground water without considering the aquifer matrix and the interrelated adjacent formations.

2. *Aquifer System*

The inclusion of an "aquifer system" concept in the Draft Articles provides strong evidence that in their current study of transboundary ground water resources, the Special Rapporteur and the UNILC recognized the need to codify and progressively develop principles that are grounded in the science of water. In defining an "aquifer system" as "a series of two or more aquifers that are hydraulically connected," the UNILC recognizes two interrelated and important aspects of ground water resources.⁴⁹ By endorsing the systems approach, the UNILC acknowledges that aquifers in nature are often found as part of a complex

45. *Yamada Second Report, supra* note 14, ¶ 12.

46. *Supra* notes 36–46, *infra* notes 47–53 and accompanying text.

47. *Yamada Second Report, supra* note 14, ¶ 12.

48. *Supra* notes 38–47 and accompanying text.

49. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 2, at 185.

hydrogeological network of hydraulically interrelated water resources.⁵⁰ For example, the Mountain—West Bank—Aquifer underlying the foothills bordering the Israeli coastal plain and the Jordan-Dead Sea Rift Valley, is comprised of two aquifers overlying each other that are separated by material of lower permeability.⁵¹ Transmission of water from one aquifer to the other takes place either through the lower permeability material as a result of differences in hydrostatic pressure, or through fractures and fissures in the strata. The result is a hydraulically interrelated system.⁵² Additionally, by endorsing the systems approach, the UNILC seemingly accepts the principle of hydrologic unity, namely that hydraulically interrelated bodies of water (at least hydraulically connected aquifers) should be managed collectively.⁵³ This acknowledgement is ideal and clearly necessary because harm that

50. Cf. *Fifty-Eighth Session Report*, *supra* note 14, ¶ 4, at 200 (Commentary on Art. 2). In the commentary to Draft Art. 2, the UNILC explains that “‘hydraulically connected’ refers to a physical relationship between two or more aquifers whereby an aquifer is capable of transmitting some quantity of water to the other aquifer . . .” Moreover, it notes that a true hydraulic connection necessarily relates to more than a *de minimis* amount of water. The standard for determining whether the quantity of the transmitted water is significant enough to qualify two adjacent aquifers as an “aquifer system” “is directly related to the potential of the transmitting aquifer to have an effect on the quantity or quality of waters in the receiving aquifer[.]” Accordingly, the determination of whether the aquifers should be treated as a system must be conducted on a case by case basis. *Id.* This is especially important in determining which of a series of aquifers near an international border constitute a transboundary aquifer system for the purposes of the Draft Articles. If the hydraulic potential between a truly transboundary aquifer or aquifer system with an adjacent aquifer is *de minimis*, the latter aquifer would not be part of the system and would not be subject to the Draft Articles.

51. See Avihu Burg, et. al., *Changes in Water Quality Along the Water Flow From the Recharge Area to the Confined Area – The Western Mountain Aquifer, Kefaruriyya Case Study*, Water for Life in the Middle East, 2d Israeli-Palestinian-International Conference, Turkey, Oct. 10–14, 2004, 5 (<http://www.ipcri.org/files/water/water-papers.html>), available at <http://www.ipcri.org/watconf/papers/avihu.pdf> (last visited Jan. 4, 2007) (noting that “[r]elatively thick marly units divide the aquifer into two sub-aquifers”).

52. *Id.* at 8 (describing seepage through fractures and fissures in the chalky layers).

53. *Yamada Second Report*, *supra* note 14, at ¶ 18. In his Second Report, the Special Rapporteur asserts that such “aquifers must be treated as a single system for proper management.” *Id.* The doctrine of hydrologic unity is not new to the UNILC as they had previously recognized it in their work on the Watercourse Convention. The Watercourse Convention defines a “watercourse” as “a system of surface waters and ground waters constituting by virtue of their physical relationship a unitary whole and normally flowing into a common terminus.” Watercourse Convention, *supra* note 13, at art. 2. The doctrine of hydraulic unity is related to the concept of conjunctive use, which concerns the combined use of surface and ground water to optimize resource use and minimize adverse effects of using a single source. See Fetter, *supra* note 37, at 538–40 (discussing conjunctive use of surface and ground water).

befalls one aquifer, such as pollution of the aquifer or a reduction in recharge, could result in similar harm to other hydraulically connected aquifers in the system.

3. *Transboundary Aquifer*

Use of the term “transboundary” in the UNILC’s work on ground water resources is intentional and of considerable consequence. Subparagraph (c) of Article 2 provides that “‘transboundary aquifer’ or ‘transboundary aquifer system’ means, respectively, an aquifer or aquifer system, parts of which are situated in different States.”⁵⁴ Under the original mandate from the UNILC, the Special Rapporteur was tasked with addressing ground water resources within the rubric of “shared natural resources.”⁵⁵ Following the submission of his First Report, various Members of the UNILC and its parent body, the Sixth Committee of the United Nations expressed considerable doubt about the use of the term “shared.”⁵⁶ The term “shared” intimates collective ownership and suggests that the resource at issue may be subject to common or equal ownership and potentially to the common heritage of humankind.⁵⁷ Referring to the UN General Assembly Resolution 1803 (XVII) on “Permanent Sovereignty over Natural Resources,”⁵⁸ some UNILC and Sixth Committee Members voiced their opposition to the possibility that a transboundary aquifer could be collectively owned.⁵⁹

54. *Fifty-Eighth Session Report*, *supra* note 14, ¶ 75, art. 2, at 185.

55. *See Yamada First Report*, *supra* note 8, ¶¶ 2–5.

56. *Yamada Second Report*, *supra* note 14, ¶¶ 2–4.

57. *Id.* ¶ 4; *see* Chusei Yamada, *Excerpts from Summary Records of the Debate on the Topic of Shared Natural Resources in the Sixth Committee During the 59th Session of the UN General Assembly in 2004, 21st Meeting 5 November 2004*, ¶ 25, U.N. Doc. A/C.6/59/SR.21 (Nov. 2004) (relating the statements of Mr. Kendall of Argentina) (on file with author)[hereinafter Statement of Kendall]; Chusei Yamada, *Excerpts from Summary Records of the Debate on the Topic of Shared Natural Resources in the Sixth Committee During the 59th session of the UN General Assembly in 2004, 23rd Meeting on 8 November 2004*, ¶ 18, U.N. Doc. A/C.6/59/SR.23 (Nov. 2004) (relating the statement of Mr. Zanelli of Peru) (on file with author).

58. Permanent Sovereignty over Natural Resources, G.A. Res. 1803 (XVII), 17 U.N. GAOR Supp. (No.17), U.N. Doc. A/5217 (1962), *available at* <http://www1.umn.edu/humanrts/instree/c2psnr.htm> (last visited Jan. 11, 2007); *see also* Karol N. Gess, *Permanent Sovereignty Over Natural Resources: An analytical review of the United Nations declaration and its genesis*, 13 ICLQ 398 (1964) (discussing the origins of Resolution 1803).

59. *See Report of the International Law Commission on the Work of its Fifty-Sixth Session, Shared Natural Resources*, U.N. GAOR, 59th Sess. Supp. No. 10, U.N. Doc. A/59/10 (2004) ¶ 54, at 28., *available at* <http://untreaty.un.org/ilc/reports/2004/2004report.htm> (last visited Mar. 11, 2007)

Given such sensitivities, and with the support of the UNILC, the Special Rapporteur amended the focus of his work to “transboundary” ground water resources.⁶⁰

While this change in terminology mollified most Members, this language is a departure from the approach used in the Watercourse Convention, which concerns “international” watercourses. In the Watercourse Convention an “international watercourse” is defined as “a watercourse, parts of which are situated in different States.”⁶¹ While the use of the different terms may appear to be semantics, these words are significant in that they determine which aquifers fall under the rubric of the Watercourse Convention, which fall under the present Draft Articles, and which might fall under the scope of both.

In his First Report, the Special Rapporteur explains that an aquifer is international where it is “part of a system where groundwater interacts with surface water that is at some point intersected by a boundary.”⁶² Thus, a purely domestic aquifer hydraulically linked to a river traversing an international political boundary would constitute an international aquifer,⁶³ or an aquifer that is a part of an international watercourse, for the purposes of the Watercourse Convention.⁶⁴ However, such an aquifer

[hereinafter *Fifty-Sixth Session Report*]. The representative from Argentina, for example, argued that while a transboundary aquifer may be subject to shared management by the States in which the aquifer was situated, the concept of a “shared” natural resource must not imply that the aquifer constituted a shared heritage of mankind or was subject to collective ownership. See Statement of Kendall, *supra* note 57. He also suggested that ground water resources can be treated in a manner similar to that of oil and gas deposits with regard to their ownership, albeit not with regard to their use, management, protection, and preservation. *Id.* Likewise, the representative from Jordan argued for an explicit reference to General Assembly Resolution 1803 (XVII) on permanent sovereignty over natural resources to ensure that ground water is not regarded as a common heritage of humankind. See Chusei Yamada, *Excerpts from the Summary Records of the Debate on the Topic of Shared Natural Resources in the 6th Committee During the 60th Session of the General Assembly in 2006*, (Oct. 20, 2006) ¶ 27 (relating statement of Mr. Hmoud of Jordan) (on file with author).

60. *Yamada Second Report*, *supra* note 14, ¶¶ 2–4.

61. Watercourse Convention, *supra* note 13, art. 2(b).

62. *Addendum to First Report on Outlines*, *supra* note 15, ¶ 13.

63. It is noteworthy that, as used here, the term “international” does not suggest that the resource is “internationalized” or otherwise subject to a common heritage. See *supra* note 56–60 and accompanying text (discussing opposition to common or internationalized ownership).

64. It is noteworthy that the reverse relationship—an aquifer that traverses a political boundary and is hydraulically connected to a purely domestic river—probably would not constitute an international watercourse and, thus, would not fall under the rubric of the Watercourse Convention. Under the Watercourse Convention, the surface body of water (e.g., river or lake) that is part of the watercourse must traverse an

would not fulfill the characteristics of a transboundary aquifer for the purposes of the present Draft Articles. The Special Rapporteur defines a “transboundary” aquifer as a “groundwater body that is intersected by a boundary itself.”⁶⁵ The defining criterion for this category is that the aquifer must traverse an international political boundary to fall under the scope of the Draft Articles. In addition, given the definition of aquifer systems,⁶⁶ it logically follows that a purely domestic aquifer hydraulically linked to a transboundary aquifer would constitute a part of a transboundary aquifer system and, thereby, also fall under the scope of the Draft Articles.

Some aquifers, however, could fall under both the Watercourse Convention and the present Draft Articles. This duality would occur where a transboundary aquifer or aquifer system has a hydraulic relationship with a transboundary river. In such a case, the transboundary nature of the river, coupled with the river’s hydraulic relationship with the aquifer, would make it subject to the Watercourse Convention. However, the aquifer’s transboundary character would also subject it to the present Draft Articles. The dual application of the two, conceivably, could create conflicting rights and obligations.⁶⁷ Since the UNILC has not yet determined the form that the present Draft Articles would take—e.g., mere guidelines or a binding framework convention—the Commission postponed consideration of the possibility of such overlapping or conflicting scopes.⁶⁸ If the Draft Articles develop into a binding international instrument, the new treaty and the Watercourse Convention would have to be harmonized or a process would have to be developed to determine which instrument applies.

In addition, two other aquifer scenarios should be considered. The first is an aquifer or aquifer system that traverses an international boundary but has no hydraulic relationship with any surface water resources. Examples of this aquifer type include the Nubian Sandstone Aquifer underneath Chad, Egypt, Libya, and Sudan; the Complex Terminal Aquifer underlying Algeria and Tunisia and possibly extending underneath Libya and Morocco; the Continental Interclaire Aquifer underlying Algeria and Tunisia and possibly Libya and Morocco; and the

international political boundary for that watercourse to fall under the Watercourse Convention. See Eckstein 2005a, *supra* note 14, at 554–55 (discussing the types of aquifers that fall within and outside the scope of the Watercourse Convention); Eckstein & Eckstein, *supra* note 6, at 241.

65. *Addendum to First Report on Outlines*, *supra* note 15, ¶ 13.

66. See *supra*, notes 49–53 and accompanying text.

67. See *supra* note 32.

68. See *Fifty-Eighth Session Report*, *supra* note 14, ¶ 2 (Commentary to Art. 1).

Qa-Disi Aquifer underlying southern Jordan and northern Saudi Arabia.⁶⁹ The second scenario is the same solitary transboundary aquifer or aquifer system with the added component of a hydraulic relationship to a river or lake that geographically is entirely domestic. The Mimbres Basin Aquifer traversing northern Mexico and the U.S. state of New Mexico is an examples of such an aquifer.⁷⁰ In both cases the aquifer or aquifer system would constitute a transboundary aquifer or aquifer system for the purpose of the present Draft Articles. However, given that the two resources described do not fulfill the unique criteria of an international watercourse neither would fall under the rubric of the Watercourse Convention.⁷¹

The consequence of this categorization exercise shows that not all transboundary aquifers can be classified as international aquifers, and not all international aquifers constitute transboundary aquifers.⁷² The key is determining whether or not the aquifer at issue traverses an international political boundary. From a practical perspective, making such a determination presents a much more difficult task than making a similar determination for a river. The very fact that aquifers are hidden from sight requires more sophisticated approaches that rely on various technologies and methodologies including well drilling, core sampling, isotope tracing, conceptual modeling, and other science-based tactics. Such assessments are essential for determining which set of international norms govern the resource. Accordingly, as noted above, the present set of definitions has a strong foundation in the science of water. The consequence, though, is that scientific research and understanding becomes critical for the proper application of the Draft Articles.

4. *Aquifer State*

Under the Draft Articles, “‘aquifer State’ means a State in whose territory any part of a transboundary aquifer or aquifer system is situated.”⁷³ In proffering this definition, the Special Rapporteur and UNILC narrowly identify the parties who can hold direct interests in a

69. See Eckstein & Eckstein, *supra* note 6, at 248 (identifying aquifers that fit under this aquifer type).

70. *Id.* at 242.

71. See *supra* notes 30 & 64; see generally Eckstein 2005a, *supra* note 14 (discussing the scope of the Watercourse Convention and the criteria required for a surface or ground water body to fall under that scope).

72. In contrast, the Special Rapporteur had previously suggested that transboundary aquifers might be a sub-category of international aquifers. See *Addendum to First Report on Outlines*, *supra* note 15, ¶ 13.

73. *Fifty-Eighth Session Report*, *supra* note 14, ¶ 75, art. 2, at 185.

transboundary aquifer. This reflects the great concern voiced by various Members of the UNILC regarding state sovereignty over natural resources. That concern is considered below in the discussion on Article 3.⁷⁴

5. Recharging Aquifer

A “recharging aquifer” is defined in the Draft Articles as “an aquifer that receives a non-negligible amount of contemporary water recharge.”⁷⁵ While not offered in the Draft Articles, it is logical to infer the corollary definition that a non-recharging aquifer is one that receives a negligible amount of contemporary water recharge.⁷⁶

The Special Rapporteur gave considerable attention to the differences between recharging and non-recharging aquifers.⁷⁷ Specifically, discussion focused on the differences in the functioning of the two aquifer types and the possible need for different regulations and management schemes. The issues considered the sustainability of a recharging aquifer versus a non-recharging aquifer and what sustainability might mean for both, the potential of both aquifer types, and the susceptibility of both aquifer types to pollution.⁷⁸

Initially, draft provisions relating to equitable and reasonable utilization contained different rules for recharging and non-recharging aquifers.⁷⁹ More general rules eventually were adopted thereby eliminating the need for distinction.

74. See *infra* notes 89–96 and accompanying text.

75. *Fifty-Eighth Session Report*, *supra* note 14, ¶ 75, art. 2, at 185.

76. Earlier drafts of the articles included the above definition of non-recharging aquifer. See *Yamada Third Report*, *supra* note 15, ¶ 7; see also Eckstein 2005a, *supra* 14, at 558–59. It was removed when the phrase non-recharging aquifer was eliminated from the Draft Articles.

77. See *Yamada Third Report*, *supra* note 15, ¶ 10.

78. See *Id.* ¶ 21. A non-recharging aquifer, for example, could never be managed sustainably because any withdrawal would eventually exhaust the resource. See Eckstein 2005a, *supra* note 14, at 559. In contrast, a recharging aquifer can be pumped at a level equal to or below the rate of recharge. In addition, certain conditions may make a non-recharging aquifer more susceptible to pollution than a recharging aquifer since a recharging aquifer could filter out the pollutants over time. *Id.* at 560.

79. Under prior formulations of the Draft Articles, sustainability was a significant factor applied to the uses of recharging aquifers. Moreover, the use of such aquifers was constrained to not impair the natural functioning of the aquifer. In contrast, prior drafts obligated States to “maximize the long-term benefits” obtained from the use of the water in non-recharging aquifers, and encouraged States “to establish a development plan” for the aquifer based agreed-upon life span for the aquifer, future water needs, and the availability of alternative water sources. See *Yamada Third Report*, *supra* note 15, ¶ 17.

6. Recharge and Discharge Zones

The final definitions provided in the Draft Articles relate to the recharge and discharge zones of an aquifer. Recharge zone is defined as “the zone which contributes water to an aquifer, consisting of the catchment area of rainfall water and the area where such water flows to an aquifer by runoff on the ground and infiltration through soil.”⁸⁰ A discharge zone is defined as “the zone where water originating from an aquifer flows to its outlets, such as a watercourse, a lake, an oasis, a wetland or an ocean.”⁸¹

By providing specific definitions for the two zones, and by formulating principles that specifically address their unique characteristics,⁸² the UNILC and Special Rapporteur recognized the importance of the recharge and discharge process to the overall hydrologic process and the normal functioning of aquifers.⁸³ This understanding is crucial because from a hydrogeological perspective, it is impossible to manage or protect an aquifer without considering these two zones. What occurs in these two zones has a direct impact on the health and viability of the aquifer.⁸⁴

III. DRAFT ARTICLES ON GENERAL PRINCIPLES

In many respects, the Draft Articles on the law of transboundary aquifers follow and build on the provisions found in the Watercourse Convention. In fact, in his Second Report, the Special Rapporteur asserts

80. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 2, at 186.

81. *Id.*

82. *See infra* notes 168–179 and accompanying text (discussing principles found in Draft Art. 10).

83. The “functioning” of an aquifer refers to how a particular aquifer works or operates as an aquifer. Aquifers typically store and transport water, dilute wastes and other contaminants, provide a habitat for aquatic biota, and serve as a source of fresh water and nutrients to aquifer-dependent ecosystems. Some aquifers even provide geothermal heat. Each of these scenarios comprises a function of an aquifer. In all cases, such functions are dependent on the particular aquifer’s hydrostatic pressure, hydraulic conductiveness, and mineralogical, biological, and chemical attributes, and may be interdependent to the extent that the aquifer’s continued operation, in turn, depends on the continuation of the particular function or series of functions. *See generally*, R.C. Heath, *Basic Ground-Water Hydrology*, Water Supply Paper 2220, 14–15 (U.S. Geological Survey, 1994)(1983), available at http://onlinepubs.er.usgs.gov/djvu/wsp/WSP_2220.pdf (last visited Mar. 8, 2007) (describing the basic “functions” of ground water systems).

84. *Id.* (discussing the role of recharge and discharge zones in the functioning of an aquifer).

that with regard to the study on transboundary ground water resources, “[t]here is no doubt that the most relevant existing general treaty is the 1997 [Watercourse] Convention.”⁸⁵ Moreover, following completion of the Draft Articles on the Watercourse Convention, the UNILC prepared a Resolution on Confined Transboundary Groundwater that recommended application of the same principles to non-recharging aquifers.⁸⁶ Nonetheless, given the unique characteristics of ground water resources, the extent to which that Convention might serve as a model is open to discussion. In fact, various Members of both the Commission and the Sixth Committee expressed considerable doubts about the idea of using the Watercourse Convention as the prototype for the Draft Articles.⁸⁷

While surface and ground water resources share numerous similarities that might indicate the applicability of the same management regime, ground water has unique characteristics that must be considered carefully when contemplating a transboundary regulatory scheme. For example, ground water is typically more vulnerable than surface water to pollution and other forms of contamination because it generally flows at much slower rates than surface water. The slow flow can result in contamination and other problems manifesting at equally slower rates, as compared to contamination of surface waters, as well as a reduction in an aquifer’s natural recuperative abilities. Additionally, reclamation of a polluted aquifer, if at all possible, can be extremely difficult and expensive and can render the aquifer unusable for years, decades, or longer. Moreover, due to its physical location, ground water is relatively more difficult and costly to monitor than surface waters. Finally, certain aquifer types have unique characteristics not found in surface waters, such as non-recharging aquifers, which, by definition, cannot be used sustainably.⁸⁸ Accordingly, the applicability of surface water law to

85. *Yamada Second Report*, *supra* note 14, ¶ 7.

86. *Resolution on Confined Transboundary Groundwater*, 2 Y.B. INT’L L. COMM’N 135, U.N. Doc. A/CN.4SER.A/1994/Add.1 (Part 2). The Resolution provides, in pertinent part:

“The International Law Commission . . .

1. Commends States to be guided by the principles contained in the draft articles on the law of the non-navigational uses of international watercourses, where appropriate, in regulating transboundary groundwater;
2. Recommends States to consider entering into agreements with the other State or States in which the confined transboundary groundwater is located;”

87. *Yamada Second Report*, *supra* note 14, ¶ 7; *Fifty-Eighth Session Report*, *supra* note 14, ¶ 2, at 193.

88. See Ludwick A. Teclaff & Eileen Teclaff, *Transboundary Ground Water Pollution: Survey and Trends in Treaty Law*, 19 NAT. RES. J. 629, 632 (1979) (describing

ground water resources must be examined carefully, keeping in mind the similarities and differences of surface and ground water, the relationship between the two resources, and the science of water. This is especially important with regard to the general principles related to the utilization, allocation, and management of transboundary aquifers.

A. Draft Article 3 – Sovereignty of Aquifer States

Each aquifer State has sovereignty over the portion of a transboundary aquifer or aquifer system located within its territory. It shall exercise its sovereignty in accordance with the present draft articles.⁸⁹

When dealing with natural resources in the international arena, sovereignty is always a limiting factor, at the very least, to the extent that States brandish the argument to protect domestic—typically economic interests—or to extract equivalent international concessions.⁹⁰ The subject of ground water is no exception.

Throughout much of the debate leading to the Draft Articles, numerous Members of the UNILC and of the Sixth Committee opined that permanent sovereignty over natural resources was central to the subject matter and must be recognized in the Draft Articles.⁹¹ Some argued for specific reference to the General Assembly's Resolution on Permanent Sovereignty over Natural Resources⁹² in the preamble, while others argued for a separate article devoted to the issue of sovereignty.⁹³

some of the differences between ground water and surface water pollution); Eckstein 2005b, *supra* note 14, at 8; *see also Yamada Third Report, supra* note 15, ¶32.

89. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 3, at 186.

90. *See generally* Ian Brownlie, *PRINCIPLES OF PUBLIC INTERNATIONAL LAW*, ch. 6 (2003) (discussing basic concepts of territorial sovereignty); Brad R. Roth, *The Enduring Significance of State Sovereignty*, 56 FL. L. REV. 1017 (2004) (concluding that “respect for sovereign prerogative continues to be a central feature of the international legal system, limiting both the establishment of binding obligations and the means by which established obligations can be enforced”); Anne C. Dowling, “*Un-Locke-ing*” a “*Just Right*” *Environmental Regime: Overcoming the Three Bears of International Environmentalism – Sovereignty, Locke, and Compensation*, 26 WM. & MARY ENVTL. L. & POL’Y REV. 891 (2002) (describing the conflict between sovereignty and environmentalism).

91. *See supra* notes 58–59 and accompanying text.

92. *See supra* note 58 and accompanying text.

93. *See e.g., Yamada Third Report, supra* note 15, ¶ 4; General Assembly, Official Records of the Fifty-Eighth Session, Summary Record of the 20th Meeting, U.N. GAOR 58th Sess., U.N. Doc. A/C.6/58/SR.20, ¶¶ 71, 74; General Assembly, Official Records of the Fifty-Eighth Session, Summary Record of the 21st Meeting, U.N. GAOR 58th Sess.,

The latter were particularly concerned with dispelling the notion that ground water resources might be subject to a common heritage of humankind.⁹⁴ Still, others doubted whether there was any role for the principle of sovereignty given that if transboundary aquifers were recognized as shared natural resources, no aquifer State could rightly claim permanent sovereignty over such resources. Moreover, they contended that it was highly unlikely that the principle of sovereignty would be undermined or diminished even if excluded from the Draft Articles.⁹⁵

In the end, those arguing for an explicit recognition of sovereignty in a separate article succeeded in their objective, at least in form. Draft Article 3 provides that: “Each aquifer State has sovereignty over the portion of a transboundary aquifer or aquifer system located within its territory. It shall exercise its sovereignty in accordance with the present draft articles.”⁹⁶ Careful scrutiny, though, suggests that some measure of compromise also was achieved. The first sentence of Draft Article 3 certainly comports with traditional notions of sovereignty over natural resources. The second sentence, however, tempers that position in that it explicitly recognizes that sovereignty is not absolute and that aquifer States “shall” moderate their rights to ensure that their actions adhere to the requirements of the Draft Articles. In essence, States that agree to the terms of the Draft Articles relinquish some measure of sovereignty to the extent that they give up their sovereign right to act contrary to the Draft Articles.

Although innocuous in appearance, this latter language ultimately may strengthen the position of those who argued for a limited role for sovereignty in the Draft Articles. By explicitly obligating States to “exercise their sovereign rights in accordance with the present draft articles,” Draft Article 3 unambiguously limits the right and ability of aquifer States to claim permanent sovereignty over natural resources, even over the portion of a transboundary aquifer or aquifer system located within their territory. This is because the principles contained in the Draft Articles, such as equitable and reasonable utilization, no significant harm, exchange of data, monitoring, and others clearly place

U.N. Doc. UA/C.6/58/SR.21, ¶¶ 24, 44, 52; Fifty-Fifth Session Report, *supra* note 88, ¶ 397, at 265; Report of the International Law Commission on the Work of its Fifty-Fifth Session, Shared Natural Resources, U.N. GAOR 59th Sess., Supp. No. 10, U.N. Doc. A/59/10 (2004), ¶ 115, at 135, *available at* <http://untreaty.un.org/ilc/reports/2004/2004report.htm>; *Fifty-Sixth Session Report, supra* note 59, ¶¶ 54, 77, at 28.

94. See *supra* notes 56–60 and accompanying text.

95. See *Fifty-Sixth Session Report, supra* note 59, ¶¶ 54–55, at 28–29.

96. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 3, at 186.

considerable restrictions and obligations on what aquifer States can do with regard to the utilization of a transboundary aquifer. These obligations implicitly, if not explicitly, prevent aquifer States from sustaining claims of absolute sovereignty.

B. Draft Article 4 – Equitable and Reasonable Utilization & Draft Article 5 – Factors Relevant to Equitable and Reasonable Utilization

Draft Article 4:

Aquifer States shall utilize a transboundary aquifer or aquifer system according to the principle of equitable and reasonable utilization, as follows:

- (a) they shall utilize the transboundary aquifer or aquifer system in a manner that is consistent with the equitable and reasonable accrual of benefits therefrom to the aquifer States concerned;
- (b) they shall aim at maximizing the long-term benefits derived from the use of water contained therein;
- (c) they shall establish individually or jointly an overall utilization plan, taking into account present and future needs of, and alternative water sources for, the aquifer States; and
- (d) they shall not utilize a recharging transboundary aquifer or aquifer system at a level that would prevent continuance of its effective functioning.⁹⁷

Draft Article 5:

1. Utilization of a transboundary aquifer or aquifer system in an equitable and reasonable manner within the meaning of draft article 4 requires taking into account all relevant factors, including:

- (a) the population dependent on the aquifer or aquifer system in each aquifer State;
- (b) the social, economic and other needs, present and future, of the aquifer States concerned;
- (c) the natural characteristics of the aquifer or aquifer system;
- (d) the contribution to the formation and recharge of the aquifer or aquifer system;

97. *Id.* art. 4.

- (e) the existing and potential utilization of the aquifer or aquifer system;
- (f) the effects of the utilization of the aquifer or aquifer system in one aquifer State on other aquifer States concerned;
- (g) the availability of alternatives to a particular existing and planned utilization of the aquifer or aquifer system;
- (h) the development, protection and conservation of the aquifer or aquifer system and the costs of measures to be taken to that effect;
- (i) the role of the aquifer or aquifer system in the related ecosystem.

2. The weight to be given to each factor is to be determined by its importance with regard to a specific transboundary aquifer or aquifer system in comparison with that of other relevant factors. In determining what is equitable and reasonable utilization, all relevant factors are to be considered together and a conclusion reached on the basis of all the factors. However, in weighing different utilizations of a transboundary aquifer or aquifer system, special regard shall be given to vital human needs.⁹⁸

The principle of equitable and reasonable utilization has been broadly accepted as one of the core principles of international water law.⁹⁹ Article 4 of the Draft Articles provides that “Aquifer States shall

98. *Id.* art. 5, at 186–87.

99. *See e.g.*, Case Concerning the Gabčíkovo-Nagymaros Project (Hung. v. Slov.), 1997 I.C.J. 7, ¶¶ 78, 85, 147 & 150 (Sept. 25); McCaffrey, *supra* note 22, at 324–25; Jerome Lipper, *Equitable Utilization*, in *THE LAW OF INTERNATIONAL DRAINAGE BASINS* 62–63 (Garretson, et. al. eds., 1967); (declaring that a great majority of authorities accept the principle of reasonable and equitable utilization). Already in 1958, at its Forty-Eighth Conference, the International Law Association adopted a Statement of Principles of International Law which states that where not expressly provided in a treaty or by customary norms, each State contiguous to an international watercourse “is entitled to a reasonable and equitable share in the beneficial uses of the waters of the drainage basin.” International Law Association, Report of the Forty-Eighth Conference 67 (1958), *reprinted* in, Report of the Forty-Eight Conference, 3 *Whiteman Digest* at 922 (1964). *See also*, Watercourse Convention, *supra* note 13, at art. 5; HELSINKI RULES ON THE USES OF THE WATERS OF INTERNATIONAL RIVERS AND COMMENTS, 484, arts. IV–V (Int’l Law Ass’n, 1967)(1966)(adopted by the Int’l Law Ass’n at the 52d Conference held in Helsinki, Aug. 20, 1966), *available at* http://www.internationalwaterlaw.org/IntlDocs/Helsinki_Rules.htm (last visited Mar. 13, 2006) [hereinafter HELSINKI RULES].

It is noteworthy that the Draft Articles employ the term “utilization” rather than “use,” the term used in the Watercourse Convention. This is intended to ensure that the mode of use is also encompassed within the scope of the Draft Articles. While “use”

utilize a transboundary aquifer or aquifer system according to the principle of equitable and reasonable utilization.” It further provides in sub-paragraph (a) that aquifer States “shall utilize the transboundary aquifer or aquifer system in a manner that is consistent with the equitable and reasonable accrual of benefits therefrom to the aquifer States concerned.”¹⁰⁰

In substance, the principle of equitable and reasonable utilization is a utilitarian concept¹⁰¹ employing a cost-benefit analysis that attempts to maximize the beneficial uses of limited water resources while minimizing the burdens.¹⁰² This point is bolstered by sub-paragraph (b) of Draft Article 4, which provides that aquifer States “shall aim at maximizing the long-term benefits derived from the use of water contained therein.”¹⁰³ This process of assessing the benefits and burdens is conducted with regard to a non-exhaustive list of factors articulated in Draft Article 5.¹⁰⁴ While the list is similar to that found in Article 6 of the

relates specifically to the purpose to which the resource is employed, “utilization” is a broader concept in that it also considers the mechanism and methodology of use. *See supra* note 25 and accompanying text.

100. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 4, at 186.

101. *See* Lipper, *supra* note 99, at 43.

102. *Cf.* D.J. Chenevert, Jr., *Application of the Draft Articles on the Non-Navigational Uses of International Watercourses to the Water Disputes Involving the Nile River and the Jordan River*, 6 EMORY INT’L L. REV. 495, 506 (1992) (discussing equitable and reasonable use in relation to surface waters). It is noteworthy that maximizing beneficial use does not necessarily imply making optimal use of the resource among all aquifer States. *See* HELSINKI RULES, *supra* note 99, at 322 (1966) (asserting that beneficial use “need not be the most productive use . . . nor need it utilize the most efficient methods known in order to avoid waste and insure maximum utilization”). Rather, the uses employed must merely be beneficial in terms of all of the relevant factors, such as those listed in Draft Article 5.

103. As a point of clarification, all of the advantages and disadvantages of a particular use must be assessed in order to achieve “maximize[ed] beneficial uses.”

104. Under Draft Article 5(1), “all relevant factors” must be considered when assessing whether a particular utilization of a transboundary aquifer or aquifer system complies with the principle of equitable and reasonable utilization. Such factors include:

- (a) the population dependent on the aquifer or aquifer system in each aquifer State;
- (b) the social, economic and other needs, present and future, of the aquifer States concerned;
- (c) the natural characteristics of the aquifer or aquifer system;
- (d) the contribution to the formation and recharge of the aquifer or aquifer system;
- (e) the existing and potential utilization of the aquifer or aquifer system;
- (f) the effects of the utilization of the aquifer or aquifer system in one aquifer State on other aquifer States concerned;
- (g) the availability of alternatives to a particular existing and planned utilization

Watercourse Convention, the UNILC tailored this list to apply specifically to the unique characteristics of ground water resources. Thus, the factors include such unique aspects as “the natural characteristics of the aquifer or aquifer system” (Draft Article 5(1)(c)), “the contribution to the formation and recharge of the aquifer or aquifer system” (Draft Article 5(1)(d)), and “the role of the aquifer or aquifer system in the related ecosystem” (Draft Article 5(1)(i)). While all of the factors are weighed collectively, each factor is assessed in accordance with its relative importance to the circumstances of the transboundary aquifer and in comparison with that of other relevant factors. Only “vital human needs” enjoys a somewhat greater preference, albeit merely as “special regard.”¹⁰⁵ Although rather amorphous, the same language is used in Article 10 of the Watercourse Convention where it was applied with reference to ensuring basic levels of sustenance.¹⁰⁶

It should be noted that based on the current definition of an aquifer, the factor listed under Draft Article 5(1)(d)—“the contribution to the formation and recharge of the aquifer or aquifer system”—while certainly an important consideration, might not be a suitable factor for evaluation. According to the definition provided in Article 2(1), an aquifer does not include the recharge zone.¹⁰⁷ While the recharge zone is certainly critical for the viability of an aquifer, whether it is appropriate to consider areas and activities outside of an aquifer is unclear at best. To do so could subject countries and actions that are, by virtue of the definition of an aquifer, not related to the aquifer. This lack of clarity is especially problematic in the case of an aquifer located in one State, but with a recharge zone located in another country.¹⁰⁸

of the aquifer or aquifer system;

(h) the development, protection and conservation of the aquifer or aquifer system and the costs of measures to be taken to that effect;

(i) the role of the aquifer or aquifer system in the related ecosystem.

105. Paragraph 2 of Draft Article 6 provides:

The weight to be given to each factor is to be determined by its importance with regard to a specific transboundary aquifer or aquifer system in comparison with that of other relevant factors. In determining what is equitable and reasonable utilization, all relevant factors are to be considered together and a conclusion reached on the basis of all the factors. However, in weighing different utilizations of a transboundary aquifer or aquifer system, special regard shall be given to vital human needs.

106. *Report of the Commission to the General Assembly on the Work of its Forty-Sixth Session*, U.N. Doc. A/49/10, reprinted in [1994] 2 Y.B. INT'L L. COMM'N 110, U.N. Doc. A/CN.4/SER.A/1994/Add.1 (Part 2) [hereinafter *Forty-Sixth Session Report*].

107. See *supra* note 36; see *infra* notes 178–179 and accompanying text.

108. See *infra* notes 178–179.

Nonetheless, the principle of equitable and reasonable utilization is also grounded in the notion that transboundary resources are shared, meaning that the two—or more—countries in whose territories the aquifer lays agree that they must allocate the use of the waters of the aquifer. This notion is derived from the objective of equity, which requires aquifer States to fairly distribute the waters of an aquifer or its benefits. Conceivably, fairness and equity might compel a more developed aquifer State to allot a greater percentage of the waters of a transboundary aquifer to a lesser developed aquifer State, even where the majority of the aquifer lies underneath the more developed State.¹⁰⁹ Such possibilities, however, were at the core of objections to the notion of “shared natural resources,” as discussed above.¹¹⁰ When considering ground water resources, many states are reluctant to accept the notion that natural resources could be divided in relation to equity rather than geography, or worse, subject to common ownership.¹¹¹ Of particular note, this concern was observed during the development of the Watercourse Convention.¹¹² Accordingly, given the degree to which many states asserted claims to sovereignty over underground natural resources, it is remarkable that the principle of equitable and reasonable utilization of Draft Article 4 found consensus among the Members of the UNILC.

Sub-paragraph (b) is noteworthy in that equitable and reasonable utilization is defined, in part, through the maximization of “the long-term benefits derived from the use of water” of an aquifer.¹¹³ This provision recognizes two important facts about aquifers: that by definition, a non-recharging aquifer is a non-renewable resource; and that a recharging aquifer could become non-renewable if overexploited. In so recognizing, the provision acknowledges the principle of sustainable utilization as tailored to the characteristics and potential benefits of the resource. This

109. Factors that may support such inequitable allocations may include the very factors identified in Draft Article 5(1).

110. See *supra* notes 55–72 and accompanying text (discussing use of the terms “shared,” “international,” and “transboundary”).

111. Common ownership here is understood to mean that both nations would have equal rights to the entire corpus of the transboundary resources, including those parts of the resources located entirely within the other State’s territory.

112. See e.g., *Summary Records of the 1556th Meeting, The Law of the Non-Navigational Uses of International Watercourses* [1979]1 Y.B. INT’L L. COMM’N 120, ¶ 25, U.N. Doc. A/CN.4/SER.A/1979 (comments of Mr. Frank X. J. C. Njenga of Kenya on the development of the Watercourse Convention, who warned against placing great reliance on the Helsinki Rules, which he believed fail to consider States’ permanent sovereignty over their natural resources).

113. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 4, at 186.

concept also appears in other provisions of the Draft Articles, including Article 7 on cooperation.¹¹⁴ It is not only a progressive obligation but also an example of the progressive development of international law.

The final two sub-paragraphs of Draft Article 4 are particularly significant to the extent that they are novel enhancements of the principle of equitable and reasonable utilization. The first one—sub-paragraph (c)—requires that aquifer States “establish individually or jointly an overall utilization plan, taking into account present and future needs of, and alternative water sources for, the aquifer States,” and is unique in that it mandates the development of a long-term strategy for the equitable and reasonable utilization of transboundary aquifers.¹¹⁵ In one sense, it suggests that such planning is a requirement for compliance with the obligation of equitable and reasonable utilization. While the sub-paragraph does not detail the procedure for such planning, it is a rather progressive obligation in that many countries, including those in the developed world, have rarely undertaken such planning.¹¹⁶ Nevertheless, if aquifer States truly adopt such a commitment, it could result in considerable benefits in terms of managing the resource for present and future needs.

114. See *infra* notes 144–150 and accompanying text.

115. *Fifty-Eighth Session Report*, *supra* note 14, ¶ 75, art. 4, at 186.

116. One of the more notorious examples of this failure to plan can be found along the Mexico-US border where both countries agreed in 1973 to develop “a comprehensive agreement on groundwater in the border area.” Minute No. 242, Permanent and Definitive Solution to the International Problem of the Salinity of the Colorado River, U.S.-Mex., Aug. 30, 1973, ¶ 5, *available at* <http://www.ibwc.state.gov/Files/Minutes/Min242.pdf> (last visited Apr. 2, 2007). To date, the two countries have yet to consider such an agreement. Moreover, the number of aquifers that traverse the Mexico-US border is unclear, at best. Three recent reports suggest that the number of transboundary aquifers in the border region is either eight, eighteen, or twenty. See *respectively* GOOD NEIGHBOR ENVIRONMENTAL BOARD, WATER RESOURCES MANAGEMENT ON THE U.S.-MEXICO BORDER, EIGHTH REPORT TO THE PRESIDENT AND THE CONGRESS OF THE UNITED STATES (2005), *available at* <http://www.epa.gov/ocem/gneb/gneb8threport/gneb8threport.pdf> (last visited Apr. 2, 2007)[hereinafter GOOD NEIGHBOR ENVIRONMENTAL BOARD]; S. Mumme, *Minute 242 and Beyond: Challenges and Opportunities for Managing Transboundary Ground Water on the Mexico-U.S. Border*, 40 NAT. RESOURCES J. 341, 344 (2000); U.N. Educ., Scientific, and Cultural Org. [UNESCO], Org. of American States [OAS], Int’l Shared Aquifer Res. Mgmt. [ISARM], *Final Report: UNESCO/OAS ISARM Americas Programme – Transboundary Aquifers of the Americas*, 2d Coordination Workshop, El Paso, Tex., Nov. 10–12, 2004 (2005), *available at* <http://www.oas.org/usde/isarm/Documents/English/ISARM%20Americas%202004-%20E1%20Paso%20Workshop%20Report.pdf> (last visited Apr. 2, 2007)[hereinafter *Final Report: UNESCO/OAS ISARM*].

Sub-paragraph (d) of the Draft Article, however, is possibly more novel than Sub-paragraph (c) by mandating that aquifer States “shall not utilize a recharging transboundary aquifer or aquifer system at a level that would prevent continuance of its effective functioning.”¹¹⁷ In effect, this provision recognizes the unique characteristic of aquifers generally, and recharging aquifers specifically, as dynamic but fragile mechanisms for transporting, storing, and processing water. The modification or removal of any segment of the mechanism—such as a reduction in recharge or overexploitation of the aquifer, both of which could reduce water flow and possibly drain the aquifer, as well as pollution of the aquifer or removal of the aquifer matrix (e.g., for its mineral content)—could have considerable consequences to the effective functioning of the aquifer.

It is noteworthy that in prior drafts, the Special Rapporteur had placed this particular obligation under the rubric of no significant harm.¹¹⁸ Arguably, as a means for protecting the integrity of an aquifer, such an obligation is better served under the structure of equitable and reasonable utilization. This is because, as currently written, any utilization that prevents the “continuance” of the “effective functioning” of a transboundary aquifer, in any portion of the aquifer, would be patently inequitable and unreasonable. In contrast, if the obligation is returned to the protections of no significant harm, one aquifer State could undertake activities that detrimentally affect the functioning of a transboundary aquifer, but which do not have a “significant” impact on other aquifer States.¹¹⁹ Accordingly, placing the obligation within the structure of equitable and reasonable utilization, to some extent, could be interpreted as creating an obligation to protect an aquifer for the sake of the aquifer. Yet, given that the analysis of equitable and reasonable utilization involves assessing benefits and burdens in relation to aquifer States and not in relation to the integrity of the aquifer, such logic may be unconvincing.

117. See *supra* note 83 (discussing what is meant by the “function” or “functioning” of an aquifer).

118. See *Yamada Second Report, supra* note 14, ¶¶ 24 & 27.

119. Arguably, this is a prerogative of state sovereignty, a topic briefly addressed *supra* notes 89–95 and accompanying text.

C. Draft Article 6 – Obligation Not to Cause Significant Harm to Other Aquifer States

1. Aquifer States shall, in utilizing a transboundary aquifer or aquifer system in their territories, take all appropriate measures to prevent the causing of significant harm to other aquifer States.

2. Aquifer States shall, in undertaking activities other than utilization of a transboundary aquifer or aquifer system that have, or are likely to have, an impact on that transboundary aquifer or aquifer system, take all appropriate measures to prevent the causing of significant harm through that aquifer or aquifer system to other aquifer States.

3. Where significant harm nevertheless is caused to another aquifer State, the aquifer States whose activities cause such harm shall take, in consultation with the affected State, all appropriate measures to eliminate or mitigate such harm, having due regard for the provisions of draft articles 4 and 5.¹²⁰

Like equitable and reasonable utilization, the principle of no significant harm is regarded as a fundamental principle of international water law.¹²¹ It is based on the Latin maxim *sic utere tuo ut alienum non laedas*, which obligates states not to use or allow the use of their territory in a way that will harm the territory of another state.¹²² The key factor is that harm must rise to the level of “significant” in order to constitute a violation of the principle. With regard to a watercourse, the UNILC stated that significant harm occurs where the “harm exceed[ed] the parameters of what was usual in the relationship between the States that relied on the use of the waters for their benefit.”¹²³ The meaning of this principle has received considerable attention in scholarly literature.¹²⁴

120. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 6, at 187.

121. See McCaffrey, *supra* note 22, at 346 (noting that the principle is “one of the most basic in all of international law”); see also Greta Goldenman, *Adapting to Climate Change: A Study of International Rivers and Their Legal Arrangements*, 17 *ECOLOGICAL L.Q.* 741, 779 (1990) (stating that the principle of *sic utere* is part of customary international law); J.O. Moermond & E. Shirley, *A Survey of the International Law of Rivers*, 16 *DENV. J. INT’L L. & POL’Y* 139, 144 (1987) (noting that the principle is widely acknowledged as a basis for establishing state liability for harm caused to another state).

122. See McCaffrey, *supra* note 22, at 349–53 (discussing the principle of *sic utere tuo* and its applicability in international water law).

123. *Report of the Commission to the General Assembly on the Work of its Thirty-Second Session, The Law of the Non-Navigational Uses of International Watercourses*, A/CN.4/SER.A/1993/Add.1 (Part 2), reprinted in [1993]2 *Y.B. INTL L. COMM’N* 89, ¶ 380 [hereinafter *Thirty-Second Session Report*]. In its effort to characterize and articulate the threshold, the UNILC stated that significant harm means “something more than

With the exception of a focus on transboundary aquifers, the principle obligation in Draft Article 6 is constructed identically to the analogous obligation found in the Watercourse Convention.¹²⁵ Paragraph 1 of Draft Article 6 states: "Aquifer States shall, in utilizing a transboundary aquifer or aquifer system in their territories, take all appropriate measures to prevent the causing of significant harm to other aquifer States."¹²⁶ Largely because of its Watercourse Convention roots, this formulation was agreed to only after considerable discussion in the UNILC and the Sixth Committee. Many Members of the two UN bodies argued that given the unique characteristics of aquifers—especially their susceptibility to pollution and relatively slow flow and recuperative abilities—significant questions arise as to whether the same standard should be applied to surface and ground water resources.¹²⁷ For example, while it may be somewhat difficult to fully assess the threat emanating from potential contamination of a river from a nearby toxic chemical spill, the same assessment is exponentially more complex for a similar spill in the vicinity of an aquifer.¹²⁸ Thus, given that the assessment process for aquifer contamination is more complicated than for surface waters and knowing that aquifers are more vulnerable than surface

'measurable', but less than 'serious' or 'substantial.'" *Summary Records of the 2322nd Meeting, The Law of the Non-Navigational Uses of International Watercourses*, U.N. Doc. A/CN.4/L.489, reprinted in [1993] 1 Y.B. INT'L L. COMM'N 169, ¶ 4, U.N. Doc. A/CN.4/SER.A/1993. It also asserted that an adverse effect or harm that is "not negligible but which yet did not necessarily rise to the level of 'substantial' or 'important'" is considered "significant." *Thirty-Second Session Report supra* ¶ 379, at 89.

124. See generally McCaffrey, *supra* note 22, at 346–80; Patricia K. Wouters, *An Assessment of Recent Developments in International Watercourse Law Through the Prism of the Substantive Rules Governing Use Allocation*, 36 NAT. RESOURCES J. 417 (1996); Stephen C. McCaffrey, *The International Law Commission Adopts Draft Articles on International Watercourses*, 89 AM. J. INT'L L. 395, 396 (1995).

125. Article 7(1) of the Watercourse Convention provides that Watercourse States must "take all appropriate measures to prevent the causing of significant harm to other watercourse States." Watercourse Convention, *supra* note 13.

126. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 6, at 187.

127. See *supra* notes 85–88 and accompanying text; see also Yamada *First Report, supra* note 8, ¶ 40.

128. A toxic chemical spill on the surface, as well as its flow direction and velocity, is typically visible and trackable. Moreover, natural conditions, such as circumstances that might hasten or slow down the potential harm, are more easily discernable. In contrast, a spill that flows underground is much more difficult to assess and track. The very fact that it is underground requires considerably greater effort, technology, knowledge, and financial resources in order to evaluate the flow direction and velocity, the existence of natural flow patterns and channels as well as possible obstacles, and, generally, the extent of the threat befalling the aquifer. Cf. Yamada *Second Report, supra* note 14, ¶ 25.

waters, a lower threshold—e.g., more stringent—may be required than that applied to surface waters.¹²⁹ The relevant question is, at what point following such a spill does the harm become “significant:” at the time of the spill, when the spill begins seeping into the ground, when the spill’s flow direction is fully appreciated, when the contaminants first reach the aquifer, or when the aquifer is deemed contaminated? In response to these concerns, many in the UNILC, including the Special Rapporteur, suggested that an alternative for “significant” was not necessary because the threshold of “significant” harm “is a flexible and relative concept.”¹³⁰ The descriptor “significant,” they argued, should be judged in relation to the totality of the circumstances. Depending on the circumstances, what might be regarded as significant harm in one scenario might be considered insignificant in a different setting.¹³¹

Although certainly a valid argument, the position taken by the Special Rapporteur and his supporters raises some concern to the extent that the “relative” characteristic of the term “significant” makes the determination of what constitutes “significant harm” an even more complicated endeavor. While States often seem to prefer flexibility when endorsing general principles of international law, it is possible that too much flexibility might defeat the purpose of the principle. Such flexibility, essentially, would require not only an *ad hoc* approach to evaluating whether the minimum threshold of harm was met, but also would necessitate extensive supporting scientific and other data. Moreover, despite the requirement of an *ad hoc* approach, to the extent that significant harm has established itself as part of international law for surface waters, aquifer States alleging significant harm via a transboundary aquifer would likely have to establish why the threshold of significant harm was met in the context of an aquifer where the same scenario on the surface would not rise to the level of significant harm. Ultimately, the unintended consequence of such relativism would be to create a threshold so high that absent actual significant harm, few scenarios of potential or imminent harm would rise to the level of significant.

129. See e.g., *Yamada Second Report*, *supra* note 14, ¶ 25 (referring to Members suggestions that a lower threshold may be required to determining harm in relation to the use of aquifers).

130. *Yamada Second Report*, *supra* note 14, ¶ 25.

131. The Commentary to Art. 6 suggests that “[e]ven when an aquifer is contaminated by a small amount of pollutant, the harm it may suffer could be evaluated as significant if the contamination has long-lasting effects, while the contamination of a watercourse by the same amount of pollutant might not be evaluated as significant.” See *Fifty-Eighth Session Report*, *supra* note 14, ¶ 4, at 213 (Commentary on Art. 6).

For example, a spill on the surface located a half kilometer from a transboundary river may not rise to the level of significant because of geography, topography, and technological and financial abilities to prevent actual harm. In the simplest of terms, a spill on the surface is easily seen and evaluated. In contrast, a spill located in a recharge zone of a transboundary aquifer that is a half kilometer or more away from the saturated zone of the aquifer arguably may be more of a threat. Here, however, the very fact that the spill and the threatened body of water are underground may require more extensive assessments as well as scientific knowledge, technology and financial resources. Nonetheless, despite the higher level of requirements, knowledge and resources, it likely would be difficult to translate such factors into a heightened degree of harm.

While the Commentaries to the Draft Article acknowledge the concerns voiced by various ILC Members, the current formulation of the Draft Article appear to endorse the relative character of "significant." Notwithstanding, the debate over the appropriate threshold for unacceptable harm to an aquifer State is likely to continue as the Draft Articles undergo the current review process.

The debate surrounding the obligations of aquifer States, where significant harm results nonetheless, was less controversial. In such situations, under paragraph three of the Draft Article, the aquifer State responsible for causing the significant harm "shall take . . . all appropriate measures to eliminate or mitigate such harm . . ." ¹³² This language tracks closely with that of the analogous Watercourse Convention provision except that it does not refer to the obligation to discuss issues of compensation. Whereas the issue of compensation is addressed by other rules of international law, and because the Members of the Commission felt that the issue of compensation does not require specialized treatment pertaining to transboundary aquifers, the Commission decided to exclude the topic from the Draft Article.

The Commission, however, did supplement the Draft Article with an additional obligation that has no counterpart in the Watercourse Convention. Paragraph 2 obligates aquifer States to "take all appropriate measures" to ensure that their other activities—i.e., activities not related to the utilization of the aquifer—"which have or are likely to have an impact on a transboundary aquifer system," do not cause significant harm to other aquifer States. ¹³³ This provision specifically relates to the scope of the Draft Articles described in Draft Article 1(b), which relates to "other activities that have or are likely to have an impact upon those

132. *Fifty-Eighth Session Report*, *supra* note 14, ¶ 75, art. 6, at 187.

133. *Id.*

aquifers and aquifer systems.”¹³⁴ Its purpose is to ensure that non-aquifer utilization activities undertaken above or around aquifers do not adversely affect the aquifer to the extent that such activity could significantly harm other aquifer States.¹³⁵

Separately, there is another matter that deserves attention in the context of assessing significant harm. Many countries today face what may best be termed as “time bomb” situations¹³⁶ in which previously deposited contaminants threaten ground water resources. These are circumstances that have not yet resulted in significant harm, but which may do so in the future. Countries, such as the prior regimes of former Soviet Republics, often discarded or deposited toxic and otherwise dangerous materials in landfills and other underground locations, sometimes near international borders.¹³⁷ Today, many of these accumulations threaten ground water resources and could contaminate numerous freshwater aquifers as a result of affirmative human activity.¹³⁸ For example, new efforts to exploit an aquifer or changes in existing pumping activities might cause contaminants in an overlying landfill to infect the aquifer; construction on and development of land overlying such dumps may cause the dangerous material to shift or break up causing similar results.¹³⁹

134. See *supra* notes 26–28 and accompanying text (discussing Draft Art. 1(b)).

135. Examples of such activities include industrial and agricultural operations in the recharge zone that might pollute the aquifer; mining activities that destroy the aquifer matrix and, thereby, its functioning; construction, forestry, and other activities that might deplete the aquifer by preventing normal recharge. See *supra* note 27 and accompanying text.

136. The term was coined by Bo Appelgren and Shammy Puri, Senior Consultants to the UN Educational, Scientific and Cultural Organization (UNESCO) in a paper prepared for the UNESCO-organized experts group and UNILC Special Rapporteur, Ambassador Chusei Yamada, in the effort to support and advise the Special Rapporteur in his study of transboundary aquifers. See B. Appelgren and S. Puri, *Addressing “Time Bomb” Conditions*, unpublished paper prepared for the UNESCO Experts Group meeting, Tokyo, Japan, Nov. 28 – Dec. 1, 2004 (on file with author) [hereinafter Appelgren & Puri].

137. For example, when the Soviet military left its bases in Eastern Europe, it often left tons of oil products and chemicals in various tanks and containers, as well as plastic wastes, scrap metals, discarded military equipment, and other leftovers. In some cases, these wastes were buried underground while in others they were left outdoors, exposed to the elements. See Anto Raukas, *Past pollution and its remediation in Estonia*, 17 *BALTICA* 71, 73–74 (2004), available at [http://www.geo.lt/Baltica/B17\(2\)/71-78.pdf](http://www.geo.lt/Baltica/B17(2)/71-78.pdf) (last visited Apr. 2, 2007) (describing the waste products often left by the Soviet military upon its departure from bases in Estonia).

138. See *id.*

139. Cf. *id.*

While international law prohibits *ex post facto* application of new legal principles and agreements,¹⁴⁰ it is unclear how such time bomb situations might be addressed under the principle of no significant harm. On the one hand, the harmful substances were deposited some time in the past when there was little awareness or political acknowledgement of human health and environmental risks and the possible need for precautionary measures. On the other hand, the activity that results in the harm is not the deposition of the contaminants, but rather human activity that causes the contamination to escape its containment or otherwise reach the aquifer. One factor that may be particularly relevant to the analysis would be whether the State taking the action that results in the harm had any degree of knowledge of the possibility that such harm could or would result. Of course, such an analysis would further complicate the assessment of significant harm.

In a similar vein, this discussion may be equally relevant for naturally-occurring contaminants. Countries like Argentina and Bangladesh have found naturally occurring arsenic in or adjacent to geologic formations containing ground water. In some cases, human activity, such as withdrawing water from these formations, has mobilized these deposits and resulted in the contamination of ground water resources and untold cases of arsenic poisoning.¹⁴¹ Similarly, in the

140. Article 28 of the Vienna Convention on the Law of Treaties codifies the general principle that a treaty shall not be applied retroactively “[u]nless a different intention appears from the treaty or is otherwise established.” Vienna Convention on the Law of Treaties, May 26, 1969, U.N. Doc. A/CONF. 39/27, at 289 (1969), 1155 U.N.T.S. 331, available at http://untreaty.un.org/ilc/texts/instruments/english/conventions/1_1_1969.pdf (last visited Apr. 2, 2007); Cf. M. Cherif Bassiouni, *Human Rights in the Context of Criminal Justice: Identifying International Procedural Protections and Equivalent Protections in National Constitutions*, 3 DUKE J. COMP. & INT’L L. 235, 290–91 (1993). Although writing on international criminal law issues, Bassiouni asserts that “[p]rotection from *ex post facto* laws is one of the fundamental principles of legality.” *Id.* at 290. The Constitution of the United States of America forbids the enactment of *ex post facto* laws by either the U.S. Congress or the legislatures of the States. U.S. Const. art. I §9, cl. 3 & U.S. Const. art. 1, §10, cl. 1, respectively.

141. See Appelgren & Puri, *supra* note 136. In the Chaco Pampean region of northwest Argentina, naturally-occurring arsenic is related to the leaching of arsenic from volcanic ash into the ground water, resulting in concentrations of 742 micrograms per liter to 14,969 micrograms per liter. Throughout Argentina, nearly 1.2 million Argentineans depend on groundwater containing arsenic in concentrations exceeding maximum guidelines of 10 micrograms per liter (0.01 mg/L) set by the World Health Organization. See *Id.*; World Health Organization, Fact Sheet No. 210, *Arsenic in Drinking Water*, Revised May 2001, available at <http://www.who.int/mediacentre/factsheets/fs210/en/index.html> (last visited Apr. 2, 2007). Possibly the largest case of mass poisoning from naturally occurring arsenic is

multi-aquifer system of the Iullemeden Aquifer in the Niger Republic, well drilling near the Nigerian border resulted in contamination of the aquifers with fluoride and boron.¹⁴² In each of these cases, there was no human action creating the hazard; the contaminants occurred naturally in the subsoil. Human activity caused the hazards to infiltrate the aquifer and result in considerable public health and environmental problems. It is doubtful that such scenarios could be covered by the present Draft Articles given the natural occurrence of the contaminants, which may have percolated into or dissolved in the subsoil eons ago.

In addition, there is the possibility that inaction by an aquifer State could result in significant harm to another aquifer State. For example, a toxic substance deposited in the distant past in State A in the vicinity of a transboundary aquifer might cause significant harm to State B, even where State A does not utilize the transboundary aquifer. For example, changes over time in the acidity of precipitation that infiltrates a landfill could dissolve packing material and allow the buried material to leak into the aquifer. Likewise, an earthquake might dislodge dangerous materials buried underground causing them to shift or break and thereby contaminate a nearby aquifer. In such cases, the lack of monitoring or preventative measures could result in significant harm to other aquifer States. The same scenarios of inaction causing significant harm also could result from naturally occurring contaminants.

Because these are cases of inaction, it is likely that these scenarios are beyond the scope of the Draft Articles. Nevertheless, the question of whether they should be subject to some regulatory or liability scheme is a fair question that should, at the very least, be considered by the UNILC,

taking place in West Bengal and Bangladesh. Approximately 220 million people live in the region overlying the alluvial basin containing numerous aquifers with naturally occurring arsenic, ranging in concentrations of 5 micrograms per liter to 41 micrograms per liter, is found at depth of 10 to 80 meters, the depths at which most shallow wells are drilled. See Appलगren & Puri, *supra* note 136; see also Marcus Moench, *Groundwater: The Challenge of Monitoring and Management*, in *THE WORLD'S WATER 2004–2005*, 79, 87 (Peter H. Gleick ed., 2004).

142. See Appलगren & Puri, *supra* note 136 (discussing fluoride and boron contamination in the Iullemeden Aquifer System); A. Vengosh, et. al., *Natural Boron Contamination in Mediterranean Groundwater*, 49 *GEOTIMES* 20 (2004) (discussing boron contamination in aquifers along the Mediterranean Sea).

possibly in commentaries to the Draft Articles.¹⁴³ Again, knowledge on the part of the State failing to act would likely be an important criterion for imposing any system of liability.

D. Draft Article 7 – General Obligation to Cooperate

1. Aquifer States shall cooperate on the basis of sovereign equality, territorial integrity, sustainable development, mutual benefit and good faith in order to attain equitable and reasonable utilization and appropriate protection of their transboundary aquifer or aquifer system.

2. For the purpose of paragraph 1, aquifer States should establish joint mechanisms of cooperation.¹⁴⁴

The obligation to cooperate is a widely accepted principle under international law and is applicable to most transboundary resource issues.¹⁴⁵ In its general sense, the duty to cooperate is an obligation of due diligence.¹⁴⁶ As suggested by ILC Member, Mr. Carlos Calero Rodrigues of Brazil, “cooperation [is] a goal, a guideline for conduct, but not a strict legal obligation which, if violated, would entail international

143. Appelgren and Puri suggest that the principle of no significant harm should be reformulated to address inaction in cases where the non-acting State has knowledge of the pending significant harm by including a paragraph, such as “Aquifer system States shall take all appropriate measures to identify and prevent the causing of significant harm to other aquifer system States *through the aquifer system.*” (emphasis in original). They note that “[s]uch phraseology would place a duty on states regardless of who created the ‘time bomb’ to ensure that these bombs do not explode.” See Time Bomb Paper, *supra* note 136.

144. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 7, at 188.

145. See generally, See *Fifty-Eighth Session Report, supra* note 14, ¶ 1, at 212 (Commentary Art. 7); *Forty-Sixth Session Report, supra* note 106, ¶¶ 1–4, at 106–07 (Commentary Art. 8).

146. In other words, while a State must pursue cooperation diligently, it cannot be faulted or held responsible for failing to achieve cooperation. See E.B. Weiss (ed.), *Environmental Change and International Law: New Challenges and Dimensions*, ch. 5, sec. 5 (1992), available at <http://www.unu.edu/unupress/unupbooks/uu25ee/uu25ee00.htm> (last visited Apr. 2, 2007) (discussing levels of state responsibility and noting that the general obligation to cooperate involves a due diligence obligation and is the lowest of the standards for state responsibility); see also Laurence Boisson de Chazournes, Changing perspectives in the management of international watercourses: An international law perspective, in *Transboundary rivers, sovereignty and development: Hydropolitical drivers in the Okavango River basin* 218 (Anthony Turton, et. al., eds) (2003), available at <http://www.okavangochallenge.com/files/wp6/hydropolitical/HydropoliticalDrivers.pdf> (last visited Apr. 2, 2007).

responsibility.¹⁴⁷ Nonetheless, the duty of cooperation is indispensable for the sound management of transboundary water resources.¹⁴⁸ In particular, it serves as the framework or background context for the application of other provisions on specific forms of cooperation, such as the Draft Articles concerning: regular exchange of data and information (Draft Article 8); protection and preservation of ecosystems (Draft Article 9); prevention, reduction and control of pollution (Draft Article 11); monitoring (Draft Article 12); management (Draft Article 13); planned activities (Draft Article 14); and scientific and technical cooperation with developing States (Draft Article 15).

The formulation of Draft Article 7 on cooperation has a number of specific characteristics that are worth noting. The first is the inclusion of the phrase “sustainable development” as one of the bases for cooperation. This is unique, in part, because it does not appear in the equivalent provision of the Watercourse Convention.¹⁴⁹ It is also singular to the extent that it further promotes the notion of sustainable utilization and maximization of the long-term benefits discussed in Article 4(b). Another unique provision is found in sub-paragraph 2 of the Draft Article, which states that to comply with the general obligation of cooperation “aquifer States should establish joint mechanisms of cooperation.” Although this idea is found in other international instruments, such as Article 8(2) of the Watercourse Convention, it is structured more as an affirmative rather than a passive consideration. While the Watercourse Convention uses the phrase “may consider the establishment of joint mechanisms or commissions, as deemed necessary by them,” Draft Article 7(2) uses the language “should establish joint mechanisms.” While neither creates a binding obligation to create such procedures or institutions, the latter does take a step closer to such a commitment. In so doing, the UNILC recognizes the value that such

147. *The Law of the Non-Navigational Uses of International Watercourses, Summary Records of the 2003rd Meeting*, [1987] 1 Y.B. INT'L L. COMM'N 67, ¶ 13, at 71, U.N. Doc. A/CN.4/SER.A/1987.

148. See *Gabčíkovo-Nagymaros Project (Hung. v. Slov.)*, *supra* note 99, ¶ 17 (asserting that “[o]nly by international co-operation could action be taken to alleviate these problems” and referring to problems of navigation, flooding, and the environment); see also McCaffrey, *supra* note 22, at 398–404 (discussing the obligation imposed on States under international law by the duty to cooperate and suggesting that the provision describing a general duty to cooperate is an “umbrella term, embracing a complex of more specific obligations, which, by and large, do reflect customary international law”).

149. Article 8(1) of the Watercourse Convention provides that “Watercourse States shall cooperate on the basis of sovereign equality, territorial integrity, mutual benefit and good faith in order to attain optimal utilization and adequate protection of an international watercourse.” Watercourse Convention, *supra* note 13.

commissions have provided both for encouraging cooperation as well as for the sound management of transboundary water resources.¹⁵⁰

E. Draft Article 8 – Regular Exchange of Data and Information

1. Pursuant to draft article 7, aquifer States shall, on a regular basis, exchange readily available data and information on the condition of the transboundary aquifer or aquifer system, in particular of a geological, hydrogeological, hydrological, meteorological and ecological nature and related to the hydrochemistry of the aquifer or aquifer system, as well as related forecasts.

2. Where knowledge about the nature and extent of some transboundary aquifer or aquifer systems is inadequate, aquifer States concerned shall employ their best efforts to collect and generate more complete data and information relating to such aquifer or aquifer systems, taking into account current practices and standards. They shall take such action individually or jointly and, where appropriate, together with or through international organizations.

3. If an aquifer State is requested by another aquifer State to provide data and information relating to the aquifer or aquifer systems that are not readily available, it shall employ its best efforts to comply with the request. The requested State may condition its compliance upon payment by the requesting State of the reasonable costs of collecting and, where appropriate, processing such data or information.

4. Aquifer States shall, where appropriate, employ their best efforts to collect and process data and information in a manner that facilitates their utilization by the other aquifer States to which such data and information are communicated.¹⁵¹

The obligation to exchange data and information is fundamental to the cooperation over and sound management of a transboundary aquifer.¹⁵² Without the sharing of such information, decision-making by the aquifer States will be hampered by an inability to fully project and

150. See *Fifty-Eighth Session Report, supra* note 14, ¶ 3, at 213 (Commentary Art. 7).

151. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 8, at 188.

152. See *Fifty-Eighth Session Report, supra* note 14, ¶ 1, at 214 (Commentary Art. 8); Stephen E. Draper, *International Duties and Obligations for Transboundary Water Sharing*, 123 J. WATER RES. PLANNING & MGMT. 344, 347–48 (1997).

plan for any deleterious consequences that might result from the utilization of a transboundary aquifer.

Draft Article 8 on the regular exchange of data and information generally is analogous to Article 9 of the Watercourse Convention except that it is tailored to the unique characteristics of aquifers.¹⁵³ Thus, Draft Article 8(1) obligates aquifer system States to regularly exchange data and information of a “geological, hydrogeological, hydrological, meteorological and ecological nature and related to the hydrochemistry of the aquifer system, as well as related forecasts.”¹⁵⁴ These data and information effectively define and distinguish the characteristics of the aquifer. While these technical terms are not defined in the Draft Articles, they are described and discussed in Commentary to Draft Article 8.¹⁵⁵ Significantly, the data sharing requirements of Draft Article 8(1) apply

153. Article 8 of the Watercourse Convention provides:

General Obligation to Cooperate

1. Watercourse States shall cooperate on the basis of sovereign equality, territorial integrity, mutual benefit and good faith in order to attain optimal utilization and adequate protection of an international watercourse.
2. In determining the manner of such cooperation, watercourse States may consider the establishment of joint mechanisms or commissions, as deemed necessary by them, to facilitate cooperation on relevant measures and procedures in the light of experience gained through cooperation in existing joint mechanisms and commissions in various regions.

Watercourse Convention, *supra* note 13.

154. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 8, at 188.

155. Paragraph 4 of Commentary to Draft Art. 8 states:

‘Geology’ describes age, composition and structure of the aquifer matrix. ‘Hydrogeology’ describes the ability of the aquifer to store, transmit and discharge groundwaters. ‘Hydrology’ describes elements other than groundwaters of the water cycle, primarily effective precipitation and surface water that are important for aquifer recharge, the aquifer regime, storage and discharge. Effective precipitation is the part of precipitation which enters aquifers. In other words, it is total precipitation minus evaporation, surface runoff and vegetation. ‘Meteorology’ provides data on precipitation, temperature and humidity which is necessary to calculate evaporation. ‘Ecology’ provides data on plants necessary to calculate plants transpiration. ‘Hydrochemistry’ yields data on chemical composition of the water necessary to define water quality. Aquifer States are required by paragraph 1 to exchange not only data and information on the present condition of the aquifer, but also related forecasts. The forecasts envisaged would relate to such matters as weather patterns and the possible effects thereof upon water levels and flow; the amount of recharge and discharge; foreseeable ice conditions; possible long-term effects of present utilization; and the condition or movement of living resources. See *Fifty-Eighth Session Report, supra* note 14, at 216.

even in cases where an aquifer State does not utilize, or has no plans to utilize, the transboundary aquifer.¹⁵⁶

Paragraph 2 of Draft Article 8 departs from the standard found in the Watercourse Convention in that it creates an obligation on States to give due regard to the gaps in knowledge about transboundary aquifers and to make a "best effort" to assess and produce data and information where such gaps exist. This commitment is based on the fact that data about ground water resources is often lacking and that the fulfillment of other obligations under the Draft Articles, such as equitable and reasonable utilization and no significant harm, are dependent on the availability and analysis of a minimum of information.

Under the current formulation, however, the point at which the obligation arises is somewhat ambiguous. The current language suggests that the obligation to "employ . . . best efforts to collect and generate" additional data and information begins when the existing knowledge base "is inadequate." It is unclear, however, what "inadequate" may mean and for what purpose the data and information must be adequate. Certainly, based on the object and purpose of the Draft Articles, it may be presumed that adequacy refers to the knowledge base necessary for educated decision-making on activities related to a transboundary aquifer. Yet, the lack of clarity on the threshold of adequacy could create opportunities for misunderstandings and disagreement over its interpretation. Thus, it may be prudent to amend the paragraph to include the criterion by which adequacy can be judged. For example, such clarification might refer to knowledge inadequate for the purpose of complying with the other obligations of the Draft Articles.

It should be noted that as currently structured, the data sharing and generating requirements of Draft Article 8(1) and 8(2) encompass all aquifer States. This would mean that both provisions would apply even in cases where an aquifer State does not utilize, or has no plans to utilize, the transboundary aquifer.¹⁵⁷ Whether this is a deliberate objective of the UNILC or merely an inadvertent result, the consequence of such language could serve as the source of considerable controversy among aquifer States. It may be prudent for the UNILC to revisit the language of these provisions and consider whether it is important to apply the obligation only aquifer States that are actively using or benefiting, or intend to use of benefit in the near future, from a transboundary aquifer.

Paragraph 3 of Draft Article 8 refers to a situation whereby data and information is requested from one aquifer State by another aquifer State

156. *Id.*

157. *See id.*

where such data and information is necessary for a better understanding of the characteristics of a transboundary aquifer or the possible consequences of a particular activity. In such cases, the requested State must make “best efforts” to fulfill the request, but may condition the request upon payment by the requesting aquifer State of the reasonable costs associated with the collection and processing of such data or information. Although not explicitly stated, this provision is intended both to minimize the burden on States with few resources and thereby allow them to participate in the data generation and management of a transboundary aquifer, and to prevent aquifer States from making unreasonable demands for data and information.¹⁵⁸

A chief concern for the management of a transboundary aquifer is that all aquifer States harmonize the methodologies, techniques, procedures, assumptions, and technologies—collectively known as metadata¹⁵⁹—used in the generation and processing of data and information. This concern is based on the fact that there may be more than one approach or instrumentation available to assess a particular aquifer characteristic, such as rate of flow, hydraulic potential, or chemical composition. Such metadata, however, can sometimes produce disparate results because of the multitude of factors and assumptions that go into the analytical process of aquifer assessment. Moreover, due to differences in education, training, experience, and preferences, the professionals employed by States producing data for a transboundary aquifer will often use different methodologies and procedures and may focus on different characteristics of a transboundary aquifer. As a result, the data and information produced may be incompatible and, even worse,

158. The decision of what data a State can generate often is subject to the availability of resources. Many countries, especially developing nations, face difficulties in complying with such obligations because of a lack of finances, field and laboratory equipment, and knowledgeable people capable of generating, processing, and interpreting the necessary data. See Eckstein 2005b, *supra* note 36, at 10.

159. The United States Geological Survey (USGS) describes metadata as consisting “of information that characterizes data. Metadata are used to provide documentation for data products. In essence, metadata answer **who, what, when, where, why, and how** about every facet of the data that are being documented.” USGS Website, <http://geology.usgs.gov/tools/metadata/tools/doc/faq.html#q1.1> (*emphasis in original*) (last visited Apr. 3, 2007). This description relies on the definition and standard proffered for metadata by the Federal Geographic Data Committee (FGDC), an interagency committee that promotes the coordinated development, use, sharing, and dissemination of geospatial data on a national basis. FGDC defines metadata as “. . . a file of information . . . which captures the basic characteristics of a data or information resource. It represents the who, what, when, where, why and how of the resource.” FGDC Website, <http://www.fgdc.gov/metadata> (last visited Apr. 3, 2007).

may be useless as a means for establishing baseline characteristics of the aquifer as well as monitoring and assessing subsequent changes.¹⁶⁰

Accordingly, paragraph 4 of the Draft Article imposes a “best efforts” obligation on aquifer States to ensure that the output of their data collection and processing efforts facilitate the utilization of the data and information by other aquifer States. The purpose of this paragraph is twofold. First, it supplements the other paragraphs in Draft Article 8 by reemphasizing the “best efforts” obligation in the collection and processing of data and information. Second, and potentially more importantly, it creates a “best effort” obligation to ensure that the data and information produced is usable by other aquifer States. This relates to the type, quantity, and quality of data and information that must be developed and exchanged. This “best effort” obligation, however, does not necessarily obligate aquifer States to coordinate and cooperate on all data and information generation activities. While this may be the ideal, such possibilities may not be realistic. Accordingly, the obligation does not require complete agreement on every aspect of methodologies, techniques, procedures, assumptions, and technologies. Nonetheless, it does mandate that there be some degree of harmonization of the metadata such that the country receiving the data and information can understand, interpret, and utilize it in their management of the transboundary aquifer.

IV. DRAFT ARTICLES RELATED TO PRINCIPLES ON PROTECTION, PRESERVATION AND MANAGEMENT

The next part of the Draft Articles on the law of transboundary aquifers also presents substantive principles for the management of transboundary aquifers. This section, however, is separated from the one on “General Principles,” possibly, because the principles enumerated in the above section may already be part of customary international law. While they are tailored to the unique aspect of ground water resources, the theories underlying the principles—such as state sovereignty, equitable and reasonable utilization, no significant harm, general obligation to cooperate and exchange of data and information—are widely accepted within the international community.¹⁶¹

160. See Eckstein 2005b, *supra* note 36, at 10 (discussing the problems of exchanging data and information that is incompatible or otherwise unusable by other aquifer States); cf. *Fifty-Eighth Session Report*, *supra* note 14, ¶ 7, at 217 (Commentary Draft Art. 8).

161. See *supra* notes 89, 97, 120, 144 & 151 and accompany text.

The Draft Articles found in this section, however, describe principles that may not yet be a part of customary international law because of their novelty, the paucity of State practice, and the fact that they are significantly tailored to the circumstances of transboundary aquifers. Thus, to some extent, the following principles were formulated by the UNILC in their capacity and under the mandate to “progressively develop” international law.¹⁶² Yet, the protection, preservation, and sound management of a transboundary aquifer are logical prerequisites for the enjoyment and application of other substantive principles, such as equitable and reasonable utilization of that aquifer.

A. Draft Article 9 – Protection and Preservation of Ecosystems

Aquifer States shall take all appropriate measures to protect and preserve ecosystems within, or dependent upon, their transboundary aquifers or aquifer systems, including measures to ensure that the quality and quantity of water retained in the aquifer or aquifer system, as well as that released in its discharge zones, are sufficient to protect and preserve such ecosystems.¹⁶³

Ecosystems can generally be defined as a dynamic community of all living organism interacting with each other and the chemical and physical factors of their environment.¹⁶⁴ Ecosystems are almost always dependent on some source of water, which in many instances comes from aquifers. Aquifer dependent ecosystems include lakes and wetlands fed from underlying aquifers or nearby springs, vegetation communities and dependent fauna that have seasonal or episodic dependence on groundwater, and river base flow ecosystems that exist in or adjacent to streams that are fed by groundwater base flow during low rainfall periods.¹⁶⁵ Ecosystems existing within certain aquifers, such as habitats

162. See *supra* note 10, art. 1, sec. 1 (discussing the mandate of the UNILC).

163. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 9, at 188–89.

164. See M. Lynne Corn, *Ecosystem, Biomes, and Watersheds: Definitions and Use* (Congressional Research Service, No. 93-655) (1993), available at <http://cnie.org/NLE/CRSreports/Biodiversity/biodv-6.cfm> (last visited Apr. 2, 2007) (explaining ecosystem dynamics). The Convention on Biological Diversity similarly defines ecosystem as “a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.” Convention on Biological Diversity, June 5, 1982, 1760 U.N.T.S. 79, available at www.biodiv.org/doc/legal/cbd-en.pdf (last visited Apr. 7, 2007).

165. See generally, Sinclair Knight Merz, *Environmental Water Requirements to Maintain Groundwater Ecosystems*, Environmental Flows Initiative Technical Report Number 2, Commonwealth of Australia, Canberra (2001), available at <http://www.environment.gov.au/water/rivers/nrhp/groundwater/pubs/groundwater.pdf>

and species found in karstic aquifers are also considered aquifer dependent ecosystems.¹⁶⁶

The obligation to ensure the viability of aquifer dependent ecosystems relates to the general desire to protect the natural environment for the benefit of humankind.¹⁶⁷ Thus, Draft Article 9 obligates aquifer States to “take all appropriate measures” to ensure the viability of dependent ecosystems within and outside of transboundary aquifers. This obligation includes taking necessary measures that will ensure the quality and quantity of water, both within the aquifer and at its discharge zones in order to protect and preserve such ecosystems.

B. Draft Article 10 – Recharge and Discharge Zones

1. Aquifer States shall identify recharge and discharge zones of their transboundary aquifer or aquifer system and, within these zones, shall take special measures to minimize detrimental impacts on the recharge and discharge processes.

(last visited Mar. 7, 2007) (discussing ground water dependent ecosystems in Australia); Brad R. Murray, et. al., *Groundwater-dependent ecosystems in Australia: It's more than just water for rivers*, 4 ECOLOGICAL MGMT. & RESTORATION 110 (2003), available at <http://www.blackwell-synergy.com/links/doi/10.1046%2Fj.1442-8903.2003.00144.x> (last visited Mar. 7, 2007)

166. Aquifer-dependent aquatic ecosystems in karst environments support a specialized fauna that is often distinct from that of surface waters. Species that live solely in these environments have curious morphologies including the degeneration or loss of eyes and body pigment, elongated legs, and enhanced sensory structures. Paul Griffiths, *Northern Vancouver Island Field Tour*, in PROCEEDINGS OF THE 1997 KARST & CAVE MANAGEMENT SYMPOSIUM, BELLINGHAM, WASHINGTON AND CHILLIWACK AND VANCOUVER ISLAND, BC, CANADA, 208, 222–24 (Robert Stitt ed., 1997), available at <http://www.nckms.org/pdf/97nckmsall.pdf> (last visited Apr. 2, 2007); see also Y. Ranga Reddy, *Why neglect groundwater biology*, 83 CURRENT SCI. 931 (2002), available at <http://www.ias.ac.in/currsci/oct252002/931.pdf> (last visited Apr. 2, 2007). The Edwards Aquifer in Texas, for example, is considered to be one of the world's most diverse aquifer ecosystems, sustaining a unique habitat with species that are geographically restricted and are not found elsewhere. For example, blind catfish, such as the Widemouth Blindcat, are occasionally pumped from the aquifer through wells that are over 2,000 feet deep. See Glenn Longley, *The Edwards Aquifer: Earth's Most Diverse Groundwater Ecosystem?*, 11 INT'L J. OF SPELEOLOGY 123, 127 (1981).

167. It is noteworthy that despite their environmental character, Draft Articles 9, 10, and 11 are not intended as environmental protection provisions, but rather as safeguards for aquifers for the benefit of humankind. *Yamada Third Report*, *supra* note 15, ¶ 33. That they also may result in enhancing environmental conditions is considered relevant only to the extent that such enhancements benefit a State or its citizens.

2. All States in whose territory a recharge or discharge zone is located, in whole or in part, and which are not aquifer States with regard to that aquifer or aquifer system, shall cooperate with the aquifer States to protect the aquifer or aquifer system.¹⁶⁸

With the exception of most non-recharging aquifers, recharge and discharge zones are integral components of aquifers. In order to ensure the viability and normal functioning of an aquifer, the integrity of related recharge and discharge zones must be maintained and protected. In the case of recharge zones, this consists of ensuring both the quantity and quality of water flowing through the recharge zone and entering the aquifer. Thus, protection of the recharge zone might include limitations on industrial and municipal development projects in the recharge area that potentially could diminish the amount of water percolating through the zone into the aquifer. It also might include restrictions on industrial and agricultural activities that might pollute the recharge area and thereby pollute the water flowing into the aquifer. In the case of discharge zones, ensuring the integrity of these zones is essential to maintaining the normal functioning of the aquifer. Any decrease or increase in discharge might negatively affect water flow within the aquifer, the location of the water table, the aquifer's cleansing abilities, or any of the other numerous characteristics that distinguish each aquifer. Protective action could include restricting construction and other activities in aquifer discharge zones. For both recharge and discharge zones, protecting their integrity also means ensuring that the matrix and strata in these zones is not affected in any way that might detrimentally impact their normal functioning. Conduct that may pose such harm could be restricted includes mining activities that remove strata in a recharge or discharge zone.

Draft Article 10(1) obligates aquifer States to identify the recharge and discharge zones of transboundary aquifers. Once identified, they are then bound to "take special measures to minimize" any negative consequences to the processes of recharge and discharge in these zones. Certainly, the language of the obligation imposed by this provision is rather weak. It is conceivable that aquifer States could avoid taking any protective measures with respect to recharge and discharge zones by declining to recognize any recharge or discharge zone within their territory, or by undertaking only nominally protective actions to minimize the detrimental impacts on these zones. That, however, is a prerogative of sovereignty,¹⁶⁹ and the lack of a more profound and

168. *Fifty-Eighth Session Report*, *supra* note 14, ¶75, art. 10, at 189.

169. *See supra* notes 89–96 and accompanying text (discussing sovereignty).

compulsory requirement could easily negate any of the intended benefits of this Draft Article.

An alternative to the current formulation might require all aquifer States to cooperate in identifying and defining the boundaries of recharge and discharge zones of a particular transboundary aquifer and, within these zones, to cooperate on the special measures necessary for minimizing detrimental impacts of the recharge and discharge processes. While still not an absolute mandate, this alternative necessitates cooperation, as required in Draft Article 7, and prevents any unilateral decision-making on a transboundary resource. Yet, this option also permits some measure of flexibility since cooperation is a relative concept and subject to due diligence.¹⁷⁰

Paragraph 2 of Draft Article 10 addresses an interesting and complex scenario that continues to confound the UNILC. The scenario describes an aquifer—as defined in Draft Article 2(a)—located in State A, but with a recharge zone in State B. Logically, State B would have no substantive incentive to become a party to any agreement related to the management of the aquifer as it is not entitled to enjoy the benefits of the aquifer. The fundamental questions considered here are whether, how, and to what extent a non-aquifer State, such as State B, can be bound to the terms of the Draft Articles?

The simple answer is that State B cannot be bound unless it voluntarily becomes a party to any treaty resulting from or based on the Draft Articles. As stated in Article 34 of the Vienna Convention on the Law of Treaties, “[a] treaty does not create either obligations or rights for a third State without its consent.”¹⁷¹ Yet, when considering the significance of a recharge zone to the integrity and normal functioning of an aquifer, that may be an unacceptable answer. Certainly, custom and practice over time might create binding obligations on non-aquifer States with regard to a recharge zone located within their territory. However, absent the existence of specific customary international law to the contrary, the structure of international law and the system of international relations do not provide a means by which a disinterested state could be subjected to such obligations.

170. See *supra* notes 146–147 and accompanying text.

171. Vienna Convention on the Law of Treaties, art. 34, May 23, 1969, 1155 UNTS 331, (entered into force on Jan. 27, 1980), available at http://untreaty.un.org/ilc/texts/instruments/english/conventions/1_1_1969.pdf (last visited 4/3/07). Likewise, Article 35 of the Vienna Convention provides that “[a]n obligation arises for a third State from a provision of a treaty [only] if the parties to the treaty intend the provision to be the means of establishing the obligation and the third State expressly accepts that obligation in writing.” *Id.* art. 35.

Alternatively, there is an additional possibility whereby a non-aquifer State may be subject to the terms of the Draft Articles. If the present effort results in a binding instrument,¹⁷² State B may ratify the treaty because it enjoys a transboundary aquifer with State C.¹⁷³ Although State B does not share such a relationship with State A, by virtue of its obligations under the treaty, it might be bound to ensure the recharge zone of State A.

In addition, while Draft Article 10(2) also refers to discharge zones located in non-aquifer States, this scenario is somewhat ambiguous. As stated in Article 2(g), the term “discharge zone” refers to “the zone where water originating from an aquifer flows to its outlets, such as a watercourse, a lake, an oasis, a wetland or an ocean.”¹⁷⁴ In other words, it is a geographic location at which water emerges from an aquifer. In the case of a natural discharge zone, this can occur via springs¹⁷⁵ or seepages,¹⁷⁶ while artificial discharge typically occurs via wells. In many cases of natural and artificial discharges, the discharge zone, or the point where water emerges, typically lies directly above the aquifer. In such scenarios, the state with the discharge zone would be an aquifer State. Certainly, there are cases in which springs and seepages occur along the

172. See *supra* note 32 and accompanying text (discussing the decision of the Commission to postpone discussion of the final form of the Draft Articles).

173. There may be considerable incentives for most countries to participate in such a treaty because, with the exception of most island nations, nearly every country in the world is hydrologically linked to another country, usually through ground water resources. See Almásy & Busás, *supra* note 4, at 64 (reporting on eighty-nine aquifers in Europe); Mummé, *supra* note 118, at 344 (identifying eighteen transboundary aquifers in the Mexico-United States border area, many related to international watercourses); UNESCO, *Transboundary Aquifers in Africa*, app. 3, in *Managing Shared Aquifer Resources in Africa*, (June 2–4, 2004) IHP-VI Series on Groundwater No. 8, (edited & written by B. Appelgren) available in <http://unesdoc.unesco.org/images/0013/001385/138581m.pdf> (last visited Apr. 2, 2007) (identifying thirty-eight transboundary aquifers in Africa); *Final Report: UNESCO/OAS ISARM* *supra* note 116 (identifying 65 transboundary aquifers in the Americas). Of course, while the majority of countries are also hydraulically linked to their neighbors via transboundary rivers and lakes, very few countries have ratified the Watercourse Convention. See Eckstein 2002, *supra* note 12, at 88. For an updated list of countries that have ratified or signed on to the Watercourses Convention, see *Status of the Watercourse Convention, International Water Law Project*, http://www.internationalwaterlaw.org/IntlDocs/Watercourse_status.htm (last visited Apr. 2, 2007).

174. *Fifty-Eighth Session Report*, *supra* note 14, ¶ 75, art. 2, at 186.

175. A spring is a localized emergence of water from an aquifer, typically along a fault or fissure. Price, *supra* note 37, at 100–01.

176. Seepage describes a diffused flow of water emerging from an aquifer along a large portion of the aquifer. *Id.*

face of an exposed aquifer strata—e.g., along the face of a cliff. Nonetheless, unless the cliff face demarcated the precise boundary between the two countries and the spring or seepage occurred exactly at that border location, the State with the discharge zone would be considered an aquifer State. One possible exception in which a discharge zone might be located in a non-aquifer State is where a non-aquifer State artificially discharges from the aquifer by drilling horizontally underneath and into the aquifer in the aquifer State.¹⁷⁷

Notwithstanding the above, this whole discussion may be superfluous when considering the current definition of “aquifer” in relation to the scope of the Draft Articles. As noted above, the definition of aquifer excludes both the recharge and discharge zones of an aquifer.¹⁷⁸ The consequence of this exclusion is not insignificant. Since the scope of the Draft Articles is limited to transboundary aquifers, the scenarios described—an aquifer located in State A with a recharge or discharge zone in State B—fall outside the scope of the Draft Articles. Such aquifers would merely be characterized as State A domestic aquifers, which are excluded from the Draft Articles.¹⁷⁹

Given the importance of recharge and discharge zones to the integrity and normal functioning of aquifers, though, this unintended consequence must be addressed and overcome. While such aquifers

177. Arguably, it is possible that the drafters of this provision intend the meaning of “discharge zone” to encompass a broader geographic and hydrologic scope. For example, a broader understanding might include the streams emerging or wetlands formed from springs and seepages. Such an understanding, however, would conflict with the scope of the Watercourse Convention.

178. The first mention that the definition of aquifer would exclude the recharge and discharge zones appears in *Yamada Second Report, supra* note 14, ¶ 17 (stating only that “[r]echarge and discharge zones are outside aquifers” with no explanation). While the reason for this exclusion was never formally documented, it was based on three concerns: 1) the desire to minimize the complexity of delimiting the geographic scope of aquifers, especially since the precise contours of an aquifer’s recharge or discharge area often is indeterminate; 2) the probability that states would object to having vast portions of their territory made subject to the terms of the Draft Articles, especially where a recharge zone extended beyond the territory overlaying the aquifer; and 3) the likelihood that states in whose territory a recharge or discharge zone lies, but where there is no saturated portion of the aquifer itself, would be disinclined to accept the responsibility of protecting the zone without obtaining any benefits. Unofficial notes of meetings of the UNESCO-organized experts group, held in Paris, Fr., June 24–25, Oct. 18–20, 2004, & Tokyo, Japan, Mar. 22–24, 2004, the latter two included Special Rapporteur, Chusei Yamada (*on file with author*).

179. The only scenario under which such an aquifer could be regarded as a transboundary aquifer is if it was transboundary with yet another State—State C. In such a case, the Draft Articles would apply only as between States A and C, but not to the state in which the recharge occurs—State B.

might not constitute transboundary aquifers for the purposes of the Draft Articles, their transboundary characteristics should not be ignored. Clearly, the chief concern in protecting the viability of a domestic aquifer with a recharge or discharge zone located in another state would be ensuring the participation of the non-aquifer State. Accordingly, it may be prudent to revisit the definition of an aquifer and reconsider whether the recharge and discharge zones should be excluded. Alternatively, special categorization or definition might be formulated that would qualify such aquifers as transboundary aquifers, despite their domestic characteristic, and make them subject to some or all of the provisions found in the Draft Articles.

C. Draft Article 11 – Prevention, Reduction and Control of Pollution

Aquifer States shall, individually and, where appropriate, jointly, prevent, reduce and control pollution of their transboundary aquifer or aquifer system, including through the recharge process, that may cause significant harm to other aquifer States. In view of uncertainty about the nature and extent of transboundary aquifers or aquifer systems and of their vulnerability to pollution, aquifer States shall take a precautionary approach.¹⁸⁰

As noted above, aquifers have particular vulnerabilities related to their slower flow and often more limited or prolonged reclamation abilities relative to surface water resources. Moreover, their physical underground location, often at considerable depths, makes monitoring and ensuring the integrity of aquifers a more complicated task.¹⁸¹ Accordingly, any pollution occurring in one portion of an aquifer may take considerable time, possibly years or decades, to manifest in another portion of the aquifer. In other words, it is possible for a transboundary aquifer State to pollute a portion of the aquifer within their territory without causing immediate significant harm to another aquifer State. This could occur where the pollution remains in the original State over an extended period of time, or where the other State is not presently utilizing or is not otherwise reliant on the aquifer.

Draft Article 11 addresses the issue of aquifer pollution in one aquifer State that may result in significant harm to another aquifer State. It provides that aquifer States must “prevent, reduce and control

180. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 11, at 189.

181. *See supra* note 90 and accompanying text.

pollution . . . that may cause significant harm to other aquifer States.”¹⁸² Certainly, the provision does not mandate that aquifer States prevent all pollution of an aquifer, but rather must prevent all pollution that may result in significant harm to another aquifer State. However, the use of the obligatory language in relation to the phrase “pollution . . . that may cause . . .” is significant in that it sets a lower threshold than that found in Draft Article 6. Draft Article 6, relating to the obligation to not cause significant harm to other aquifer States, addresses significant harm in terms of actual significant harm. Here, the modifier “may” requires aquifer States to take preventative or precautionary measures even where the likelihood of significant harm is uncertain. However, it is unclear who is to judge the threshold issue: is it delegated to the aquifer State in which the pollution occurs to decide whether that pollution “may cause significant harm to [an]other aquifer States” and how to respond, or is it for the aquifer State that may be significantly harmed to determine that preventative or precautionary measures are necessary?¹⁸³ Considering issues of sovereignty, it is likely that the former was intended.

To some extent, the Draft Article attempts to assuage this ambiguity by obligating all aquifer States to “take a precautionary approach” in addressing aquifer pollution and the likelihood of significantly harming another aquifer State.¹⁸⁴ Thus, regardless of who judges the threshold question, the aquifer State in which the pollution occurs must err on the side of precaution.

D. Draft Article 12 – Monitoring

1. Aquifer States shall monitor their transboundary aquifer or aquifer system. They shall, wherever possible, carry out these monitoring activities jointly with other aquifer States concerned and, where appropriate, in collaboration with the competent international organizations. Where, however, monitoring activities are not carried out jointly, the aquifer States shall exchange the monitored data among themselves.

2. Aquifer States shall use agreed or harmonized standards and methodology for monitoring their transboundary aquifer or aquifer

182. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 11, at 189.

183. *Id.*

184. While acknowledging the preference of ground water scientists, the Special Rapporteur opted to use the broader phrase “precautionary approach” rather than the better known “precautionary principle because he does not believe that the latter has developed into a rule of general international law. *See Yamada Third Report, supra* note 15, ¶ 32.

system. They should identify key parameters that they will monitor based on an agreed conceptual model of the aquifer or aquifer system. These parameters should include parameters on the condition of the aquifer or aquifer system as listed in draft article 8, paragraph 1, and also on the utilization of the aquifer and aquifer system.¹⁸⁵

Under Draft Article 8, aquifer States are obligated to exchange data and information on a regular basis regarding a transboundary aquifer. Accordingly, that data and information must be generated in some fashion and in a consistent manner so as to provide a clear picture of the unique and dynamic nature of each transboundary aquifer. Hence, Draft Article 12(1) creates an affirmative obligation, requiring aquifer States to monitor transboundary aquifers. In this context, monitoring refers to the continuous examination of various characteristics and conditions related to the transboundary aquifer. While not a comprehensive list, Draft Article 12(1) requires monitoring of the list of aquifer characteristics and conditions provided in Draft Article 8.

The Draft Article also encourages such monitoring activities to be conducted in partnership with other aquifer States. From both a scientific and political perspective, coordinated monitoring is the ideal scenario since it contemplates both the sharing of resources as well as agreement on monitoring methodologies, techniques, procedures, assumptions, and technologies. Moreover, such cooperation facilitates the utilization of the data and information developed through monitoring activities.¹⁸⁶ A coordinated effort is further emphasized in the second paragraph of Draft Article 12, which requires aquifer States to “harmonize standards and methodology” in carrying out monitoring activities, whether jointly or independently.

However, this Draft Article takes the objective of coordination and cooperation a step further. First, it encourages aquifer States to identify the key characteristics and conditions that will be monitored by them, whether jointly or independently. As noted previously in the discussion regarding harmonization and exchange of data and information, it is critical for all of the parties to be able to understand the data and information generated by each aquifer State in order to facilitate their utilization of the data and information.

More importantly, especially from a hydrogeologic perspective, the Draft Article encourages aquifer States to agree on a conceptual model for the aquifer.¹⁸⁷ While not always an easy task, an agreed-upon

185. *Fifty-Eighth Session Report*, *supra* note 14, ¶ 75, art. 12, at 189.

186. *See supra* note 160 and accompanying text.

187. A conceptual model of an aquifer is a pictorial representation of the hydrogeological system that allows ground water scientists to develop mathematical

conceptual model allows the aquifer States to more easily exchange and understand data and information and, thereby develop a more complete understanding of the dynamics, functioning, and vulnerabilities of a transboundary aquifer.

E. Draft Article 13 – Management

Aquifer States shall establish and implement plans for the proper management of their transboundary aquifer or aquifer system in accordance with the provisions of the present draft articles. They shall, at the request by any of them, enter into consultations concerning the management of the transboundary aquifer or aquifer system. A joint management mechanism shall be established, wherever appropriate.¹⁸⁸

In contrast to the above Draft Articles, Draft Article 13 presents a more general duty—an obligation to plan. Draft Article 13 requires aquifer States to “establish and implement plans for the proper management of their transboundary aquifer . . . in accordance with . . . the present draft article.” In essence, the Draft Article encompasses all of the other obligations contained in the Draft Articles by requiring aquifer States, in advance, to strategize and establish the mechanisms for utilizing the aquifer in an equitable and reasonable manner without causing significant harm to other aquifer States, by cooperating in good faith, by exchanging data and information, and so on. Under the Draft Article, such planning can be carried out individually or jointly with other aquifer States. On the other hand, the Draft Article states that in the event that an aquifer State is requested to consult with another aquifer State on the management of a transboundary aquifer, it must do so, albeit without prejudice as to the outcome of the consultation.¹⁸⁹

Significantly, the Draft Article also obligates aquifer States, “where appropriate,” to establish a joint mechanism for managing a

models for assessing and analyzing an aquifer and, thereby, understanding and predicting system behavior. See Mary P. Anderson & William W. Woessner, APPLIED GROUNDWATER MODELING: SIMULATION OF FLOW AND ADVECTIVE TRANSPORT 28–29 (1992) (describing the steps for formulating a conceptual model of an aquifer). A conceptual model is integral to an aquifer monitoring program since the characteristics and conditions monitored should be structured and related to an identifiable objective. Merely measuring the rate of ground water flow at a particular location serves little purpose unless those measurements are related to and correlated with other locations where flow is measured in the context of a conceptual model.

188. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 13, at 189–90.

189. *Id.*

transboundary aquifer. Although stopping short of calling for the creation of an institution to carry out the joint management activities, the Draft Article effectively mandates cooperation and coordination. Certainly, the phrase “where appropriate” tempers the obligation to the extent that it would allow States to avoid joint mechanisms if such efforts were unwarranted. Nonetheless, given the lack of real world examples of States cooperating over, let alone instituting joint mechanisms for transboundary aquifers, such moderation may be warranted to allow States the flexibility to experiment with different mechanisms for managing transboundary ground water resources.¹⁹⁰

V. DRAFT ARTICLES ON ACTIVITIES AFFECTING OTHER STATES

A. *Draft Article 14 – Planned Activities*

1. When a State has reasonable grounds for believing that a particular planned activity in its territory may affect a transboundary aquifer or aquifer system and thereby may have a significant adverse effect upon another State, it shall, as far as practicable, assess the possible effects of such activity.
2. Before a State implements or permits the implementation of planned activities which may affect a transboundary aquifer or aquifer system and thereby may have a significant adverse effect upon another State, it shall provide that State with timely notification thereof. Such notification shall be accompanied by available technical data and information, including any environmental impact assessment, in order to enable the notified State to evaluate the possible effects of the planned activities.
3. If the notifying and the notified States disagree on the possible effect of the planned activities, they shall enter into consultations and, if necessary, negotiations with a view to arriving at an equitable resolution of the situation. They may utilize an independent fact

190. While there are numerous examples where institutions were created to oversee the management of surface waters, there is only one example relating to a transboundary ground water resource: Arrangement on the Protection, Utilization, and Recharge of the Franko-Swiss Genevise Aquifer, Fr.-Switz., Sept. 1977, (Unofficial English Translation) available at <http://www.internationalwaterlaw.org/RegionalDocs/Franko-Swiss-Aquifer.htm> (last visited Oct. 13, 2006).

finding body to make an impartial assessment of the effect of the planned activities.¹⁹¹

Of the various obligations imposed by the Watercourse Convention on riparians to an international watercourse, none are as detailed as the provisions on planned measures. No less than nine articles specify the steps and measures required by watercourse States in relation to planned measures that may have a significant effect on other watercourse States.¹⁹² In contrast, the Draft Articles offer rather simple procedural requirements in one article. The UNILC explains in its Commentaries to Draft Article 14 that while numerous development projects on, and related disputes over international watercourses have generated detailed procedures to avoid and mitigate disputes, “[i]n the case of transboundary aquifers, detailed procedures for dealing with planned activities have not yet been developed.”¹⁹³

Despite the lack of state practice, in one important respect, the UNILC achieved a remarkable consensus related to the obligation on planned measures. The obligations and benefits found in Draft Article 14 are significantly broad in that they extend to non-aquifer States. Under the Draft Article, *any* State that undertakes or allows measures to be taken within its territory that would result in “a significant adverse effect” on any other State must, “as far as practicable, assess the possible effects of such activity.”¹⁹⁴ Clearly, such a broad application is troubling to the extent that enforcement of such obligations may be difficult, especially with regard to those imposed on non-aquifer States.¹⁹⁵ As

191. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 14, at 190.

192. *See* Watercourse Convention, *supra* note 13, arts. 11–19. The titles and subject-matter of the articles include:

Article 11 – Information Concerning Planned Measures

Article 12 – Notification Concerning Planned Measures with Possible Adverse Effects

Article 13 – Period for Reply to Notification

Article 14 – Obligations of the Notifying State During the Period for Reply

Article 15 – Reply to Notification

Article 16 – Absence of Reply to Notification

Article 17 – Consultations and Negotiations Concerning Planned Measures

Article 18 – Procedures in the Absence of Notification

Article 19 – Urgent Implementation of Planned Measures

193. *See Fifty-Eighth Session Report, supra* note 14, ¶ 1, at 230 (Commentary on Draft Art. 14).

194. *Id.*, ¶ 75, art. 14, at 190.

195. Arguably, enforcement of benefits should not be an issue. Even where the benefiting State is a non-aquifer State, under Article 36 of the Vienna Convention on the Law of Treaties, a right or benefit can arise for a third State “if the parties to the treaty intend the provision to accord that right . . . to the third State . . . and the third State

noted above, States that are not a party to an agreement cannot be bound by that agreement.¹⁹⁶ Nonetheless, as suggested above, if a State becomes a party to any formal instrument resulting from the Draft Articles, it may still be bound to the planned measures obligation even in relation to aquifer States with which it does not share an aquifer.¹⁹⁷

With regard to planned activities that trigger this obligation, including measures carried out by the State and those undertaken by subsidiary organs of the State or by private enterprises. These activities include both the utilization of a transboundary aquifer as well as other activities that could impact that aquifer; however, they do not encompass activities related to the obligations described in Draft Articles 9-13 related to the protection, preservation, and management of a transboundary aquifer.¹⁹⁸

As for the obligations themselves, Draft Article 14 articulates an interrelated and short successive series of requirements that all States may follow. First, as a minimum obligation, each State must undertake an assessment of the possible significant adverse effects¹⁹⁹ that a planned activity may cause to another State prior to undertaking the particular activity. It then must timely notify the potentially affected State of its plans and furnish it with available technical data and information, presumably developed in the course of its assessment. Lastly, where the

assents thereto. Its assent shall be presumed so long as the contrary is not indicated, unless the treaty otherwise provides." See Vienna Convention on the Law of Treaties, *supra* note 172, art. 36.

196. See Vienna Convention *supra* note 171, arts. 34 & 36 and accompanying text.

197. See *Fifty-Eighth Session Report supra* note 194, art. 14, at 190 and accompanying text.

198. See *id.* ¶¶ 1-3, at 230-31 (Commentary on Art. 14).

199. It is noteworthy that the threshold triggering the obligation is that the planned activity may result in a "significant adverse effect." This is a lower threshold than that of "significant harm" found in Draft Article 6. See *Fifty-Eighth Session Report, supra* note 14, art. 6, at 187; see *supra* notes 120-143 and accompanying text. The standard is intentionally lower because the use of the higher standard—significant harm—would implicate the procedures of Draft Article 14 only where implementation of the new activities might result in a conduct already covered by Draft Article 6. In other words, an aquifer State providing the requisite notification to another aquifer State, essentially, would be admitting that its planned activities might cause significant harm to that other State. The use of the lower threshold is intended to avoid such a situation and to ensure that aquifer States provide notice before embarking on activities that may result, at least, in a significant adverse effect. Cf. *Report of the Commission to the General Assembly on the Work of its Thirty-First Session, The Law of the Non-Navigational Uses of International Watercourses*, U.N. Doc. A/49/10 (1994), reprinted in [1994](2) Y.B. INTL L. COMM'N 111, at Commentary (2) to Art. 12, U.N. Doc. A/CN.4/SER.A/1994/Add.1 (Part 2) (discussing the lower threshold of significant adverse effect in relation to the notification requirement of the Watercourse Convention).

two States disagree on the likelihood, type, and degree of harm that may result from the planned measures, the States must consult and negotiate in an effort to reach a compromise on the planned measures and the potential harm.

The first obligation is highly qualified in two regards. First, the requirement applies only where the State contemplating the planned activities has reasonable grounds to believe that its activities may result in a significant adverse effect on another State. Secondly, the obligation is conditioned on the practicability of the planning State to conduct an assessment. While some States may value the flexibility afforded by this provision, the language allows for considerable subjectivity in the determination of whether these two prerequisites are met. Moreover, from a practical perspective, it is unlikely that a decided undertaking by the planning State would ever be subject to review such that a State could be found to have violated Draft Article 14. As a result, these qualifications seriously undercut the value and impact of the other two obligations of consultation and negotiation, which are at the core of Draft Article 14. Because they are critically dependent on the completion of the first obligation—the assessment of whether a planned activity may result in significant adverse effect on another aquifer State—they could become meaningless if the planning State finds justification to avoid the assessment obligation. Accordingly, the prerequisites of Draft Article 14(a) bring into question not only the enforceability of Draft Article 14, but also the relevance of its principles for managing transboundary ground water resources.

Although given the lack of State practice pertaining to notice requirements for activities related to transboundary aquifers, it is possible that the UNILC was unwilling to formulate stronger conditions to govern the planned activities of States. Nonetheless, the very purpose of a notification requirement is to ensure that potentially affected States, at the very least, become aware of other States' planned activities and their possible negative impacts. Arguably, a general notice requirement for plans to exploit a transboundary natural resource is already part of customary international law.²⁰⁰

It is noteworthy that the qualified assessment requirement does not appear in the Watercourse Convention. Its absence in that instrument suggests either that an unconditioned assessment is mandated, or that the Watercourse State planning activities must notify other Watercourse

200. See Owen McIntyre, *The Role of Customary Rules and Principles of International Environmental Law in the Protection of Shared International Freshwater Resources*, 46 NAT. RESOURCES J. 157, 180–86 (2006); see generally Daniel G. Partan, *The "Duty to Inform" in International Environmental Law*, 6 B.U. INT'L L.J. 43 (1988).

States to allow them to make such an assessment.²⁰¹ Accordingly, it may be worthwhile for the UNILC to revisit the first paragraph of this Draft Article and either replace the first paragraph of Draft Article 14 with one similar to Article 11 of the Watercourse Convention, or strengthen the assessment obligation in that paragraph to ensure that the decision of whether to conduct such an assessment is not so subjective.

VI. MISCELLANEOUS DRAFT ARTICLES

A. *Draft Article 15 – Scientific and Technical Cooperation with Developing States*

States shall, directly or through competent international organizations, promote scientific, educational, technical and other cooperation with developing States for the protection and management of transboundary aquifers or aquifer systems. Such cooperation shall include, inter alia:

- (a) training of their scientific and technical personnel;
- (b) facilitating their participation in relevant international programmes;
- (c) supplying them with necessary equipment and facilities;
- (d) enhancing their capacity to manufacture such equipment;
- (e) providing advice on and developing facilities for research, monitoring, educational and other programmes;

201. See Watercourse Convention *supra* note 13. Article 11 of the Watercourse Convention provides:

Information Concerning Planned Measures

Watercourse States shall exchange information and consult each other and, if necessary, negotiate on the possible effects of planned measures on the condition of an international watercourse. Watercourse Convention, *supra* note 13.

Article 12 of the Watercourse Convention provides:

Notification Concerning Planned Measures with Possible Adverse Effects

Before a watercourse State implements or permits the implementation of planned measures which may have a significant adverse effect upon other watercourse States, it shall provide those States with timely notification thereof. Such notification shall be accompanied by available technical data and information, including the results of any environmental impact assessment, in order to enable the notified States to evaluate the possible effects of the planned measures. *Id.*

(f) providing advice on and developing facilities for minimizing the detrimental effects of major activities affecting transboundary aquifers or aquifer systems;

(g) preparing environmental impact assessments.²⁰²

While Draft Article 7 addressed the general obligation to cooperate, Draft Article 15 articulates a more specific commitment in two respects: it creates a unidirectional track of cooperation, obligating the more developed States to assist developing States,²⁰³ and it focuses primarily on scientific and technical cooperation.²⁰⁴

In many parts of the world, data and information on ground water resources is lacking or non-existent. This is especially prevalent in border regions where studies, if conducted, typically are pursued independently on each side of the border, using different scientific standards, collecting dissimilar data, and generating maps and conceptual models that "stop" at the border.²⁰⁵ In addition, the technical knowledge,

202. Fifty-Eighth Session Report, *supra* note 14, ¶ 75, art. 15, at 190–91.

203. The duty of developed nations to cooperate and assist less developed nations is not a new concept and as a principle of international law, evidence of state practice of cooperation even may predate that of sovereign rights. Mehlika Hoodbhoy, et al., *Exporting Despair: The Human Rights Implications of U.S. Restrictions on Foreign Health Care Funding in Kenya*, 29 *FORDHAM INT'L LJ.* 1, 111 (2005) (discussing the general duty of developed nations to assist and cooperate with developing states in human rights contexts). For example, the Charter on Economic Rights and Duties of States contains strong language on the obligation of developed states to cooperate and actively assist developing nations. G.A. Res. 3281 (XXIX), U.N. Doc. A/RES/29/3281 (Dec. 12, 1974), available at <http://www.un-documents.net/a29r3281.htm> (last visited Mar. 7, 2007). See also Declaration on Principles of International Law Concerning Friendly Relations and Cooperation Among States in Accordance with the Charter of the United Nations, G.A. Res. 2625, at 121, U.N. GAOR, 25th Sess., Supp. No. 28, U.N. Doc. A/5217 (Oct. 24, 1970).

204. In many cases, international cooperation is understood to mean the provision of technical, scientific, and even financial assistance to developing countries. See Hoodbhoy, *supra* note 203, at 112. Moreover, the obligation to provide scientific and technical assistance to developing States is found in numerous international agreements. E.g., United Nations Convention on the Law of the Sea, arts. 201–03, U.N. Doc. A/Conf.62/122, U.N. Sales No. E.83.V.5 (1983); Stockholm Convention on Persistent Organic Pollutants, art. 12(2), U.N. Doc. UNEP/POPS/CONF/4, (May 22, 2001)(instructing parties to provide technical assistance to developing countries); Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, art. 16, UNEP/FAO/PIC/CONF/5 (Sept. 11, 1998)(requiring parties to provide technical assistance to countries with less developed infrastructure and capacity to manage chemicals).

205. Although most prominent in developing countries, this phenomenon is also evident in some of the most industrialized nations. For example, in the United States, there is a paucity of information on aquifers found along the US-Mexico border. In fact, the exact number, size, and potential of aquifers in the border region are still unclear. See,

equipment, and processes necessary to conduct appropriate hydrogeological studies exist primarily in the developed world.²⁰⁶

The lack of data and information is predominantly a function of resources and capacity, and serves as a barrier for many countries to develop sustainable water management practices and policies. Although Draft Article 15 does not necessarily burden developed States with financial or other resource requirements, it does seek to compel them to help improve the conditions necessary for, and enhance the capacity of, developing States to appropriately manage and protect their transboundary aquifers. This obligation is limited considerably in that it requires developed States merely to “promote” cooperation with developing States. Moreover, it does not mandate how a more developed State complies with the obligation under Draft Article 15, but rather allows it to select the degree of effort and modality of cooperation.²⁰⁷ Accordingly, these responsibilities are merely altruistic objectives couched in seemingly obligatory language. Arguably, such non-binding and unenforceable “obligations” already “burden” the developed world where compliance has been underwhelming.

One particular shortcoming of the Draft Article is the absence of any provision for developing mechanisms to mobilize financial resources to support capacity building, knowledge development, research and data generation, and equipment procurement. Concededly, there is no obligation under international law for any nation to provide financial support or other resources to another State.²⁰⁸ Nonetheless, the Draft Articles would be meaningless to countries that adopt the Draft Articles, but lack the resources and capacity to implement them.

G. Eckstein, *Commentary on “Turning on the tap: the world’s water problems”* by Robert Glennon, 3 *FRONTIERS IN ECOLOGY AND THE ENVIRONMENT* 504, 505 (2005); GOOD NEIGHBOR ENVIRONMENTAL BOARD, *supra* note 116, at 24.

Recognizing the seriousness of this predicament, as well as the growing importance of ground water resources for the United States, on December 22, 2006, President George W. Bush signed into law the US-Mexico Transboundary Aquifer Assessment Act. The Act directs the US Department of Interior to cooperate with the US States of Arizona, California, New Mexico, and Texas along the US-Mexico border, and other appropriate entities, to conduct a systematic hydrogeological characterization, mapping, and modeling program for priority transboundary aquifers along the US-Mexico border. Pub. L. No. 109-448, 120 Stat. 3328 (2006).

206. See Fifty-Eighth Session Report, *supra* note 14, ¶ 2, at 233–34 (Commentary on Draft Art. 15).

207. See *id.*, ¶ 1, at 233–34 (Commentary on Draft Art. 15).

208. Potentially, a developed nation might have an incentive to provide such support and cooperation where it bordered a developing state lacking the appropriate resources and capacity. While examples of such relationships do exist around the world, the numbers are limited.

B. Draft Article 16 – Emergency Situations

1. For the purpose of the present draft article, “emergency” means a situation, resulting suddenly from natural causes or from human conduct, that poses an imminent threat of causing serious harm to aquifer States or other States.

2. Where an emergency affects a transboundary aquifer or aquifer system and thereby poses an imminent threat to States, the following shall apply:

(a) the State within whose territory the emergency originates shall:

(i) without delay and by the most expeditious means available, notify other potentially affected States and competent international organizations of the emergency;

(ii) in cooperation with potentially affected States and, where appropriate, competent international organizations, immediately take all practicable measures necessitated by the circumstances to prevent, mitigate and eliminate any harmful effect of the emergency;

(b) States shall provide scientific, technical, logistical and other cooperation to other States experiencing an emergency. Cooperation may include coordination of international emergency actions and communications, making available trained emergency response personnel, emergency response equipments and supplies, scientific and technical expertise and humanitarian assistance.

3. Where an emergency poses a threat to vital human needs, aquifer States, notwithstanding draft articles 4 and 6, may take measures that are strictly necessary to meet such needs.²⁰⁹

Draft Article 16 addresses the obligations of States under circumstances denoted as “emergency situations.” This Draft Article is best understood in three parts: 1) interpreting “emergency situation”; 2) obligations of the State in whose territory the emergency originates; and 3) obligations of other States.

A situation constitutes an “emergency situation” regardless of whether it originates from natural causes or from human conduct. Moreover, in the case of human origin, liability or responsibility for the emergency situation is irrelevant as Draft Article 16 does not

209. Fifty-Eighth Session Report, *supra* note 14, ¶ 75, art. 16, at 191.

contemplate accountability. Hence, the obligations triggered by the Draft Article would apply in situations of industrial accident or other accident, intentionally causing the emergency, terrorism, or natural disaster.

A situation is denoted an “emergency” where it arises suddenly, and creates or results in an “imminent threat” of “serious harm” to another State. All three criteria—suddenness of the situation, imminent threat of the harm, and seriousness of the harm—must be present to justify the measures required by the Draft Article.²¹⁰ All three of the criteria create thresholds that must be overcome for the Draft Article to apply: if the threat of harm does not result suddenly, is not imminent, or the threatened harm is not serious, the measures of Draft Article 16 would not be justified. That is not to say that no other obligation would result or action be required. Rather, any circumstance that does not qualify as an emergency situation would still be subject to the other Draft Articles.

With regard to the three criteria, the imminent threat and serious harm criteria offer little that is novel or controversial. An imminent threat of harm suggests a pending or forthcoming harm that is likely to occur. Although the term “imminent” is not defined in the Draft Articles, this threshold is rather easily understood and relates directly to the concept of an emergency or urgent situation. As for “serious harm,” it is unlikely to be contentious, in part, because it is the same threshold used in the analogous provision on emergency situations found in the Watercourse Convention.²¹¹

210. The Commentary to Draft Article 16 appears to suggest that there are only two criteria—suddenness and seriousness of the harm—that are required for application of the Draft Article. It would be unreasonable, however, not to require that the serious harm be looming and forthcoming. Accordingly, the Commentary should be clarified to denote all three of the criteria. See Fifty-Eighth Session Report, *supra* note 14, ¶ 2, at 238 (Commentary on Draft Art. 16).

211. Watercourse Convention, *supra* note 13, art. 28. Article 28 of the Watercourse Convention provides:

Emergency situations

1. For the purposes of this article, “emergency” means a situation that causes, or poses an imminent threat of causing, serious harm to watercourse States or other States and that results suddenly from natural causes, such as floods, the breaking up of ice, landslides or earthquakes, or from human conduct, such as industrial accidents.
2. A watercourse State shall, without delay and by the most expeditious means available, notify other potentially affected States and competent international organizations of any emergency originating within its territory.
3. A watercourse State within whose territory an emergency originates shall, in cooperation with potentially affected States and, where appropriate, competent international organizations, immediately take all

The suddenness criteria, however, does pose a conceptual problem in that the phrase “resulting suddenly” requires clarification. A literal interpretation suggests an abrupt or immediate consequence that results from some event—whether of human or natural origins—that did not exist prior to the event. However, it is unclear whether the discovery of or development of new data or information on an existing scenario also might fall within the meaning of the phrase. For example, a study conducted in one State might reveal information about a previously unknown plume of dangerous contaminants on the verge of, or actively contaminating a transboundary aquifer used for drinking water.²¹² Whether that new knowledge would meet the “resulting suddenly” criteria to trigger the measures of the Draft Article is uncertain. Under a narrow interpretation, the fact that the plume existed prior to its discovery might exempt the situation from the “emergency” categorization.

Moreover, in the same hypothetical, it is doubtful whether there is any triggering event that “result[s] suddenly” in the “emergency situation” contemplated by Draft Article 16. The language of the Draft Article intimates that the imminent threat of serious harm must result from some sudden circumstance or event, such as an industrial accident or tsunami. In the above example, although the plume could have either natural or human origins, its origins may not have resulted in the imminent threat of serious harm. For example, if the plume originated from the deposition of toxic wastes, depending on a variety of factors including the proximity of the deposition site to the aquifer, the actual deposition of the wastes may not have constituted a sudden and imminent threat of serious harm. Likewise, in the case of natural origins,

practicable measures necessitated by the circumstances to prevent, mitigate and eliminate harmful effects of the emergency.

4. When necessary, watercourse States shall jointly develop contingency plans for responding to emergencies, in cooperation, where appropriate, with other potentially affected States and competent international organizations.

212. For example, ground water in the area of former Soviet military bases in Eastern Europe has recently been found to be contaminated with rocket fuel residues, including toxic, carcinogenic, and mutagenic compounds like dimethylanilines and triethylamine. See Janek Reinika and Juha Kallas, *Increasing the biodegradability of rocket fuel polluted groundwater by means of chemical oxidation processes*, 55 PROC. OF THE ESTONIAN ACAD. OF SCI., CHEM. 190, 191 (2006), available at <http://www.kirj.ee/esil-k/chem-2006-4-2.pdf> (last visited Apr. 11, 2007) (noting ground water contamination from rocket fuel residues in Estonia and Latvia); see also Anto Raukas, *supra* note 137, at 73–74 (discussing former Russian bases in Estonia that were contaminated with fuels, oil products, chemicals, demolished buildings, and domestic wastes thereby making ground water in an area of 16 square kilometers completely undrinkable).

an earthquake, volcanic eruption, or other natural phenomena in the distant past could be responsible for mobilizing a contaminant toward the aquifer. Depending on proximity and other factors, that earthquake or volcanic eruption, at the time of that natural event, may not have constituted a sudden and imminent threat of serious harm to the aquifer. In both cases, the circumstance or action that resulted in the present imminent threat of serious harm was a combination of factors: the previous deposition of the contaminant or mobilization of an existing contaminant, the lack of knowledge that the contaminant could or does pose any sort of threat to the transboundary aquifer, and discovery of the plume at the precise time when the contaminant poses an imminent threat of serious harm. However, none of these factors, individually or collectively, “result[] suddenly” in an “emergency situation.”²¹³

Accordingly, it is critical that Draft Article 16 be revisited and considered in relation to the suddenness criteria. At the very least, a commentary should be formulated interpreting the “resulting suddenly” criteria in relation to the discovery of a preexisting situation that presently constitutes an imminent threat of serious harm. For example, the first paragraph of the Draft Article might be revised to read: *For the purpose of the present draft article, “emergency” means a situation resulting from natural causes or from human conduct that arises suddenly or is preexisting but only recently discovered, that poses an imminent threat of causing serious harm to aquifer States or other States.*

With regard to the obligations contemplated by the Draft Article, there are two categories of obligations: those imposed on States in whose territory the emergency originates, and those imposed on all other States. With respect to the former, the responsibilities articulated are similar to those found in the analogous provision in the Watercourse Convention.²¹⁴ Sub-article 2(a)(i) creates a notification obligation that requires the State to immediately inform potentially affected States of the emergency situation. As discussed in the Commentaries, the language of the obligation to notify as well as timing of the notification is well grounded in international law and follows on language found in other international

213. Such a scenario could easily be the source of an international dispute. For example, assume that State A discovers a plume of toxic wastes that originated in State B and that poses an imminent threat of serious harm to a transboundary aquifer on which State A relies. If the toxic waste was deposited at some distant point in the past, State A would be unable to benefit from the provisions of Draft Article 16, *supra* note 14, at 237 (e.g., obligating State B to take immediate corrective action or allowing State A to invoke the vital human needs provision of sub-paragraph 3) because of the lack of a triggering event “resulting suddenly” in the “emergency situation.”

214. See Watercourse Convention, *supra* note 13, art. 28.

instruments.²¹⁵ Sub-article 2(b)(ii) follows with an obligation to undertake “all practicable measures” in response to the harm posed and “necessitated by the circumstances to prevent, mitigate and eliminate any harmful effect of the emergency.” The use of the phrases “all practicable measures” and “necessitated by the circumstances” somewhat temper the obligation as the measures required need only be ones that are “feasible, workable and reasonable [and] warranted by the factual situation of the emergency and its possible effect upon other States.”²¹⁶ It is noteworthy that these obligations would ensue regardless of whether the imminent threat of serious harm results from natural or human origins. While liability is unlikely to be imposed on States in whose territory an emergency originates from natural circumstances, those States are still obligated to comply with both sub-articles 2(a)(i) and 2(a)(ii).

Separately, sub-paragraph 2(b) of the Draft Article attempts to impose obligations on “other States” when a country faces an “emergency situation.” Building on the general duty to cooperate, as articulated in Draft Article 7,²¹⁷ it focuses on and articulates more specific obligations for the unique circumstance of emergency situations. Under “emergency situations,” other States—those not experiencing the emergency situation—must cooperate with States affected by the emergency in providing them with scientific, technical, logistical, and other support to deal with the emergency. Although the use of the word “shall” indicates that the duties articulated are intended to be obligatory, it is questionable whether this formulation is supported by customary international law or constitutes the progressive development of international law. While admirable and even desirable, it is doubtful that customary international law would compel any nation to provide assistance to another nation under any emergency circumstances.²¹⁸

215. Citing to comparable language found in such instruments as the 1986 Convention on Early Notification of a Nuclear Accident and the 1982 United Nations Convention on the Law of the Sea, Commentary 3 to Draft Article 16 asserts that “[w]ithout delay” means immediately upon learning of the emergency, and the phrase “by the most expeditious means available” means that the most rapid means of communication that is accessible is to be utilized.” See Fifty-Eighth Session Report, *supra* note 14, ¶ 3, at 238 (Commentary on Draft Art. 16); see also ¶¶ 5–6 (Commentary on Draft Art. 16) (referring to additional international instruments that pertain to the obligation to notify in emergency situations).

216. See Fifty-Eighth Session Report, *supra* note 14, ¶ 3, at 238 (Commentary on Draft Art. 16).

217. See *supra* notes 144–150 and accompanying text.

218. This was the position taken by the representative of The Netherlands in his comments on the Draft Articles during the October 30, 2006, meeting of the Sixth Committee of the United Nations during the 61st Session of the General Assembly. See Summary Records of the Debate on the Topic of Shared Natural Resources, U.N. GAOR

Notwithstanding, if Draft Article 16, in its current form, was incorporated into an international convention, such obligations would certainly ensue to those States that signed or ratified that instrument.

Lastly, it should be noted that in contrast to the equivalent Watercourse Convention provision,²¹⁹ the Draft Article does not compel aquifer States to jointly develop contingency plans for responding to emergencies. The reasons for this exclusion are not provided in the various documents prepared by the Commission or the Special Rapporteur. In light of natural disasters, such as the Asian tsunami of 2004²²⁰ and its effect on the region's ground water resources,²²¹ the potential for terrorism affecting drinking supplies,²²² and other emergency situations, there are very good arguments to be made for developing contingency plans. Such was the opinion of the Commission when it drafted Article 28 of the Watercourse Convention on Emergency

61st Sess., 6th Committee mtg., ¶ 14, U.N. Doc. A/C.6/61/SR14 (Oct. 30, 2006) *reprinted in* Excerpts from Summary Records of the Debate on the Topic of Shared Natural Resources in the 6th Committee of the United Nations during the 61st Session of the General Assembly, UNILC (LIX)/WG/SNR/Inf.P1, Dec. 21, 2006, prepared by Special Rapporteur Chusei Yamada (*on file with author*).

219. *See supra* note 211, art. 28.

220. U.N.: *Tsunami damage 'unprecedented'*, *cnn.com*, Dec. 28, 2004, *available at* <http://edition.cnn.com/2004/US/12/27/un.tsunami/index.html> (last visited Jan. 11, 2007); U.N.: *Tsunami toll approaches 150,000*, *cnn.com*, Jan. 1, 2005, *available at* <http://edition.cnn.com/2004/WORLD/asiapcf/12/31/asia.quake/index.html> (last visited Apr. 3, 2007).

221. *See* K.G., Villholth, *Tsunami Impacts on Shallow Groundwater and Associated Water Supply on the East Coast of Sri Lanka*, International Water Management Institute (2005) (describing the impact of the December 2004 Asian tsunami on wells and aquifers in Sri Lanka), *available at* http://www.iwmi.cgiar.org/TSUNAMI/pdf/Tsunami_Impacts_on_Shallow_Groundwater.pdf (last visited Jan. 11, 2007); *see also* *Groundwater Community Responds to December 2004 Tsunami*, NEWS & INFO., INT'L ASS'N OF HYDROGEOLOGISTS, Issue D19, Apr. 2005, *available at* <http://www.iah.org/archive/files/N&I%2013.2.pdf> (last visited Apr. 3, 2007); *Impact of the 26-12-04 tsunami on groundwater systems and groundwater based water supplies*, INTERNATIONAL GROUNDWATER RESOURCES ASSESSMENT CENTRE, *available at* <http://igrac.nitg.tno.nl/tsunami1.html> (last visited Apr. 3, 2007).

222. *See* Peter H. Gleick, *Water and Terrorism*, 8 WATER POLICY 481 (2006) (reviewing the history of terrorist attacks on water systems and the most pressing vulnerabilities and risks facing modern water systems), *available at* <http://aquadoc.typepad.com/waterwired/files/GleickWaterTerrorism06.pdf> (last visited Apr. 3, 2007); Michael E. Campana, *Terrorists and Ground Water: Is Weaponization Possible?*, GROUND WATER NEWS & VIEWS (Nat'l Ground Water Ass'n, 2005) *available at* http://aquadoc.typepad.com/waterwired/files/weaponization_and_ground_water4282005.pdf (last visited Apr. 3, 2007).

Situations.²²³ Accordingly, the Commission may wish to reexamine the decision to omit this obligation from the Draft Articles.

C. Draft Article 17 – Protection in Time of Armed Conflict

Transboundary aquifers or aquifer systems and related installations, facilities and other works shall enjoy the protection accorded by the principles and rules of international law applicable in international and non-international armed conflicts and shall not be used in violation of those principles and rules.²²⁴

Draft Article 17 pertains to the protections afforded during times of armed conflict to transboundary aquifers and equipment and installations related to such aquifers. The Draft Article does not articulate new law but merely serves as a reminder of the existence of international law, in particular humanitarian law, concerning fresh water resources and related works.²²⁵ It is noteworthy that the Draft Article does not reference the obligations solely with regard to aquifer States, but rather does so with regard to all States. This is appropriate since a transboundary aquifer and related works could be utilized or attacked during an armed conflict by a non-aquifer State. This Draft Article is nearly identical to Article 29 of the Watercourse Convention.

D. Draft Article 18 – Data and Information Concerning National Defence or Security

Nothing in the present draft articles obliges a State to provide data or information the confidentiality of which is essential to its national defence or security. Nevertheless, that State shall cooperate in good

223. *Forty-Sixth Session Report, supra* note 106, ¶¶ 5–7, at 130 (Commentary on Art. 28).

224. *Fifty-Eighth Session Report, supra* note 14, ¶ 75, art. 17, at 192.

225. *See e.g.*, Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts, art. 54, *opened for signature* Dec. 12, 1977, 1125 U.N.T.S. 3, (prohibiting States from “attack[ing], destroy[ing], remov[ing] or render[ing] useless . . . drinking water installations and supplies and irrigation works”); Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protections of Victims of Non-International Armed Conflicts art. 14, *opened for signature* Dec. 12, 1977, 16 I.L.M. 1442; *see also* Amy Hardberger, *Whose Job Is It Anyway?: Governmental Obligations Created by the Human Right to Water*, 41 *TEX. INT’L L. J.* 533, 549–52 (2006) (discussing the obligations of states during armed conflicts to take no action that would deprive people of needed fresh water).

faith with other States with a view to providing as much information as possible under the circumstances.²²⁶

Draft Article 18 carves out an exception to the obligations created by other Draft Articles on the provision and sharing of data and information.²²⁷ The exception relates to the needs of a State to safeguard classified information that the State regards as “essential to its national defence or security.” The determination of what constitutes “essential” is a matter of discretion for the acting State. This latter point was a particularly controversial issue in the deliberations of the Commission. Concerns were voiced that the degree of discretion afforded by the Draft Article could easily allow for abuse and the protection of information on unverifiable grounds.²²⁸ They also noted that the threshold for that discretion was lower than that afforded by the analogous provision found in the Watercourse Convention, which required data and information to be “vital,” as opposed to “essential,” to a State’s defense or security before its was justified in withholding its disclosure.²²⁹

While the concerns may be justified, the exception created does not exempt the withholding State from the duties imposed by other Draft Articles, in particular, Draft Articles 4, 5, 6, 9, 10, 11, and 14. Moreover, Draft Article 18 does create some, albeit limited, obligations on States withholding data and information on grounds of national defense or security. The article provides that States withholding information must “cooperate in good faith with the other States with a view to providing as much information as possible under the circumstances.” Certainly, this language may not make up for the lack of necessary or important information. Yet, it allows for the possibility that an aquifer State that may be adversely affected by planned measures or other conditions is not left entirely without information concerning those possible effects.

One modification that could strengthen the obligation without

226. Fifty-Eighth Session Report, *supra* note 14, ¶ 75, art. 18 ,at 192.

227. *See supra* notes 144–150 and accompanying text on Draft Art. 7—General obligation to cooperate; *see supra* notes 151–160 and accompanying text on Draft Art. 8—Regular exchange of data and information; *see supra* notes 185–187 and accompanying text on Draft Art. 12—Monitoring.

228. *See* Fifty-Eighth Session Report, *supra* note 14, ¶ 2, at 243 (Commentary on Draft Art. 18).

229. Watercourse Convention, *supra* note 13, art. 31. Article 31 provides:

Data and Information Vital to National Defence or Security

Nothing in the present Convention obliges a watercourse State to provide data or information vital to its national defence or security. Nevertheless, that State shall cooperate in good faith with the other watercourse States with a view to providing as much information as possible under the circumstances.

jeopardizing the interests of the withholding State is to specify that the State withholding information shall cooperate in good faith not only with other States, but, more specifically, with States that might be detrimentally affected by the withholding of the data or information. Under such formulation, the withholding State would still have the discretion, based on good faith and due diligence, of determining which states might be detrimentally affected. However, failure to undertake such an assessment, and, thereafter to pursue cooperation with a State that might be detrimentally affected, would subject the withholding State to additional liability if its actions did, in fact, detrimentally affect the other State.

E. Draft Article 19 – Bilateral and Regional Agreements and Arrangements

For the purpose of managing a particular transboundary aquifer or aquifer system, aquifer States are encouraged to enter into a bilateral or regional agreement or arrangement among themselves. Such agreement or arrangement may be entered into with respect to an entire aquifer or aquifer system or any part thereof or a particular project, programme or utilization except insofar as the agreement or arrangement adversely affects, to a significant extent, the utilization, by one or more other aquifer States of the water in that aquifer or aquifer system, without their express consent.²³⁰

While similarities can be drawn among various transboundary aquifers, most aquifers exhibit features that are specific to the geography, geologic history, climate, and other factors of their environment. Moreover, countries overlying an aquifer in one region of the world will have different historical, political, social, and economic characteristics that are vastly different from States in other regions of the world. For these reasons the Draft Articles were not designed to serve as a model treaty. Rather, the Draft Articles collectively form a framework of principles that apply only generally to all transboundary aquifers. Ideally, the concepts and principles espoused in the Draft Articles will serve as a framework or a set of guidelines for more specific aquifer agreements tailored to each aquifer's and region's unique traits.

Accordingly, Draft Article 19 encourages aquifer States to enter into and develop aquifer or region-specific agreements that address the uniqueness of each aquifer and its environment. Moreover, given the lack

230. Fifty-Eighth Session Report, *supra* note 14, ¶ 75, art. 19, at 192.

of experience in formulating agreements over transboundary aquifers,²³¹ the Draft Article allows for the development of “arrangements” as an alternative to agreements to allow States to cultivate cooperation and experience without necessarily being contractually bound.²³² For similar reasons, the Draft Article advances the notion that agreements and arrangements between States may be crafted for an aquifer, aquifer system, or any part of an aquifer, so long as the agreement or arrangement does not significantly or adversely affect the interests of any aquifer State not participating in the deal without their express consent.

VII. CONCLUSION

In his First Report on Outlines, UNILC Special Rapporteur Chusei Yamada poignantly noted that “[w]e are headed for a world water crises.”²³³ He explained that rapid worldwide growth of economies and populations are taxing existing fresh water resources and that the trends are not expected to decline in the foreseeable future.²³⁴ The Special Rapporteur, however, also suggested that given the sheer volume of ground water in relation to surface water resources, ground water holds great promise for alleviating many of the world’s water ills.²³⁵ The challenge now is to formulate appropriate principles and doctrines of international law that will allow States to overcome the unique problems associated with the utilization, management, allocation, and protection of transboundary aquifers. That challenge is not insignificant. Ground water

231. While there are hundreds of bilateral and regional agreements pertaining to international rivers and lakes, similar cooperation on transboundary aquifers is relatively scarce. See Dante A. Caponera, *PRINCIPLES OF WATER LAW AND ADMINISTRATION: NATIONAL AND INTERNATIONAL*, 186–87 (1992) (discussing sources of international water law); Dante A. Caponera & Dominique Alh riti re, *Principles for International Ground Water Law*, 18 NAT. RESOURCES J. 589, 592–94, 612–13 (1978) (discussing the few references to ground water resources found in treaties); see also Eckstein & Eckstein, *supra* note 6, at 222–31 (tracing the history of ground water in treaties and other international instruments).

232. While not defined, “arrangement” is intended to refer to a less-than-formal or less-than-official agreement that does not necessarily bind the parties to any particular terms.

233. See *Yamada First Report*, *supra* note 8, ¶ 22.

234. *Id.* (asserting that “freshwater is becoming scarce”).

235. *Id.* ¶ 23 (citing to *WATER FOR PEOPLE*, *supra* note 2, for the estimate that global ground water resources contain around 23,400,000 cubic km of water while rivers hold only 42,800 cubic km).

resources have long been the neglected stepchild of international water law.²³⁶

Accordingly, the work of the UNILC on transboundary aquifers is a significant and long overdue undertaking. That the Commission was able to formulate 19 Draft Articles in a matter of four years is a testament to the growing recognition that ensuring fresh water resources is critical to all nations and humanity.²³⁷ At the close of its Fifty-Eighth Session, the UNILC transmitted the 19 Draft Articles on the law of transboundary aquifers to the State Members of the United Nations and requested comments no later than January 1, 2008.²³⁸ The Commission hopes, and possibly expects, that the States will comply with the request given the status and importance of transboundary ground water resources to most nations. Those comments, however, will be critical to the Commission's efforts to craft principles and articles that are not only politically and legally sound and judicious, but also scientifically and socially sensible as well.

236. See Eckstein & Eckstein, *supra* note 5, at 222–31 (discussing the status of ground water under international law and its historical absence from treaties); see also Albert E. Utton, *The Development of International Groundwater Law*, 22 NAT. RESOURCES J. 95, 98 (1982) (noting that “The laws governing groundwater nationally are inadequately developed, and the law governing transboundary groundwaters is only at the beginning state of development.”). As the Special Rapporteur noted, “[m]anagement of confined transboundary groundwaters is still in its infancy . . .”). See *Yamada First Report*, *supra* note 8, ¶ 22.

237. In contrast, it took more than 20 years for the UNILC to formulate its initial draft articles on transboundary watercourses. See *supra* note 11 and accompanying text (discussing briefly the lengthy development of the Watercourse Convention).

238. See Fifty-Eighth Session Report, *supra* note 14, ¶ 73.