

Fossil Aquifers: A Common Heritage of Mankind

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Introduction

Most of the world is not yet aware that a crisis over allocation and use of fresh water will arrive within our lifetimes. We are permitted, even encouraged, to continue utilizing water in inefficient and unsustainable ways for drinking, agriculture, and industry, as if there will always be more of this vital resource available when needed. Every school child is taught that the amount of water on the planet always remains the same—water starts by being soaked up by flora or carried by rivers into the ocean, is released into the air through transpiration and evaporation, and finally returns to the earth in the form of raindrops.¹ If water passing through the hydrological cycle is neither created nor lost, how can there be a crisis?

What many people have not grasped is that most of the water in the world is unavailable for use by humans and other land-based life forms, because the vast bulk of water on the planet—ninety-seven percent—exists in the form of salt water.² Of the remaining three percent, slightly more than two-thirds is frozen in glaciers and ice caps³ (which, as any follower of climate change knows, are releasing their volumes into the salty seas), and thirty percent is found under the surface of the planet.⁴ A quick calculation reveals that only a very small percentage of fresh water—approximately 0.26% of global fresh water reserves—runs through rivers and lies

in lakes,⁵ while the vast majority of available fresh water is stored underground, and is thus called groundwater.

Most groundwater gathers in areas of porous or permeable rock that are called aquifers. Aquifers vary greatly in their characteristics, including size and connectivity to surface waters.⁶ Many aquifers have waters flowing through them at various rates and are replenished, or “recharged,” through rainwater, runoff, rivers, or lakes.⁷ Some aquifers release, or “discharge,” their waters into oases, artesian wells, rivers, or lakes, due to subterranean pressures pushing the water towards lower pressure.⁸ Rechargeable aquifers are dynamic systems that are capable of being replenished, but whose fluids may be depleted if withdrawals are greater than the rate of recharge. India, Pakistan, and China are all consistently withdrawing water from their aquifers much more quickly than the aquifers can be recharged, mostly for agricultural use.⁹ As the water level in an aquifer decreases, wells must be drilled deeper to access groundwater.¹⁰ Growing populations in these countries result in demand for even more unsustainable groundwater withdrawals.¹¹

Another type of aquifer, known as a “fossil aquifer,” occurs in rock formations where water was deposited thousands or even millions of years ago when rainfall or runoff was plentiful in the area, but where the current climatic conditions permit little or no recharge.¹² Withdrawals from a fossil aquifer

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1. See Igor A. Shiklomanov, *World Fresh Water Resources*, in *WATER IN CRISIS: A GUIDE TO THE WORLD'S FRESH WATER RESOURCES* 13, 15 (Peter Gleick ed., 1993).
2. Peter Gleick, *An Introduction to Global Fresh Water Issues*, in *WATER IN CRISIS: A GUIDE TO THE WORLD'S FRESH WATER RESOURCES* 3 (Peter Gleick ed., 1993).
3. Shiklomanov, *supra* note 1, at 13 tbl.2.1; see also FRED PEARCE, *WHEN THE RIVERS RUN DRY* 19 (2006).
4. Shiklomanov, *supra* note 1, at 13 tbl.2.1.

5. *Id.* at 13.
6. See PEARCE, *supra* note 3, at 19.
7. See Gleick, *supra* note 2, at 3.
8. See *The Water Cycle: Ground-Water Discharge*, U.S. GEOLOGICAL SURVEY, <http://ga.water.usgs.gov/edu/watercyclegwdischarge.html> (last visited Nov. 29, 2010); THOMAS HARTER, DIV. OF AGRIC. AND NATURAL RES., UNIV. OF CAL., *BASIC CONCEPTS OF GROUNDWATER HYDROLOGY* 3 (2003), available at http://groundwater.ucdavis.edu/Publications/Harter_FWQFS_8083.pdf.
9. PEARCE, *supra* note 3, at 57.
10. *Id.* at 58.
11. For a fascinating account of a successful project that gave Indian farmers the informational tools to balance withdrawals and rates of recharge, see WORLD BANK, *DEEP WELLS AND PRUDENCE: TOWARDS PRAGMATIC ACTION FOR ADDRESSING GROUNDWATER OVEREXPLOITATION IN INDIA* 59 (2009).
12. See U.N. EDUC., SCIENTIFIC & CULTURAL ORG. (UNESCO), *Preface to NON-RENEWABLE GROUNDWATER RESOURCES: A GUIDEBOOK ON SOCIALLY-SUSTAINABLE MANAGEMENT FOR WATER-POLICY MAKERS* (Stephen Foster & Daniel P. Loucks eds., 2006) [hereinafter UNESCO, *NON-RENEWABLE GROUNDWATER RESOURCES*], available at <http://unesdoc.unesco.org/images/0014/001469/146997e.pdf>. According to the United Nations Educational, Scientific and Cultural Organization (“UNESCO”), the term “fossil aquifer” refers to a groundwater resource that contains water that was put in place millennia ago and whose current rate of recharge may or may not be

fer permanently impact the future availability of that aquifer as a water resource.¹³ Fossil aquifers thus function as terrestrial water banks, neither drawing interest nor losing capital, except when water is extracted through water wells.

Overutilization of groundwater is becoming an urgent problem, as more than half of the world's population depends on groundwater for basic needs such as drinking water.¹⁴ According to a 2009 report issued by the United Nations Educational, Scientific, and Cultural Organization ("UNESCO") and Earthscan, approximately twenty percent of all water used worldwide comes from groundwater, and that percentage is expected to rise.¹⁵ Currently, less than one percent of water used is derived from fossil aquifers, with arid countries such as Algeria, Libyan Arab Jamahiriya ("Libya"), and Saudi Arabia being the prime examples of nations utilizing and sometimes sharing these resources.¹⁶ The Ogallala aquifer in the United States, shared by eight states ranging from South Dakota to Texas,¹⁷ is an example of a domestic fossil aquifer that is being rapidly depleted. The Ogallala contains as much water as Lake Huron¹⁸ and yields roughly thirty percent of all groundwater used for irrigation in the United States.¹⁹ However, as water activist Maude Barlow notes, overexploitation of this resource has reduced crop yields to half of what they were in the 1970s.²⁰ The problem is not limited to the United States. As is discussed later in this Article, other fossil aquifers across the globe are also being depleted, as China, Saudi Arabia, Jordan, Algeria, and Libya all utilize fossil aquifers to satisfy the current needs of their populations.²¹

Many freshwater systems, including aquifers, lie within the borders of a single sovereign nation. According to conventional rules of international law, use of the water stored in these aquifers is governed by the domestic laws of that nation. However, flowing water does not respect national borders, and those freshwater systems traveling over international boundaries fall into the realm of international water law.

quite low, and "non-renewable groundwater resource" refers to aquifers that have a very low rate of recharge. See *id.* at 14 tbl.1. Connate groundwater was also sealed in place many years ago but is often saline. See *id.* Throughout this paper, the term "fossil aquifer" will be used to mean both fossil aquifers and non-renewable groundwater resources, but not connate groundwater.

13. See *id.* at 17.

14. Yoram Eckstein & Gabriel E. Eckstein, *Transboundary Aquifers: Conceptual Models for Development of International Law*, 43 *GROUNDWATER* 679, 679 (2005).

15. RICHARD CONNOR ET AL., UNESCO & EARTHSCAN, *THE UNITED NATIONS WORLD WATER DEVELOPMENT REPORT 3: WATER IN A CHANGING WORLD* 100 (2009).

16. See *id.*

17. ELEANOR STERLING & ERIN VINTINNER, *WATER CONSCIOUSNESS* 20 (Tara Lohan ed., 2008). The geological formation commonly known as the Ogallala aquifer is called the High Plains aquifer by the U.S. Geological Survey, with the Ogallala Formation occupying 80% of the aquifer system. See *High Plains Regional Ground-Water Study*, U.S. GEOLOGICAL SURVEY (Aug. 14, 2010, 2:44 PM), <http://co.water.usgs.gov/nawqa/hpgw/factsheets/DENNEHYFS1.html> [hereinafter *High Plains Groundwater Study*]. This paper will use the term Ogallala aquifer to refer to the entire High Plains aquifer system.

18. Richard Stengel, Richard Woodbury & Sam Allis, *Environment: Ebbing of the Ogallala*, *TIME*, May 10, 1982, available at <http://www.time.com/time/magazine/article/0,9171,925386,00.html>.

19. *High Plains Groundwater Study*, *supra* note 17.

20. MAUDE BARLOW, *BLUE COVENANT* 12–13 (New Press 2008) (2007).

21. See *infra* Part II.

As will be addressed later, issues of competing sovereignty arise when water flows across borders, with nations usually claiming exclusive rights over any water falling within their own jurisdictions.²² Some writers are beginning to suggest that, considering water's unique and vital role in supporting life and society, transboundary ecosystem governance by sovereign nations should be replaced by governance through collaborative institutions consisting of a larger community of citizens, nongovernmental organizations ("NGO"), scientists, and scholars.²³ The debates over who should govern water will certainly grow more heated as climate change advances and shortages of fresh water are felt more acutely. Although there are many treaties addressing surface water,²⁴ and agreements governing the navigational uses of surface water have been around for centuries,²⁵ the complexities of nations sharing groundwater have only recently begun to receive direct attention.²⁶

Much of the scholarly work on groundwater has only been produced in the past forty years, and most of the legal concepts exist only in the form of draft articles, treaties and conventions.²⁷ For example, the Helsinki Rules on the Uses of the Waters of International Rivers,²⁸ one of the first international agreements to address groundwater resources, were issued by the International Law Association in 1966,²⁹ the Bellagio Draft Treaty³⁰ was authored by a group of groundwater scholars in 1989,³¹ and the draft treaty on groundwater, produced by the International Law Commission of the United Nations, was adopted by resolution of the U.N. General Assembly in December 2008.³² International law forms slowly, and the nascent body of international groundwater law is much too fresh for many concepts to be deemed to have crystallized fully. The importance of water-rich, but

22. See *infra* Part I.G.

23. See Bradley C. Karkkainen, *Transboundary Ecosystem Governance: Beyond Sovereignty?*, in *PUBLIC PARTICIPATION IN THE GOVERNANCE OF INTERNATIONAL FRESHWATER RESOURCES* 73, 78–79 (Carl Bruch, Libor Jansky, Mikiyasu Nakayama & Kazimierz A. Salewicz eds., 2005).

24. As of 1978, an index compiled by the U.N. Food and Agriculture Organization listed over 2000 treaties and instruments addressing international watercourses. Stephen C. McCaffrey, *Water, Politics and International Law*, in *WATER IN CRISIS* 92, 97, 103 n.103 (Peter Gleick ed., 1993).

25. Salman M. A. Salman, *The Helsinki Rules, the U.N. Watercourses Convention and the Berlin Rules: Perspectives on International Water Law*, 23 *WATER RESOURCES DEV.* 625, 625 (2007).

26. See generally STEFANO BURCHI & KERSTIN MECHLEM, *FOOD & AGRIC. ORG. OF THE U.N. ("FAO"), GROUNDWATER IN INTERNATIONAL LAW: COMPILATION OF TREATIES AND OTHER LEGAL INSTRUMENTS*, (2005). For a thorough analysis of treaties that mention, but do not have as their primary subject, groundwater, see KYOKO MATSUMOTO, *TRANSBOUNDARY GROUNDWATER AND INTERNATIONAL LAW: PAST PRACTICES AND CURRENT IMPLICATIONS* 22–25, app. 1(A)–(C) (2002), available at <http://www.bvsde.paho.org/bvsacd/cd30/matsumoto.pdf>; see also Eckstein & Eckstein, *supra* note 14, at 680–681.

27. As of this writing, there is only one treaty directly addressing groundwater—the 1977 Franco-Genovese Treaty between French Prefect of Haute-Savoie and the Swiss Canton of Geneva. See Eckstein & Eckstein, *supra* note 14, at 681.

28. International Law Association, Fifty-Second Conference, Helsinki, Fin., Aug. 1966, *The Helsinki Rules on the Uses of the Waters of International Rivers*, U.N. Doc. A/CONF.52/484 (1967) [hereinafter *Helsinki Rules*].

29. *Id.*

30. Robert D. Hayton & Albert E. Utton, *Transboundary Groundwaters: The Bellagio Draft Treaty*, 29 *NAT. RESOURCES J.* 663, 676–722 (1989) [hereinafter *Bellagio Treaty*].

31. *Id.*

32. G.A. Res. 63/124, U.N. Doc. A/RES/63/124 (Jan. 15, 2009).

non-recharging, fossil aquifers is now becoming clear, but there is not yet a consensus on how they should be addressed. Rather than managing their use through the same principles that are proposed for recharging aquifers, the unique and fragile nature of fossil aquifers demands more deliberate and communal practices.

Part I of this Article tracks the history of international groundwater law through analysis of conventions, draft treaties, current practices, and scholarly writings on the topic. Part II summarizes the current status of some of the major fossil aquifers that have been tapped and shows how rapidly those resources are being depleted under the current legal system governing natural resources. After exploring the concepts of "common concern of humanity" and the "common heritage of mankind," Part III then proposes that, given their character as non-renewing resources and the paucity of law on the topic, both wholly domestic and transboundary fossil aquifers should be treated as the common heritage of mankind. As such, they should be managed by an international body that would include hydrologists and water-poor nations, and utilized sustainably with a keen focus on preservation for future generations.

Part I

A. *The State of International Environmental Law*

The commonly accepted starting point for determining whether a practice or principle is considered to have achieved the status of international law³³ is Article 38 of the Statute of the International Court of Justice ("ICJ"),³⁴ a court established by the United Nations in 1945.³⁵ In analyzing and deciding a case under international law, the court may utilize the items on the following list as guidelines, in descending order of importance:

- a. international conventions, whether general or particular, establishing rules expressly recognized by the contesting states;
- b. international custom, as evidence of a general practice accepted as law;
- c. the general principles of law recognized by civilized nations;
- d. subject to the provisions of Article 59 [of the Statute of the ICJ, which states that ICJ decisions are only binding on the parties to that case], judicial decisions and the teachings of the most highly qualified publicists of

the various nations, as subsidiary means for the determination of rules of law.³⁶

The body of international law addressing groundwater is sparse and was developed only recently. Since significant utilization of transboundary fossil aquifers is a recent phenomenon, any practice that has been established with respect to them cannot yet be deemed to be "evidence of a general practice."³⁷ Draft treaties developed on the topic will be addressed herein, even though they generally fall into the category of "teachings of the most highly qualified publicists of the various nations," as opposed to "international conventions," because they have not yet entered into force. However, one could argue that they are evidence of "international custom" and/or "general principles of law recognized by civilized nations."³⁸ Indeed, as will be more fully explored, there is currently a vigorous debate about the state of customary international law with respect to groundwater and whether the principles of customary international environmental law should trump the principles of customary international water law. Because this debate played an important role in the development of the few declarations, conventions, and draft treaties that address transboundary groundwater, either tangentially or directly, we begin our study of international groundwater law by exploring the history of the principles included in those declarations, conventions, and draft treaties.

B. *United Nations Declarations*

The Declaration of the U.N. Conference on the Human Environment, issued following a conference held in Stockholm, Sweden, in June 1972 ("Stockholm Declaration"),³⁹ can be viewed as the first evidence of nations turning their collective attention to environmental issues. Written in lofty and idealistic prose during a time of intense interest and activity in environmental matters, the Stockholm Declaration chronicled the hazards facing the planet as a result of human activities,⁴⁰ called for measures to safeguard natural resources for future generations ("generational equity principle"),⁴¹ and proposed a coordinated approach to all matters affecting the environment.⁴² Principle 5 of the Stockholm Declaration states that "non-renewable resources of the earth must be employed in such a way as to guard against the danger of their future exhaustion and to ensure that benefits from such employment are shared by all mankind."⁴³ That goal of sharing resources was tempered by Principle 21, which reaffirmed states' "sovereign right to exploit their own resources pursuant to their own environmental policies[.]" while recogniz-

33. See SEAN D. MURPHY, *PRINCIPLES OF INTERNATIONAL LAW* 65 (2006). The list provided in Article 38 duplicates the list that was provided to the Permanent Court of International Justice, which was the precursor to the International Court of Justice. *Id.*

34. Statute of the International Court of Justice, art. 38, Oct. 24, 1945, 59 Stat. 1031.

35. *The Court*, INT'L COURT OF JUSTICE, <http://www.icj-cij.org/court/index.php?p1=1> (last visited Nov. 29, 2010).

36. Statute of the International Court of Justice, *supra* note 34, art. 38.

37. *See id.*

38. *See id.*

39. United Nations Conference on the Human Environment, Stockholm, Swed., June 5-16, 1972, *Declaration of the United Nations Conference on the Human Environment*, U.N. Doc. A/CONF.48/14/Rev.1, Ch. 1 (June 16, 1972) [hereinafter *Stockholm Declaration*].

40. *See id.* *proclamations* 1-3.

41. *Id.* *princs.* 2, 5.

42. *Id.* *princs.* 13, 20, 22, 24.

43. *Id.* *princ.* 5.

ing that states have a responsibility to guard against causing damage to the environment beyond their borders.⁴⁴ As will be discussed later, the conflict between a state's sovereignty over natural resources within its borders and its obligation to refrain from actions that would harm its neighbors has not yet been resolved with respect to groundwater.

The Rio Declaration⁴⁵ was issued at the U.N. Conference on Environment and Development, held in Rio de Janeiro, Brazil, from June 3 to June 14, 1992 (known as the "Earth Summit"), almost twenty years to the day after the U.N. Conference on the Human Environment was held in Stockholm. The Rio Declaration reaffirmed the principles of the Stockholm Declaration, but its own principles were more cautious. The Rio Declaration grants nations "the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies[.]" thus adding developmental objectives to the sovereign interests of nations.⁴⁶ In the view of some scholars, adding a reference to developmental policies merely affirmed "an existing and necessary reconciliation with the principle of sustainable development and the sovereignty of states over their own natural resources."⁴⁷

In recognition that economic development was creating extreme pressures on natural resources, the Rio Declaration spoke frequently of sustainable development and cooperation among nations and called for establishment of domestic laws to protect the environment.⁴⁸ However, unlike the Stockholm Declaration, concern for future generations was mentioned only once, in Principle 3, by declaring that the "right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations."⁴⁹ Similarly, the development of international legal norms is mentioned only once, in Principle 13, which, in a slight expansion of Principle 22 of the Stockholm Declaration, calls for a system to determine compensation for damage caused by environmental degradation ("polluter pays principle").⁵⁰ Principle 12 advises nations to cooperate with one another, in stating that "[u]nilateral actions to deal with environmental challenges outside the jurisdiction of the importing country should be avoided. Environmental measures addressing transboundary or global environmental problems should, as far as possible, be based on an international consensus."⁵¹ Principle 15 provides the now-famous "precautionary principle": "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack

of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."⁵² Principle 7 of the Rio Declaration also introduced the principle of "common but differentiated responsibilities," which provides that nations' responsibilities for addressing environmental problems are dependent on their contributions to those environmental problems.⁵³ Pursuant to this principle, developing nations have a lower degree of responsibility for addressing such problems than developed nations, which have been freely polluting the planet for more than a century.⁵⁴ Finally, in Principle 10 the Rio Declaration calls on states to guarantee public access to information on environmental issues, such that individual citizens can become more informed and involved in the decision-making process ("transparency principle").⁵⁵ The Stockholm Declaration places responsibility on the media to disseminate information to the public,⁵⁶ but the Rio Declaration shifts that responsibility to the states. The Rio Declaration sets forth a number of principles that have become familiar in environmental circles. Unfortunately, over the course of the twenty years between the Stockholm Declaration and the Rio Declaration, the generational equity principle lost momentum and was overtaken by the principle of sustainable economic and social development.

C. The International Law Association's Contributions

One of the earliest international guidelines to include groundwater was issued in August 1966 by the International Law Association ("ILA"), a body of international law scholars and professionals that studies, clarifies, and develops private and public international law.⁵⁷ The Helsinki Rules on the Uses of the Waters of International Rivers ("Helsinki Rules")⁵⁸ focus exclusively on waters linked to a river basin and thus include only the nations that share such waters.⁵⁹ Articles IV through VIII call for reasonable and equitable sharing of waters by those nations that are part of the same river basin,⁶⁰ a concept that reappeared later in the 1997 United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses ("Watercourses Convention").⁶¹ The Helsinki Rules may have set a pattern for future draft agreements by providing a list of factors for parties to consider when determining how to apportion water equitably.⁶² However, Article VII established the overarching principle of utilization by declaring that "present reasonable use" may not be subordi-

44. See *id.* princ. 21.

45. United Nations Conference on Environment and Development, Rio de Janeiro, Braz., June 3-14, 1992, *Rio Declaration on Environment and Development*, U.N. Doc. A/CONF.151/5/Rev.1, reprinted in 31 I.L.M. 874 (1992).

46. See *id.* (emphasis added).

47. PATRICIA BIRNIE & ALAN BOYLE, *INTERNATIONAL LAW AND THE ENVIRONMENT* 110 (2002).

48. See Rio Declaration, *supra* note 45, pmbl., princs. 4, 7-8, 11-12, 27.

49. Compare Stockholm Declaration, *supra* note 39, proclamations 6-7, princs. 1-2, with Rio Declaration, *supra* note 45, pmbl., princ. 3.

50. See Rio Declaration, *supra* note 45, princ. 13; Stockholm Declaration, *supra* note 39, princ. 22.

51. Rio Declaration, *supra* note 45, princ. 12.

52. *Id.* princ. 15.

53. *Id.* princ. 7.

54. See *id.*

55. *Id.* princ. 10.

56. See Stockholm Declaration, *supra* note 39, princ. 19.

57. Home, INT'L LAW ASS'N, <http://www.ila-hq.org/> (last visited Nov. 29, 2010).

58. *Helsinki Rules*, *supra* note 28, at 2.

59. See *id.* at 1 (defining international drainage basins as extending over multiple nations).

60. *Id.* at 1-2.

61. Convention on the Law of the Non-Navigational Uses of International Watercourses, art. 6, May 21, 1997, 36 I.L.M. 700 [hereinafter *Watercourses Convention*].

62. See Helsinki Rules, *supra* note 28, at 1-2 (listing factors).

nated to a prospective future need,⁶³ thus undermining any attempt to preserve water for future generations. Because the Helsinki Rules addressed only riparian waters, fossil aquifers are outside of its scope, although Article II refers to both "surface and underground waters."⁶⁴ As the work of a group of legal scholars, the Helsinki Rules have no enforcement mechanism nor can they stand as legal authority but, as the precursor for other agreed texts, they can serve as evidence of the beginning of customary international groundwater law.⁶⁵

In recognition that the Helsinki Rules did not adequately address aquifers, in particular fossil aquifers, the ILA adopted the Seoul Rules on International Groundwaters ("Seoul Rules") at its sixty-second conference, held in Seoul, South Korea, in 1986.⁶⁶ The Seoul Rules are very short—a mere four articles—and are meant to supplement the Helsinki Rules by bringing transboundary groundwater within the purview of the Helsinki Rules. Thus, the groundwater in an aquifer is deemed to fall under the Seoul Rules if the aquifer lies under the lands of two or more nations, even if there is no water flowing between the aquifer and the surface.⁶⁷ Pursuant to the Seoul Rules, common concepts such as the protection of the aquifer from pollution, sharing of information, cooperation on management, and recognition of the integration between surface and groundwaters are specifically extended to aquifers.⁶⁸ The Seoul Rules also advise states to consider the interdependence and interconnections between and among surface waters and different aquifers.⁶⁹

By 1997, the ILA determined that it needed to update the entirety of the Helsinki Rules to reflect changes in customary international water law. To achieve this, the ILA adopted the Berlin Rules on Water Resources ("Berlin Rules") in Berlin, Germany in August 2004.⁷⁰ The Berlin Rules were drafted by the ILA Water Resources Committee, which was led by Special Rapporteur Joseph Dellapenna.⁷¹ The committee split sharply on several issues, resulting in a dissent being published. Led by Stefano Burchi, a well-known scholar and lawyer from the Food and Agriculture Organization of the United Nations ("FAO"), the dissent felt strongly enough to state that "[t]he 1966 Helsinki Rules and the other rules adopted by the ILA in subsequent resolutions on the law governing the waters of international drainage basins have been widely accepted and followed by basin states and are justly regarded as embodying the rules of customary international law. . . . The adoption of the rules now proposed in the Report of the WRC [Water Resources Committee] would mark a radical and unwarranted departure from existing

customary law; it would diminish the influence and reputation of the ILA."⁷² Specifically, the dissent disagreed with the inclusion of domestic water in a document originally meant to update the law on international waters, considering such an inclusion to be an unwarranted leap that expanded customary law to include domestic systems.⁷³ From a legal perspective, the dissent argued that the committee had prioritized the development of international environmental law over international water law.⁷⁴ For example, under Articles 12 and 16, the dissent argued that a state's obligation of management and protection of the resource trumps its right to equitable use, a fundamental premise of international water law.⁷⁵ However, from the viewpoint of Special Rapporteur Dellapenna, the Berlin Rules "provide a clear, cogent, and coherent summary of the customary international law applicable to water resources, incorporating the experience of the four decades since the [ILA] approved the Helsinki Rules."⁷⁶

The Berlin Rules built on the Helsinki Rules in providing guidelines for determining equitable use, with present, vital human needs taking top priority.⁷⁷ In a measure displaying the emerging importance of groundwater concerns, the Berlin Rules dedicated a full chapter to groundwater, ranging from Article 36 to Article 42.⁷⁸ Fossil aquifers are specifically included in the scope of Article 36, though not named as such.⁷⁹ A "precautionary approach" to sustainability of aquifers is mandated in Article 38⁸⁰ but, according to Article 40, sustainable management of fossil aquifers is not to be deemed to prevent withdrawals.⁸¹ Thus, Article 40 of the Berlin Rules repeats the mantra of Article VII of the Helsinki Rules: that present needs should not be subordinated to prospective future requirements.⁸²

The Berlin Rules also state that aquifers are to be protected against pollution,⁸³ and that transboundary aquifers are to be cooperatively managed as entire groundwater systems by states under whose borders they lie.⁸⁴ Further, while they do not restate the polluter pays principle, they do provide a procedural right of redress for harms to groundwater supplies.⁸⁵ Special Rapporteur Dellapenna describes the approach taken in the Berlin Rules as an attempt to reconcile international water law with both international environmental law and international human rights law.⁸⁶

63. *Id.* at 2.

64. *Id.* at 1.

65. See Eckstein & Eckstein, *supra* note 14, at 681.

66. International Law Association, Sixty-Second Conference, Seoul, S. Kor., 1968, The Seoul Rules on International Groundwaters, *reprinted in* Burchi & Mechlem, *supra* note 26, at 534–36 [hereinafter Seoul Rules].

67. *Id.* at 534–35.

68. *Id.* at 535–36.

69. *Id.* at 536.

70. International Law Association, Berlin Conference, Berlin, Ger., 2004, *The Berlin Rules on Water Resources*, 71 Int'l L. Ass'n Rep. Conf. 334, 337–38, available at http://www.internationalwaterlaw.org/documents/intldocs/ILA_Berlin_Rules-2004.pdf [hereinafter Berlin Rules].

71. *Id.* at 338.

72. Slavko Bogdanovic, Charles Bourne, Stefano Burchi & Patricia Wouters, ILA Berlin Conference 2004 – Water Resources Committee Dissenting Opinion, Aug. 9, 2004, available at http://www.internationalwaterlaw.org/documents/intldocs/ila_berlin_rules_dissent.html [hereinafter Water Resources Committee Dissenting Opinion].

73. See *id.*

74. *Id.*

75. See *id.*

76. Joseph W. Dellapenna, *International Water Law in a Climate of Disruption*, 17 MICH. ST. J. INT'L L. 43, 78 (2008).

77. See Berlin Rules, *supra* note 70, at 363–364 (Article 14).

78. See *id.* at 384–90.

79. *Id.* at 384.

80. *Id.* at 385–86.

81. *Id.* at 386–87.

82. See *id.*

83. *Id.* at 387–89.

84. *Id.* at 389–90.

85. *Id.* at 406–10.

86. Dellapenna, *supra* note 76, at 84.

At a conference sponsored by the FAO four months after adoption of the Berlin Rules, Stephano Burchi (a member of the ILA Water Resources Committee that drafted the Berlin Rules and a co-signer of the dissent) and Kerstin Mechlam (a legal officer of the FAO and a consultant to the ILA Water Resources Committee) gave a presentation on what they perceived to be accepted customary international law for water, and outlined the issues yet to be clarified.⁸⁷ In their minds the Helsinki Convention on Transboundary Watercourses⁸⁸ reaffirmed three cardinal rules of international water law: the polluter pays principle, the sustainable development principle, and the precautionary principle.⁸⁹ In addition, they postulated that other general principles had become recognized under international water law, such as equitable utilization of resources, the requirement to use all appropriate measures to prevent significant harm in a neighboring state, and the duty for states to cooperate in sharing information and in giving notice of planned measures that could affect shared water resources.⁹⁰

However, Burchi and Mechlam noted that questions remain about the meaning and extent of certain emerging principles because of the nascent state of international groundwater law. In their estimation, by 1994, other, even newer principles of international groundwater law were beginning to emerge, such as integration of land and groundwater management, integration of overall resource management, the obligation of sustainable use (which could include limiting groundwater withdrawals), and the obligation to protect water resources from pollution.⁹¹ Curiously, in spite of the arguments made in Burchi's dissent to the Berlin Rules that reasonable and equitable use in international water law still overrides international law's principle of resource protection, Burchi and Mechlam agreed that consensus was building that the requirement to protect groundwater is as important as the right to its development and use.⁹²

D. The Bellagio Approach

In 1977, Albert Utton, frustrated and concerned by the lack of established laws and procedures with respect to aquifers and understanding the increasing and future importance of groundwater, began a dialogue among legal and scientific experts to crystallize what they viewed as essential requirements for proper use and management of transboundary aquifers.⁹³ The group met at the Rockefeller Foundation Bellagio Center in Bellagio, Italy in 1987 to review and discuss

their work.⁹⁴ The notes and tapes of that meeting formed the basis of the Bellagio Draft Treaty ("Bellagio Treaty"),⁹⁵ which was penned by R.D. Hayton, G.E. Radosevich, and Albert Utton and presented at a conference of the International Water Resources Association in Ottawa, Canada in May 1988.⁹⁶ Under the Bellagio Treaty, with the assent of the governments participating in the treaty, a given location could be designated a "groundwater conservation area" based on consideration of whether withdrawals exceeded or might exceed recharge, whether recharge has or might become impaired, whether the aquifer has or might become contaminated, and whether management is necessitated by a recurring or persistent drought.⁹⁷ Because withdrawals from fossil aquifers would always exceed the rate of recharge, the Bellagio Treaty would presumably deem all fossil aquifers groundwater conservation areas.

The Bellagio Treaty also called for information gathering⁹⁸ and sharing,⁹⁹ water quality protection,¹⁰⁰ planned depletion of aquifers,¹⁰¹ drought and emergency planning and response,¹⁰² public access to information,¹⁰³ and a comprehensive dispute settlement mechanism.¹⁰⁴ It presented a thoughtful approach to joint aquifer management while allowing states to maintain their sovereignty.

E. The Dublin Rules and the Helsinki Convention on Transboundary Watercourses

In addition to playing an important role in the June 1992 Earth Summit, water was also the focus of a number of other global gatherings that same year. In January 1992, the International Conference on Water and the Environment in Dublin, Ireland, began with a dramatic flourish, as children from the world over pleaded for water to be preserved for their generation.¹⁰⁵ For five days, five hundred experts from one hundred governments and more than eighty organizations discussed the critical issues threatening freshwater resources.¹⁰⁶ At the end of the conference, the participants sent a message to those who would gather at the Earth Summit in June by adopting four principles that have come to be known as the Dublin Statement:

94. *Id.*, at 667.

95. *Id.* at 676.

96. *Id.* at 666.

97. *Id.* at 693.

98. *Id.* at 682–83.

99. *Id.* at 687.

100. *Id.*

101. *Id.* at 703.

102. *Id.* at 706–08.

103. *Id.* at 709–10.

104. *Id.* at 718–19; see also Raj Krishna & Salman M. A. Salman, *International Groundwater Law and the World Bank Policy for Projects on Transboundary Groundwater*, in World Bank Technical Paper No. 456, Groundwater: Legal and Policy Perspectives, Proceedings of a World Bank Seminar 178–79, (Salman M. A. Salman ed., 1999) (summarizing and evaluating the Bellagio Treaty).

105. International Conference on Water and Development, Dublin, Ir., Jan. 26–31, 1992, The Dublin Statement on Water and Sustainable Development, U.N. Doc. A/CONF.151/PC/112 [hereinafter Dublin Statement], available at <http://www.gdrc.org/uem/water/dublin-statement.html>.

106. *Id.*

87. Stefano Burchi, Senior Legal Officer, FAO Legal Office, & Kerstin Mechlam, Legal Officer, FAO Legal Office, Presentation at UNESCO-ISARM-MED Consultative Meeting on Key Issues for Sustainable Management of Transboundary Aquifers in the Mediterranean and in South Eastern Europe: Legal Instruments for Transboundary Groundwater Resources Management, (Oct. 21–23, 2004), available at http://inweb.gr/workshops/presentations_pdf/groundwater/Burchi.pdf.

88. See *infra* Part I.E.

89. *Id.*

90. *Id.*

91. *Id.*

92. See *id.*

93. Bellagio Treaty, *supra* note 30, at 666.

Principle No. 1—Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.

Principle No. 2—Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels.

Principle No. 3—Women play a central part in the provision, management and safeguarding of water.

Principle No. 4—Water has an economic value in all its competing uses and should be recognized as an economic good.¹⁰⁷

While the Dublin Statement was not binding on any parties, the action agenda accompanying the Dublin Statement was among the first to call on the world's nations to use the river basin system, integrating both surface and groundwater, as the principal framework for managing water resources.¹⁰⁸ Fossil aquifers were not mentioned, but the action agenda accompanying the Dublin Statement reaffirmed the polluter pays principle, called for sustainable development in urban areas and responsible water use in rural areas, requested training on water issues and stressed the importance of gathering and exchanging data regarding the hydrological cycle on a global scale.¹⁰⁹

The Helsinki Convention on Transboundary Watercourses¹¹⁰ was signed two months after the Dublin Statement, in March 1992, and entered into force in 1996.¹¹¹ It marked the first time that the transboundary aspects of surface and groundwater in river basins were the focus of an enforceable convention under international law.¹¹² While the Convention defines transboundary waters to include groundwater, its focus is exclusively on the rechargeable aquifers that are part of riparian systems;¹¹³ therefore, fossil aquifers and other aquifers not dependent on rivers for recharge are not included within its scope. However, a reading of the terms of the Convention provides guidance on the legal principles that were deemed to be applicable to groundwater at the time.

Although the Helsinki Convention on Transboundary Watercourses does not focus primarily on aquifers, either rechargeable or confined, it incorporates themes similar to those found in the Stockholm Declaration and the Rio

Declaration, such as the principles of polluter pays, precautionary measures, and generational equity.¹¹⁴ The Helsinki Convention on Transboundary Watercourses also emphasizes cooperation on research and development, exchange of information, and public education on water resource issues.¹¹⁵ Curiously, neither sustainable development nor sustainable use is mentioned anywhere in the Helsinki Convention on Transboundary Watercourses, although promotion of "sustainable water resources management, including application of the ecosystems approach[.]" is listed as an aspirational goal for the parties.¹¹⁶

F. The Watercourses Convention

Meanwhile, the United Nations began its own attempt to codify existing customary law. At the request of the Government of Finland, which had hosted the conference at which the Helsinki Rules were adopted in 1966, the U.N. General Assembly adopted Resolution 2669 on Progressive Development and Codification of the Rules of International Law Relating to International Watercourses on December 8, 1970. Resolution 2669 instructed the U.N. International Law Commission ("ILC") to undertake a study of the "non-navigational use of international watercourses."¹¹⁷ Twenty-four years later, the ILC completed its work and issued its recommendations to the Sixth Committee of the United Nations. Based on these recommendations, the ILC drafted the text of the Convention on the Law of Non-navigational Uses of International Watercourses ("Watercourses Convention"),¹¹⁸ which was adopted by a nearly unanimous vote (103-3) of the U.N. General Assembly on May 21, 1997.¹¹⁹

Although the Watercourses Convention has yet to enter into force, an examination of the Convention's key principles may provide an insight into what the United Nations viewed as developing customary law concerning water rights in general and groundwater in particular. The Watercourses Convention echoes some of the same concepts that appeared in prior official texts. For example, the section entitled "General Principles" contains a requirement for equitable and reasonable utilization and sustainable development,¹²⁰ an obligation to take "all appropriate measures" to prevent significant harm to other watercourse states,¹²¹ the polluter pays principle,¹²² and the obligations to cooperate¹²³ and exchange data.¹²⁴ The Watercourses Convention also includes requirements for the protection of ecosystems¹²⁵ and the marine environment,¹²⁶

107. *Id.*

108. *See id.*

109. *See id.*

110. Transboundary Watercourses and International Lakes, Mar. 17, 1992, 31 I.L.M. 1313 [hereinafter Helsinki Convention].

111. United Nations Econ. Comm'n for Eur., *The Water Convention* (2009), available at http://www.unece.org/env/water/publications/brochure/Water_Convention_e.pdf.

112. The convention included as its parties the states that opted to belong to the United Nations Economic Commission for Europe, which was organized in 1947 by the U.N. Economic and Social Council and is comprised of 56 countries in the European Union, non-EU Western and Eastern Europe, South-East Europe and Commonwealth of Independent States ("CIS") and North America. About UNECE, United Nations Econ. Comm'n for Eur., <http://www.unece.org/about/about.htm> (last visited Nov. 29, 2010).

113. Helsinki Convention, *supra* note 110, at 1314. As of 2007, the ECE had identified more than seventy transboundary aquifers within its region and expected to find more. U.N. Econ. Comm'n for Eur., *Our Waters: Joining Hands Across Borders* 8 (2007).

114. Helsinki Convention, *supra* note 110, at 1316.

115. *Id.*

116. *Id.* at 1317.

117. G.A. Res. 2669 (XXV), ¶ 2, U.N. Doc. A/7991 (Dec. 8, 1970).

118. Watercourses Convention, *supra* note 61.

119. G.A. Res. 51/229, annex, U.N. Doc. A/RES/51/229 (July 8, 1997).

120. *Id.* arts. 5, 6.

121. *Id.* art. 7. This Article is further enhanced by the provisions of Article 27, which requires "all appropriate measures" to prevent or mitigate conditions that may cause harm to other states. *Id.* art. 27.

122. *Id.* art. 7.

123. *Id.* art. 8.

124. *Id.* art. 9.

125. *Id.* art. 20.

126. *Id.* art. 23.

prevention and control of pollution¹²⁷ and of alien species,¹²⁸ and the inclusion of a dispute settlement mechanism in Article 33.¹²⁹

One reason the Watercourses Convention failed to gain enough acceptance to achieve entry into force is because of the tension between the obligation to prevent significant harm, a fundamental premise of international environmental law, and the right to equitable and reasonable utilization, considered to be a standard of international water law.¹³⁰ Some countries felt that having a separate obligation to prevent harm wrongly placed it on par with the sacrosanct right of equitable and reasonable utilization, and others objected to having equitable and reasonable utilization achieve priority over the obligation to protect against harm.¹³¹ Generally speaking, upstream users wanted equitable and reasonable utilization to have priority so that they would be free to utilize the waters flowing through their borders as they wish, and downstream users wanted the waters reaching them to be protected from significant harm, such as pollution and overuse.¹³² The Convention is not clear as to which concept has priority, but what is clear is that the conflict between protection of resources according to international environmental law and the right to utilization under international riparian law continued through the time of the Watercourses Convention¹³³ and continues to this day.¹³⁴

As discussed earlier, giving primacy to equitable utilization over prevention of harm is a declaration that established rules of international water law have priority over those of international environmental law. The reason that the conflict between these two principles continues is that both arguments have merit—water must be both protected and utilized. In an era when protection of water resources is vital to the continued health of humanity and ecosystems, a resolution of the conflict between these two competing philosophies is urgently required. One solution, which is discussed later in this Article, is to have the water in fossil aquifers managed and allocated on a global basis, so that all nations would be required to protect the resource and no country would have the unilateral right to utilize fossil waters without the consent of a community of nations.

G. The United Nations Draft Articles

In the early stages of its study of shared natural resources, the ILC viewed fossil aquifers to be similar enough to oil and natural gas that the three forms of shared natural resources

were planned to be included together in one body of work.¹³⁵ However, the work on groundwater took priority and was separated from the study on oil and natural gas. In 2007, the Special Rapporteur Chusei Yamada officially recommended that the work on transboundary aquifers proceed separately, reasoning that “(w)ater is the life-supporting resource for mankind and there exists no alternative resource. While oil and natural gas are important resources, they are not essential for life and there are various alternative resources.”¹³⁶

The scope of the draft articles was also expanded, from including only fossil aquifers to including both fossil and rechargeable aquifers,¹³⁷ and the term aquifer was defined without reference to whether the groundwater has any link to surface water. Using its own Watercourses Convention as a framework and guide, the ILC produced nineteen draft articles that were annexed to a U.N. General Assembly resolution that was adopted without a vote on December 11, 2008 (“U.N. Draft Aquifer Articles”).¹³⁸ The issue of whether the U.N. Draft Aquifer Articles would be transformed into a convention was left to be debated at a later time.¹³⁹

Because the U.N. Draft Aquifer Articles represent the thoughts of global experts on how nations should cooperate on the protection and utilization of groundwater, they could be considered as evidence of international groundwater law, even though they have not yet entered into force.¹⁴⁰ In the preamble of the U.N. Draft Aquifer Articles, we once again find references to the U.N. Charter and the Rio Declaration, along with acknowledgements that aquifers are particularly vulnerable to pollution and must be protected and sustainably developed “for present and future generations.”¹⁴¹ The scope of the draft articles includes utilization of aquifers, activities affecting aquifers, and “[m]easures for the protection, preservation[,] and management of . . . aquifers or aquifer systems.”¹⁴² Aquifer systems consisting of two or more aquifers that are hydrologically linked, and which, therefore, could be managed as a single unit, are specifically included.¹⁴³

During the course of the ILC deliberations about the scope of the draft articles and their impact on sovereignty, states consistently expressed concern that the articles not be worded so that one could infer that the waters of an aquifer constitute a common heritage of mankind.¹⁴⁴ A state’s

135. Rep. of the Int’l Law Comm’n, 55th Sess., May 5–June 6, July 7–Aug. 8, 2003, U.N. Doc. A/58/10; GAOR, 58th Sess., Supp. No. 10 (2003) [hereinafter 2003 ILC Report].

136. Special Rapporteur, *Fourth Rep. on Shared Natural Resources: Transboundary Groundwaters*, Int’l Law Comm’n, at 5, U.N. Doc. A/CN.4/580 (Mar. 6, 2007) (by Chusei Yamada).

137. Rep. of the Int’l Law Comm’n, 57th Sess., May 2–June 3, July 11–Aug. 5, 2005, at 14–15, U.N. Doc. A/60/10; GAOR, 60th Sess., Supp. No. 10 (2005) [hereinafter 2005 ILC Report].

138. G.A. Res. 63/124, U.N. Doc. A/RES/63/124 (Jan. 15, 2009) [hereinafter *Draft Aquifer Articles*].

139. Rep. of the Int’l Law Comm’n, 60th Sess., May 5–June 6, July 7–Aug. 8, 2008, at 14, U.N. Doc. A/63/10; GAOR, 63d Sess., Supp. No. 10 (2008).

140. See Statute of the International Court of Justice, art. 38, Oct. 24, 1945, 59 Stat. 1031 (including “the teachings of the most highly qualified publicists of the various nations, as subsidiary means for the determination of rules of law”).

141. Draft Aquifer Articles, *supra* note 138, pmb1.

142. *Id.* art. 1.

143. *Id.* art. 2.

144. 2005 ILC Report, *supra* note 137, at 28–29; Rep. of the Int’l Law Comm’n, 56th Sess., May 3–June 4, July 5–Aug. 6, 2004, at 141, U.N. Doc. A/59/10;

127. *Id.* art. 21.

128. *Id.* art. 22.

129. *Id.* art. 33.

130. For an account of the history of the conflict between these two concepts during the drafting of the Watercourses Convention, see Charles B. Bourne, *The International Law Commission’s Draft Articles on the Law of International Watercourses: Principles and Planned Measures*, 3 COLO. J. INT’L ENVTL. L. & POL’Y 65, 73–91 (1992).

131. *See id.*

132. See Salzman, *supra* note 25, at 633–34.

133. See Bourne, *supra* note 130, at 73–91.

134. See generally Albert E. Utton, Which Rule Should Prevail in International Water Disputes: That of Reasonableness or That of No Harm?, 36 NAT. RESOURCES J. 635 (1996).

sovereignty over the portion of an aquifer that lies within its jurisdiction is therefore acknowledged in Article 3.¹⁴⁵ In accordance with the definition of an aquifer provided in Article 1, Article 3 extends state sovereignty over the geological formation as well as the water in the saturated zone of the formation.¹⁴⁶ Article 3 thus preserves states' exclusive sovereignty over water resources that lie within their borders, with the limitation that such sovereignty must be exercised within the bounds of international law.

Stephen C. McCaffrey, one of the Special Rapporteurs of the Watercourses Convention, calls the scope of the U.N. Draft Aquifer Articles' declaration of exclusive sovereignty "breathtaking."¹⁴⁷ McCaffrey argues that the U.N. Draft Aquifer Articles refer only to sovereignty over the rock formations that contain the groundwater, and not to the groundwater itself, because fluid is always moving and thus is incapable of possessing the static character necessary for exercise of sovereignty. In his view, granting complete sovereignty over a watercourse marks a return to the now-obsolete Harmon Doctrine, which allows nations to utilize waters within their borders for any purpose they deem appropriate, without regard to the consequences of their utilization to other states.¹⁴⁸ By inserting Article 3, McCaffrey argues, the ILC deviated from its principle mission of codifying developing international law and acceded to the advocacy of a few states that argued vociferously for complete sovereignty over their water resources.¹⁴⁹ Indeed, in 2008, only six states commented on draft Article 3, with Austria, Brazil, Cuba, Israel, and Turkey arguing in favor of complete sovereignty, and only Portugal suggesting a "shift to a more actual and mitigated doctrine of sovereignty" that would emphasize "the principle of cooperation between States."¹⁵⁰

The now-familiar right to equitable and reasonable utilization appears in Article 4, with states being directed with "shall" statements to maximize the long-term benefits of water use and to enter into individual and joint utilization plans, bearing in mind the needs of present and future generations.¹⁵¹ Article 4 also states that recharging aquifers shall be utilized so as not to "prevent continuance of [their] effective functioning."¹⁵² The U.N. Draft Aquifer Articles provide a list of factors to analyze when determining what constitutes equitable and reasonable utilization.¹⁵³ The list is nearly iden-

tical to the list in Article 6 of the Watercourses Convention,¹⁵⁴ although neither list can be considered entirely comprehensive. In weighing social, economic, and other needs, the needs of both present and future generations must be given consideration.¹⁵⁵ Contributions to the formation and recharge of the aquifer are deemed to be important,¹⁵⁶ as are the actual and potential effects of utilization on another state.¹⁵⁷ Advancements in hydrogeology have shown that aquifers play an important role in the health of ecosystems, so the impact of aquifer utilization on ecosystems has also been a factor.¹⁵⁸ Thus, in both the preamble and the text of U.N. Draft Aquifer Articles, we once again see references to the needs of future generations (generational equity), a directive to utilize aquifers in a sustainable manner while being mindful of impacts on future use, and an acknowledgement of the responsibility to consider other living creatures that depend on ecosystems for their existence¹⁵⁹—although "special regard" is still to be given to "vital human needs."¹⁶⁰ It should be noted, however, that in Professor McCaffrey's opinion, the declaration of sovereignty in Article 3 conflicts with and risks being interpreted by some states as releasing them from any obligation to practice reasonable and equitable utilization of aquifers; the idea of full sovereignty over a resource may lead a state to believe it need not take into consideration the water requirements of and impacts on other states.¹⁶¹

Although the balance between equitable utilization of waters and the obligation not to cause significant harm to other states caused friction in the drafting of the Berlin Rules¹⁶² and may have contributed to the international community's failure to officially adopt the Watercourses Convention, Article 6 of the U.N. Draft Aquifer Articles repeats the obligation that in utilizing aquifers states should take "all appropriate measures to prevent the causing of significant harm."¹⁶³ Furthermore, that obligation is now extended to "activities other than utilization of a transboundary aquifer or aquifer system."¹⁶⁴ When significant harm is caused, states are obliged to take "all appropriate response measures to eliminate or mitigate such harm," though they are to do so while "having due regard for the provisions of articles 4 and 5,"¹⁶⁵ which provide for equitable and reasonable utilization.¹⁶⁶ Yet, the requirement in the Watercourses Conven-

GAOR, 59th Sess., Supp. No. 10 (2004); 2003 ILC Report, *supra* note 135, at 263.

145. Draft Aquifer Articles, *supra* note 138, art. 3.

146. *Id.* arts. 1, 3.

147. Stephen C. McCaffrey, Current Developments: The International Law Commission Adopts Draft Articles on Transboundary Aquifers, 103 AM. J. INT'L L. 272, 289 (2009) [hereinafter McCaffrey, Current Developments].

148. Gabriel Eckstein, *Application of International Water Law to Transboundary Groundwater Resources, and the Slovak-Hungarian Dispute Over Gabčíkovo-Nagymaros*, 19 SUFFOLK TRANSNAT'L L. REV. 67, 73 (1995) [hereinafter Eckstein, Gabčíkovo].

149. McCaffrey, Current Developments, *supra* note 147, at 290–91.

150. Int'l Law Comm'n, Shared Natural Resources: Comments and Observations by Governments on the Draft Articles on the Law of Transboundary Aquifers, 60th Sess., May 5–June 6, July 7–Aug. 8, 2008, at 21–22, U.N. Doc. A/CN.4/595 (Mar. 26, 2008).

151. See Draft Aquifer Articles, *supra* note 138, art. 4.

152. *Id.* art. 4.

153. *Id.* art. 5.

154. Watercourses Convention, *supra* note 61, art. 6.

155. Draft Aquifer Articles, *supra* note 138, art. 5(b).

156. *Id.* art. 5(1)(d).

157. *Id.* art. 5(1)(f).

158. *Id.* art. 5(1)(i).

159. See *supra* notes 141–143, 153–158, and accompanying text.

160. *Id.* art. 5(2).

161. See McCaffrey, Current Developments, *supra* note 147, at 291.

162. See *supra* text accompanying notes 72–76.

163. Draft Aquifer Articles, *supra* note 138, art. 6(1) ("Aquifer States shall, in utilizing transboundary aquifers or aquifer systems in their territories, take all appropriate measures to prevent the causing of significant harm to other aquifer States or other States in whose territory a discharge zone is located.")

164. *Id.* art. 6(2).

165. *Id.* art. 6(3) (alteration to the original). Once again, the tension between utilization and protection of the resource was left unresolved.

166. See *id.* arts. 4–5.

tion to discuss compensation “where appropriate”¹⁶⁷ has been eliminated.¹⁶⁸

In Article 7 of the U.N. Draft Aquifer Articles, the parties are once again told to cooperate based on the principles of sovereignty and good faith dealings, but sustainable development has been added as one of the bases on which to cooperate.¹⁶⁹ However, the Watercourses Convention’s requirement to attain “adequate protection” of the aquifers¹⁷⁰ was lowered to a standard of “appropriate protection” in the U.N. Draft Aquifer Articles.¹⁷¹ Perhaps as a balance, the U.N. Draft Aquifer Articles state that the parties “should establish joint mechanisms of cooperation,”¹⁷² which is slightly stronger than the Watercourses Convention’s suggestion that the states “may consider” establishing such a mechanism.¹⁷³ The U.N. Draft Aquifer Articles also use strong “shall” language concerning the establishment, “wherever appropriate[,]” of a joint management mechanism for managing transboundary aquifers or aquifer systems.¹⁷⁴

Thus, the U.N. Draft Aquifer Articles produced by the ILC follow and repeat many of the concepts found in earlier attempts to codify or create methods and perspectives for nations to share groundwater. None of the prior attempts to craft a model for managing groundwater has been widely accepted by the international community, and the U.N. Draft Aquifer Articles appear destined for nothing more than academic significance. The conflict between the principle of equitable and reasonable utilization and that of adequate protection remains unresolved; the U.N. Draft Aquifer Articles added its own voice to the conflict by assigning to all nations exclusive sovereignty over water that lies and flows under their borders and rejecting the view that groundwater is the common heritage of mankind. The concept of regional management of aquifers has been retained, but only as modified by the principle of absolute and exclusive sovereignty.

H. Customary International Water Law According to the ICJ

Only one decision of the ICJ has mentioned the customary law of transboundary waters,¹⁷⁵ the 1993 case concerning the Gabčíkovo-Nagymaros Project, in which Hungary and Slovakia brought a dispute before the court regarding their 1977 agreement to dam parts of the Danube River to allow for hydroelectricity, improved navigation, and reduced flood-

ing along the banks of the river.¹⁷⁶ In 1989, in response to mounting concerns among its populace about the environmental impact of the project, Hungary suspended its work on the project and, in 1992, terminated the agreement.¹⁷⁷ Because two of the three segments of the project were nearly completed when Hungary suspended its work, Slovakia continued to finalize the dams and barrages.¹⁷⁸ The parties filed claims against one another, with Slovakia complaining that Hungary was not entitled to terminate the treaty and Hungary complaining about Slovakia’s continued work on the Danube and its ecological impact.¹⁷⁹

Since the flow of the Danube was significantly reduced by the dams and barrages and resulted in a severe reduction in groundwater supplies and the navigability of the river, Hungary cited a state of ecological necessity as the rationale for its action.¹⁸⁰ The court ruled that in breaching the treaty Hungary did not give up its right to an equitable and reasonable sharing of the water resources.¹⁸¹ The ICJ noted a 1929 ruling of the Permanent Court of International Justice in the *River Oder* case that mandated a “perfect equality” in all uses of a navigational waterway and declared that a “community of interest” in a river becomes a “common legal right.”¹⁸² The ICJ seemed to view the Watercourses Convention as embodying customary law by stating that the Watercourses Convention is evidence that international law has now extended those concepts to non-navigational uses of waterways.¹⁸³

Later in the opinion, the Court cited the Watercourses Convention again in support of an established standard for equitable and reasonable use of water resources and a duty to cooperate in the protection and development of the watercourse.¹⁸⁴ In adopting these principles the court rejected the notion of a state’s absolute sovereignty over transboundary waters within its borders, an interpretation which is further supported because neither claimant used the notion of sovereignty in presenting its case.¹⁸⁵ The ICJ also noted that new norms and standards concerning environmental laws had been established in the prior two decades, and that these norms and standards must be given proper weight when considering the reasonableness of both new and old activities.¹⁸⁶ Regarding another precept of international environmental law—the precautionary principle—the court noted that the parties had agreed on the need “to take environmental concerns seriously and to take the required precautionary measures”¹⁸⁷

Applying these principles, the ICJ held that Slovakia, by continuing the work of damming the river, deprived Hun-

167. Watercourses Convention, *supra* note 61, art. 7(2).

168. See Draft Aquifer Articles, *supra* note 138, art. 6.

169. *Id.* art. 7(1).

170. Watercourses Convention, *supra* note 61, art. 8(1).

171. Draft Aquifer Articles, *supra* note 138, art. 7(1).

172. *Id.* art. 7(2).

173. Watercourses Convention, *supra* note 61, art. 8(2).

174. Draft Aquifer Articles, *supra* note 138, art. 14.

175. See Stephen Stec & Gabriel E. Eckstein, *Of Solemn Oaths and Obligations: The Environmental Impact of the ICJ’s Decision in the Case Concerning the Gabčíkovo-Nagymaros Project*, 8 Y.B. INT’L ENVTL. L. 41, 42, 45–46 (1997). In April 2010, the ICJ rendered another opinion concerning international waters, but that case was decided purely on treaty grounds, and customary law was not discussed. *Pulp Mills on the River Uruguay (Arg. v. Uru.)*, Judgment, ¶ 267–281 (Apr. 20, 2010), available at <http://www.icj-cij.org/docket/files/135/15877.pdf>.

176. Gabčíkovo-Nagymaros Project (Hung./Slov.), Judgment, 1997 I.C.J. 7, ¶ 15 (Sept. 25), available at <http://www.icj-cij.org/docket/files/92/7375.pdf> [hereinafter ICJ Gabčíkovo Judgment].

177. *Id.* ¶ 22.

178. See *id.* ¶ 73.

179. *Id.* at 15–16.

180. *Id.* ¶ 40.

181. *Id.* ¶ 78.

182. *Id.* ¶ 85.

183. *Id.*

184. *Id.* ¶ 147.

185. McCaffrey, Current Developments, *supra* note 147, at 288.

186. ICJ Gabčíkovo Judgment, *supra* note 176, ¶ 140.

187. *Id.* ¶ 113.

gary of its right to an equitable and reasonable share of the Danube's waters, and that Slovakia had thus "fail[ed] to respect the proportionality which is required by international law."¹⁸⁸ The court ultimately held that each party was liable to pay compensation to the other.¹⁸⁹

In addition to its discussions on the state of customary water law, the *Gabčíkovo-Nagymaros* case was notable for a number of other reasons as well. First, the parties themselves agreed that the precautionary principle applied to their dispute, and the court's ruling can be read to support the polluter pays principle, even though water shortages, and not water pollution, were at issue in the case. Second, the court recognized that environmental concerns are an essential interest of any state and that those concerns can be grounds to abrogate a treaty, but only if the claimant has not contributed to those concerns.¹⁹⁰ In reaching its conclusions, the court took judicial notice of concepts included in the *Watercourses Convention*. The court's holding indicates that, in the absence of defined international law on a topic, it can turn to the writings of legal experts—such as those in its sibling organization the ILC—for guidance and then declare those opinions to be established customary law. Indeed, in Special Rapporteur McCaffrey's opinion, the fact that the ICJ referred to the *Watercourses Convention* only four months after its adoption is proof that the convention represents customary law.¹⁹¹

Part II

Overutilization Under The Current System of Governance

As discussed above, a legal regime for administering and allocating the water in transboundary aquifers has yet to develop, despite several laudable attempts in the last few decades. Customary law on the topic has not yet settled on whether international water law or international environmental law should have priority, so the battle between reasonable utilization and adequate protection of the resource continues. Meanwhile, nations with the good fortune to have water hidden in the deep rock formations under their borders have exercised their right to full sovereignty over this resource, while negotiating to include provisions supporting this philosophy in several of the draft conventions and articles.

Part II analyzes the systems in place for governing fossil aquifers and how nations have chosen to utilize fossil waters in the absence of any controlling international law. Although a number of fossil aquifers have been identified, this Article addresses only the six that are best known. Three are entirely domestic: the deeper of several aquifers lying under the North

China Plain, a set of fossil aquifers in Saudi Arabia, and the Ogallala Aquifer system in the central United States. The other three fossil aquifers that will be discussed are shared by two or more countries: the Nubian Sandstone Aquifer System underlying Libya, Sudan, Egypt, and Chad; the Qa-Disi Aquifer underlying Jordan and Saudi Arabia; and the Continental Interclaire Aquifer which underlies Libya, Algeria and Tunisia.

Turning first to the entirely domestic aquifers, the fossil aquifers in the North China Plain, which are part of the North China Plain Quaternary Aquifer System, are being rapidly depleted to serve agricultural needs.¹⁹² The North China Plain Quaternary Aquifer System consists of four aquifers, two of which are shallow and thus are currently recharging, and two of which are fossil aquifers containing waters deposited up to 10,000 years ago.¹⁹³ The Yellow River formerly supplied the water needed to grow crops, but its overuse and depletion led to a search for additional water sources.¹⁹⁴ The two shallow aquifers were tapped first; when that source proved to be inadequate, the deeper fossil aquifers were called into service.¹⁹⁵ The plain where the aquifers lie produces half of China's wheat and a third of its corn crop, which explains the critical need for water.¹⁹⁶

Half of the water in China's fossil aquifers is estimated to have been withdrawn in the twentieth century and, at the current rate of withdrawals, the accessible water will be depleted by 2035, with some localities losing their water supplies fifteen years earlier.¹⁹⁷ Indeed, according to a 2001 survey conducted by the Chinese Geological Environmental Monitoring Institute, the water level in the fossil aquifer lying under the Hebei Province in the northern plain was dropping at an annual rate of almost three meters and even faster under some cities.¹⁹⁸ Such excessive withdrawals from the underground geological formations have caused an imbalance in subterranean forces and pressures that have produced widespread land subsidence.¹⁹⁹ A World Bank report predicts "catastrophic consequences for future generations" unless China's usage of water can be brought in line with its supplies.²⁰⁰

The Saudi fossil aquifers, presently covered by desert, are one-sixth the size of the Ogallala aquifer and have held their waters for up to 30,000 years, dating back to a time when there was more moisture on the surface level.²⁰¹ The waters in these fossil aquifers are being withdrawn at a furi-

188. *Id.* ¶ 85.

189. *Id.* ¶ 152.

190. *Id.* ¶ 52.

191. Steven C. McCaffrey, *The 1997 U.N. Watercourses Convention: Retrospect and Prospect*, 21 *PAC. McGEORGE GLOBAL BUS. & DEV. L.J.* 165, 170 (2008) [hereinafter *McCaffrey Watercourses Convention Perspective*]. In further support of his contention that the *Watercourses Convention* represents customary law, Professor McCaffrey cites its influence in the negotiations of treaties such as the 2000 Southern African Development Community ("SADC") Revised Protocol, the Senegal River Water Charter, and the Nile River Basin Cooperative Framework Agreement. *Id.* at 171.

192. STEVEN SOLOMON, *WATER: THE EPIC STRUGGLE FOR WEALTH, POWER AND CIVILIZATION* 434 (2010).

193. HAN ZAISHENG, *ALLUVIAL AQUIFERS IN NORTH CHINA PLAIN* 1–3 (2006), available at http://www.brgm.fr/brgm/aih/fichier/actes/theme1_p5_49.pdf.

194. SOLOMON, *supra* note 192, at 434.

195. Lester Brown, *Aquifer Depletion*, *THE ENCYCLOPEDIA OF EARTH* (Jan. 23, 2010), http://www.eoearth.org/article/Aquifer_depletion.

196. SOLOMON, *supra* note 192, at 434.

197. *Id.* at 435.

198. Brown, *supra* note 195. In a decade, village wells in Hebei province have gone from depths of 20 to 30 meters to 120 to 200 meters to find clean water. See PETER H. GLEICK ET AL., *THE WORLD'S WATER 2008–2009: THE BIENNIAL REPORT ON FRESHWATER RESOURCES* 86 (2009).

199. Zaisheng, *supra* note 193, at 3.

200. Brown, *supra* note 195.

201. Solomon, *supra* note 192, at 413.

ous pace and provide half the domestic needs for Saudi cities and seventy percent of the agricultural requirements of the desert kingdom.²⁰² By 2005, sixty percent of the renewable and fossil aquifers in Saudi Arabia had been depleted of their water.²⁰³ There are estimates that irrigated agriculture will disappear from Saudi Arabia in the next decade as a result of aquifer depletion.²⁰⁴

At a recharge rate of only half an inch per year, the half-dozen aquifers comprising the Ogallala Aquifer system, which runs deep beneath Nebraska, western Kansas, the Oklahoma Panhandle, northwest Texas, and portions of South Dakota, Wyoming, Colorado, and New Mexico, qualify as fossil aquifers.²⁰⁵ It was water from the Ogallala Aquifer that turned the Dust Bowl of the 1930s into the Farm Belt of the 1970s.²⁰⁶ As discussed earlier,²⁰⁷ the Ogallala Aquifer is being rapidly depleted for those agricultural purposes that gave the Farm Belt its name. At the height of extraction in the 1970s, when more than 66,000 wells drank day and night from the Ogallala in West Texas alone,²⁰⁸ the annual overdraft from the Ogallala was equal to the annual flow of the Colorado River (fourteen million acre-feet),²⁰⁹ allowing Ogallala water to support forty percent of American cattle²¹⁰ and fifteen percent of the nation's wheat, corn, cotton, and sorghum.²¹¹ As producer of seventy-five percent of the wheat sold on the world market, the United States was, in a sense, exporting Ogallala water around the globe.²¹²

Of course, this unsustainable practice could not last forever. Beginning in the Texas panhandle in 1970, wells tapping the Ogallala started to run dry.²¹³ Today, more than twenty-five percent of the aquifer under Texas, Oklahoma and Kansas has been depleted,²¹⁴ and Texas and Kansas are expected to exhaust their shares of the Ogallala between 2020 and 2030.²¹⁵ When the Ogallala's fossil waters are depleted, the Farm Belt will once again suffer intense water shortages reminiscent of the Dust Bowl,²¹⁶ and the country will have to look elsewhere to meet its agricultural needs.

Turning to the shared aquifers, the Nubian Sandstone Aquifer System ("NSAS") is the largest fossil aquifer in the world and extends over two million square kilometers, underlying all of Egypt west of the Nile, all of eastern Libya, and much of northern Chad and Sudan.²¹⁷ The NSAS consists of

two aquifer systems: the Nubian Aquifer System ("NAS"), which is largely unconfined, and the Post-Nubian Aquifer System ("PNAS"), which is bounded.²¹⁸ The NSAS contains the equivalent of at least 500 years of Nile River flow.²¹⁹ The NSAS aquifer waters, some of which are estimated to have fallen between 20,000 and 1 million years ago, were discovered in Libya during a period of oil exploration in the 1950s.²²⁰

In the early 1970s, Libya and Egypt began a process of cooperation regarding the NSAS, and in 1992 the Joint Authority for the Management of the NSAS System ("Joint NSAS Authority") was formed. Sudan joined the NSAS in 1996, followed by Chad in 1999.²²¹ Given the magnitude and importance of the NSAS, a consortium of agencies and groups formed the IAEA/UNDP/GEF Nubian Project in 2006. Participants in the project include the U.N. Development Programme ("UNDP") and the Global Environment Facility ("GEF") as the implementing agencies; the International Atomic Energy Agency ("IAEA") as the executing agency, the lead technical agency on the scientific component, and the principal co-funding agency; UNESCO and its partners in the Internationally Shared Aquifer Resources Management ("ISARM") initiative as co-funding and cooperating agencies; the NSAS countries; and the Joint NSAS Authority as the lead regional institution.²²² Thus far, the activity of this plethora of agencies and organizations has been limited to discussions on how to proceed with gathering information, although a framework for management and utilization of the NSAS is envisioned.²²³

Meanwhile, Libya has proceeded with the Great Man-made River Project, which used oil revenues to construct a 2000-mile system of "subway-sized tunnels" to carry water from the NSAS and other aquifers to Tripoli and other destinations on the Mediterranean Coast.²²⁴ Although UNESCO predicts that the NSAS has enough reserves to support withdrawals for 50 to 100 years,²²⁵ the IAEA, which is normally occupied with nuclear energy and weaponry, is concerned that the vast NSAS will be too depleted to support unsustainable water-rich lifestyles in the desert.²²⁶

The Qa-Disi Aquifer is suffering a fate similar to all the other fossil aquifers discussed, with Saudi Arabia and Jordan

202. *Id.* at 414. According to UNESCO, non-renewable groundwater supplied sixty-six percent of the Saudi national water needs in 2000. See UNESCO, NON-RENEWABLE GROUNDWATER RESOURCES, *supra* note 12, at 64.

203. Solomon, *supra* note 192, at 414.

204. Brown, *supra* note 195.

205. Solomon, *supra* note 192, at 345; see also Pearce, *supra* note 3, at 59.

206. Stengel et al., *supra* note 18.

207. See *id.* at 2-3.

208. MARC REISNER, CADILLAC DESERT 437 (1986).

209. *Id.* at 438.

210. Solomon, *supra* note 192, at 345; Reisner, *supra* note 208, at 437.

211. Solomon, *supra* note 192, at 345, 347.

212. Pearce, *supra* note 3, at 60.

213. *Id.* at 60.

214. *Id.*

215. Solomon, *supra* note 192, at 348.

216. See Pearce, *supra* note 3, at 59-60.

217. *The 37 Great Aquifer Systems of Earth: Solution to Global Drought, Biot Report No. 675*, SUBURBAN EMERGENCY MGMT. PROJECT (Dec. 28, 2009), http://www.semp.us/publications/biot_reader.php?BiotID=675.

218. UNESCO: NON-RENEWABLE GROUNDWATER RESOURCES, *supra* note 12, at 75, 78. The PNAS lies under only Libya and Egypt.

219. Cara Wood, *The Water Is Ancient, The Secrets Are Many: IAEA, Partners Help Characterize Massive Water Source Under Sahara Desert*, Int'l Atomic Energy Agency (Mar. 22, 2010), <http://www.iaea.org/NewsCenter/News/2010/nubianaquifer.html>.

220. *The 37 Great Aquifer Systems of Earth: Solution to Global Drought*, *supra* note 217.

221. Ahmed Khatar, NAT'L WATER RESEARCH CTR., *Transboundary and Local Aquifer Systems Technical Workshop: The Nubian Aquifer Project 7* (2009), available at http://www.iwlearn.net/abt_iwlearn/events/iwc5/iwc5_presentations/khatar_iwc5_nubian.pdf.

222. INT'L ATOMIC ENERGY AGENCY, U.N. DEV. PROGRAM, GLOBAL ENV'T FACILITY, NUBIAN SANDSTONE AQUIFER SYSTEM, Project Implementation Plan (2006), available at <http://www-naweb.iaea.org/napc/ih/documents/Nubian/Nubian%20PIP%20-%20may1107.pdf>.

223. *Id.* at 12-13.

224. Solomon, *supra* note 192, at 415.

225. UNESCO: Non-Renewable Groundwater Resources, *supra* note 12, at 32.

226. Wood, *supra* note 219.

each competing to drain the aquifer before the other can.²²⁷ This aquifer lies under southern Jordan and northwestern Saudi Arabia, and its waters accumulated 40,000 years ago.²²⁸ By the 1990s, Saudi Arabia was extracting nine times as much water as Jordan,²²⁹ and in 1992 the Jordanian Minister of Agriculture accused the Saudis of overextraction, but the Saudi government did not respond to the accusation.²³⁰ Using their vast oil wealth, the Saudis are progressing with construction of desalination plants while continuing to withdraw water from the domestic aquifers under their own land as well as from the Qa-Disi Aquifer.²³¹ Jordan, one of the driest countries on earth, has no comparable financial resources, and it has begun to drain the aquifer to support the populace in its capital Amman. As one author puts it, no matter what happens, "the aquifer seems doomed."²³²

As stated earlier, the Continental Intercalaire Aquifer, also known as the Intercalaire, lies under Libya, Algeria, and Tunisia. Another deep aquifer, the Complex Terminal Aquifer, also lies under the same three countries, but there is some disagreement about whether it is a fossil aquifer.²³³ The two aquifers are referred to collectively as the North Western Sahara Aquifer System ("NWSAS"), or the *Système Aquifère du Sahara Septentrionale* ("SASS"), and the three countries with claims to the NWSAS have begun sharing information and conducting studies to determine the characteristics of the aquifers and their capacities.²³⁴ As a result of increasing exploitation of the aquifers over the past twenty years, degradation of the groundwater in the aquifers is already occurring in the form of salination and the disappearance of artesian flows.²³⁵ Consequently, calls for a joint management system are being heard.²³⁶

Part III

A. Water as a Common Resource

The current system of fossil water allocation and use—in which the nation lying above the aquifer has full sovereignty over its groundwater resources—has led to rampant

and uncontrolled groundwater use that, in most cases, will cause the aquifer to be functionally depleted in merely a few decades. Part I of this Article demonstrates a gradual evolution of theories concerning groundwater over several decades, each one building on prior assumptions regarding the state of the law and practice. Thus, the right of a state to reasonable use of waters flowing through and lying under its borders has been preserved through all of the groundwater pronouncements. The corollary to reasonable use—sovereign rights over water lying under the borders of a state—has logically been preserved as well.

This struggle between international water law, with its parochial tenets of ownership, and international environmental law, with its broader scope of protection, has yet to be resolved.²³⁷ Other less controversial ideas that developed during the course of debates on surface waters and aquifers include proposals for a system of water management based on those waters flowing throughout a basin area and proposals for sharing information regarding the resource among affected states.²³⁸ However, the sovereign right of a state to waters running through or under its jurisdiction has been viewed as sacrosanct.²³⁹

This line of declarations, conventions, and draft treaties pertaining to water resources has consistently presented and preserved the same concepts, yet the conventions and draft treaties have failed to achieve a critical mass of acceptance, much less universal approval.²⁴⁰ Nations are still anchored in their assertion of sovereignty over a resource that will become increasingly critical.²⁴¹ If numerous harmonized attempts to develop a system for sharing groundwater have not found wide acceptance in the international community, perhaps a different point of view should be introduced and tested before groundwater suffers a fate analogous to a tragedy of the commons. Although some nations will object to the concept, it might be wise to consider whether the principle of sovereignty over groundwater results in optimal use as the world comes to grip with sharing resources on a global scale.

Fossil aquifers, in particular, should be subjected to a fresh look because they are by definition not connected with the surface in a way that would allow for meaningful recharge. The water in fossil aquifers was put in place thousands and sometimes millions of years ago, and, for the most part, the resource can only productively be reached from the surface by artificial means such as drilling.²⁴² If the connection of fossil aquifers to the surface is so limited, one could argue that they should not automatically be deemed the property of the state that happens to lie over them. If we are to propose shattering the fundamental tenet of international law that a state has sovereignty over everything from the surface of its territory to the center of the earth, what should replace it?

Hugo Grotius, the seventeenth century scholar who is widely regarded as the father of international law, viewed

227. Pearce, *supra* note 3, at 62.

228. GREG SHAPLAND, RIVERS OF DISCORD: INTERNATIONAL WATER DISPUTES IN THE MIDDLE EAST 148 (1997).

229. *Id.*

230. *Id.* at 149.

231. Pearce, *supra* note 3, at 61–62.

232. *Id.*

233. Compare Krishna and Salman, *supra* note 104, at 181, with Gabriel 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, 555 (2007).

234. Mustapha Besbes et al., *Conceptual Framework of the North Western Sahara Aquifer System*, in *Managing Shared Aquifer Resources in Africa* 163 (Bo Applegren ed., Isarm-Africa, 2002), available at http://www.isarm.net/dynamics/modules/SFIL0100/view.php?fil_Id=192.

235. UNESCO: Non-Renewable Groundwater Resources, *supra* note 12, at 69. An artesian flow results where underground pressures force groundwater to flow under and sometimes to the surface. See Thomas Harter, DIV. OF AGRIC. AND NATURAL RES., UNIV. OF CAL., REFERENCE SHEET NO. 11.3, *Water Well Design and Construction 1* (2003), available at http://groundwater.ucdavis.edu/Publications/Harter_FWQFS_8086.pdf.

236. See UNESCO: Non-Renewable Groundwater Resources, *supra* note 12, at 68–74.

237. See, e.g., Water Resources Committee Dissenting Opinion, *supra* note 72.

238. Watercourses Convention, *supra* note 61.

239. Draft Aquifer Articles, *supra* note 138.

240. Statute of the International Court of Justice, *supra* note 34.

241. Rio Declaration, *supra* note 45.

242. UNESCO, NON-RENEWABLE GROUNDWATER RESOURCES, *supra* note 12.

international law as being derived from natural laws that have their basis in nature and thus are common to everyone everywhere.²⁴³ If we accept Grotius' natural law theories of normativity,²⁴⁴ there seems to be nothing more fundamentally natural and compellingly moral than equitable sharing of a resource that is vital to all terrestrial life on the planet.

Although he acknowledged the status of the principle of reasonable use in international water law, the water law pioneer Julio Barberis noted that the principle is limited by a prohibition against harming the territory of neighbors.²⁴⁵ Barberis also recognized that groundwater is a natural resource that might be shared among nations under some circumstances²⁴⁶ and agreed with the text of the 1967 European Water Charter that states "[w]ater knows no frontiers; as a common resource it demands international co-operation."²⁴⁷ Although the idea of groundwater as a shared natural resource was consistently rejected by some of the states involved in construction of the U.N. Draft Aquifer Articles,²⁴⁸ we should not consider their parochial and self-serving positions to represent the only viewpoints.

Barberis listed two ways in which natural resources can be shared. The first category consists of natural resources that lie outside the territory of any state. Those resources that can be considered to be *res communis*, or belonging to everyone, include the moon and other planetary bodies beyond the earth, and the seabed that is outside the territorial waters of any state.²⁴⁹ The other category concerns those resources that lie across boundaries and thus are shared by two or more states.²⁵⁰

If we accept that groundwater can be considered a shared natural resource, and further accept that fossil aquifers, having a limited connection to surface soils, lie outside the territory of any state and thus are beyond sovereign claims, then we can further postulate that fossil aquifers should be declared a shared natural resource. As a shared natural resource fossil aquifers would then be subject to the joint management of all states, and withdrawals of their waters would not be the sole purview of a single nation, or even two or three nations.

Another argument in favor of giving fossil aquifers special treatment as a common resource stems from the concept of *erga omnes*. *Erga omnes* is a legal principle whereby obligations are owed to the global community as a whole.²⁵¹ When applied to natural resources, *erga omnes* can be interpreted to mean that states have rights in those resources regardless

of their direct relationship to them, and that all states have a duty to protect the resource from serious harm and for the benefit of the global community.²⁵² Environmental law scholar David Freestone made the following case for treating transboundary groundwater as giving rise to rights and obligations *erga omnes*:

Exploitation of scarce, transboundary groundwater resources can no longer be seen as an issue exclusively within the jurisdiction of the State under the territory of which these resources extend. For the vast continental groundwater resources . . . there can be argued to be obligations owed *erga omnes*—they are resources of international concern.²⁵³

At the present moment, with aquifers of all types being drained at unsustainable rates and with annual global population growth of 83 million people placing increasing stress on the groundwater resources,²⁵⁴ protecting aquifers from further depletion would seem to be an obligation owed to the global community. If the prediction that 1.8 billion people will live with severe water scarcity within fifteen years²⁵⁵ comes true, an obligation arises for the human species to use water in sustainable ways to preserve as much as possible for future generations. Furthermore, with as many as 126,000 animal species living in the earth's freshwater lakes, swamps, and rivers,²⁵⁶ humans also have a moral obligation to share water with other ecosystems. Protection of fossil aquifers, whose waters were put in place millennia ago and from which any withdrawals are largely unsustainable,²⁵⁷ must surely qualify as an *erga omnes* obligation to all living things. If rights to water stored in fossil aquifers extend to the global community, all nations would have an interest in the waters of the aquifers and would have a right to have their voices heard regarding any withdrawal or usage. Similarly, those nations with fossil aquifers lying under their borders would have an obligation to protect the aquifers from unauthorized withdrawals and, more critically, from pollution that could lead to contamination of the waters.

One may begin to ask why fossil aquifers, with structures similar to those containing other natural resources such as oil and gas,²⁵⁸ should be blessed with special treatment. Why shouldn't the waters in these fossil aquifers fall under the well-established regimes for oil and gas? Why shouldn't the waters be ruled by the law of capture,²⁵⁹ which grants sovereignty to the nations lying above the deposits and allows withdrawals to be determined on a first-come, first-served basis? The answer for the differentiation in treatment lies in the purpose and use of the resources.

252. *Id.*

253. David Freestone, *International Environmental Law: Principles Relevant to Transboundary Groundwater*, in *Groundwater: Legal and Policy Perspectives* 191, 202 (Salman M.A. Salman ed., 1999) (footnote omitted).

254. Barbara Kingsolver, *Water is Life*, NAT'L GEOGRAPHIC, April 2010, at 36, 52.

255. *Id.* at 56.

256. Douglas Chadwick, *Silent Streams*, NAT'L GEOGRAPHIC, April 2010, at 116, 118–19.

257. See UNESCO: Non-Renewable Groundwater Resources, *supra* note 12, at 13–17.

258. See *supra* text accompanying note 135.

259. Eugene Kuntz, A Treatise on the Law of Oil and Gas § 4.1 (1964), available at <http://www.mcombs.utexas.edu/faculty/David.Spence/Rule-of-capture.doc>.

243. See MURPHY, *supra* note 33, at 22–23.

244. This theory is premised on the notion that "moral, political and legal norms are all based on laws derived from or supplied by nature." John Miller, *Hugo Grotius*, STANFORD ENCYCLOPEDIA OF PHILOSOPHY, Dec. 16, 2005, available at <http://plato.stanford.edu/entries/grotius/#NatLaw>.

245. JULIO BARBERIS, Food and Agric. Org. of the U.N., LEGISLATIVE STUDY NO. 40, INTERNATIONAL GROUNDWATER RESOURCES LAW 48, (1986).

246. *Id.* at 23.

247. *Id.* at 27.

248. Rep. of the Int'l Law Comm'n, at 124, 56th Sess., May 3–June 4, July 5–Aug. 6, 2004, U.N. Doc. A/59/10; GAOR, 59th Sess., Supp. No. 10 (2004).

249. Barberis, *supra* note 245, at 23.

250. *Id.*

251. Coalter G. Lathrop, *Finding the Right Fit: One Design Element in the International Groundwater Resource Regime*, 19 DUKE J. COMP. & INT'L L. 413, 428 (2009).

Oil and gas fuel the economy, power our vehicles, provide heat and energy for our buildings, and serve as chemical components for a wide variety of manufactured goods. Going without oil and gas would be highly inconvenient and uncomfortable, but humans and other creatures would survive. However, without access to fresh water land-based plants and animals quickly perish. Even those organisms adapted for living in the desert require some minimal amount of water. As the Special Rapporteur to the U.N. Draft Aquifer Articles made clear, water is a vital resource without any substitute.²⁶⁰ Protection of fresh water resources should be a moral responsibility of all nations, not just for its use for human consumption, but also to nourish the plants and animals that provide the biodiversity so critical to eco-systems and all life systems.

In addition to natural law and *erga omnes*, other established principles in international environmental law support special, communal treatment of fossil aquifers: the concepts of common concern of humanity and common heritage of mankind.

B. Common Concern of Humanity

Alexandre Kiss and Dinah Shelton succinctly described the ideals supporting the principle that some issues are the common concern of all of humanity:

[K]nowledge that the biosphere is the only known place in the universe where life is possible led to the emergence of another universal value, protection of the human environment as a common concern of humanity. The global environment, an interdependent ecological system, can only be protected at the global level, making it a common concern for all humanity. Transboundary and domestic environmental issues that cannot be managed effectively by national or regional efforts also are common concerns.²⁶¹

When considering the unique and fragile nature of fossil aquifers, as well as the vital importance of their waters to all terrestrial life forms, one can easily support categorizing these aquifers as a common concern of humanity. Nations will most often be forced by parochial concerns to utilize natural resources for the benefit of their own populace, which can often lead to severe depletion and even exhaustion of the resource. Domestic and even regional management of fossil aquifers has not produced a system of governance that takes into consideration other nations or even future generations.²⁶² Thus, it would seem that only a global system of governance will protect and preserve these freshwater systems, an idea that is developed further in this Section.

The 1972 Stockholm Declaration,²⁶³ considered to be the progenitor of many of the environmental declarations and

treaties to follow, is rife with statements that echo common concerns of humanity. Paragraph 6 of the preamble provides:

To defend and improve the human environment for present and future generations has become an imperative goal for mankind[;] a goal to be pursued together with, and in harmony with, the established and fundamental goals of peace and of world-wide economic and social development.²⁶⁴

The first five principles of the Stockholm Declaration can also be considered to reflect common concerns of humanity, even though not all of them express environmental concerns:

Principle 1

Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being, and he bears a solemn responsibility to protect and improve the environment for present and future generations. In this respect, policies promoting or perpetuating apartheid, racial segregation, discrimination, colonial and other forms of oppression and foreign domination stand condemned and must be eliminated.

Principle 2

The natural resources of the earth, including the air, *water*, land, flora and fauna and especially representative samples of natural ecosystems must be safeguarded for the benefit of present and future generations through careful planning or management, as appropriate.

Principle 3

The capacity of the earth to produce vital renewable resources must be maintained and, wherever practicable, restored or improved.

Principle 4

Man has a special responsibility to safeguard and wisely manage the heritage of wildlife and its habitat, which are now gravely imperilled [sic] by a combination of adverse factors. Nature conservation[,] including wildlife[,] must therefore receive importance in planning for economic development.

Principle 5

The non-renewable resources of the earth must be employed in such a way as to guard against the danger of their future exhaustion and to ensure that benefits from such employment are shared by *all* mankind.²⁶⁵

These principles set forth a number of issues that may be considered the common interests of humanity, including protection of the environment, elimination of racial discrimination and oppression, safeguarding of natural resources and ecosystems, conservation of wildlife, and wise stewardship of non-renewable resources. A clear relationship exists between the preservation of fossil aquifers and Principle 5's reference

260. SPECIAL RAPPOREUR, *Fourth Rep. on Shared Natural Resources: Transboundary Groundwaters*, at 5, INT'L LAW COMM'N, U.N. DOC. A/CN.4/580 (Mar. 6, 2007) (by Chusei Yamada).

261. ALEXANDRE KISS & DINAH SHELTON, *INTERNATIONAL ENVIRONMENTAL LAW* 32 (3rd ed. 2004).

262. See *infra* Part II.

263. Stockholm Declaration, *supra* note 39.

264. *Id.* at 3.

265. *Id.* at 5 (first and second emphasis added).

to non-renewable resources, as fossil aquifers are non-replenishing and thus must be guarded from exhaustion in order to preserve them for the future.

According to Kiss and Shelton, acknowledgement that protection of certain parts of the planet is the common interest of humanity is found in the Antarctic Treaty System,²⁶⁶ which was inaugurated with the 1959 Antarctic Treaty²⁶⁷ and was later expanded with the 1980 Canberra Convention on the Conservation of Antarctic Marine Living Resources ("CCAMLR")²⁶⁸ and the 1991 Madrid Protocol on Environmental Protection to the Antarctic Treaty ("Madrid Protocol").²⁶⁹ The Antarctic Treaty begins with the statement that "it is in the interest of all mankind that Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord[.]"²⁷⁰ and goes on to provide that the Antarctic may be used for scientific research, but not for military activities such as establishing bases or engaging in nuclear testing.²⁷¹ CCAMLR's preamble has similar statements about "safeguarding the environment and protecting the integrity of the ecosystem of the seas surrounding Antarctica[.]" and "[b]elieving that the conservation of Antarctic marine living resources calls for international co-operation."²⁷² The CCAMLR preamble also reflects the spirit of the Antarctic Treaty "that it is in the interest of all mankind to preserve the waters surrounding the Antarctic continent for peaceful purposes only."²⁷³ The preamble of the Madrid Protocol follows the Antarctic treaty and CCAMLR by stating "that the development of a comprehensive regime for the protection of the Antarctic environment and dependent and associated ecosystems is in the interest of mankind as a whole[.]" and then goes further to "designate Antarctica as a natural reserve, devoted to peace and science[.]"²⁷⁴ Interestingly, the Convention on the Regulation of Antarctic Mineral Resource Activities ("CRAMRA"),²⁷⁵ a lengthy document that established a commission to ensure protection of the environment during any mining of minerals in the Antarctic region, was signed but never entered into force.²⁷⁶ Thus, Article 7 of the Madrid Protocol, which states that "[a]ny activity relating to mineral resources, other than scientific research, shall be prohibited[.]"²⁷⁷ remains the prevailing rule in the Antarctic region.

The nations of the world, therefore, formally recognize a common concern of humanity in keeping the entire Antarctic free from militarization, allowing for scientific research on the continent, and protecting the Antarctic environment and ecosystem. One can argue that declaring an area of the planet to be protected from development and depletion is much easier when there is no human population present to compete for its resources and when no nation has an undisputed claim to sovereignty over the land.²⁷⁸ However, the system that was put into place is an example of what can be accomplished when nations agree to cooperate in achieving a common goal and to refrain from undertaking certain activities in a defined area.

The Antarctic Treaty System is not the only example of cooperation among states to protect something deemed to be a common concern of humanity. The 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies ("Outer Space Treaty")²⁷⁹ was signed eight years after the 1959 Antarctic Treaty and was heavily influenced by it.²⁸⁰ The preamble of the Outer Space Treaty "[r]ecogniz[es] the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes[.]"²⁸¹ Article I declares that "[t]he exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind."²⁸² Article II eliminates any question of sovereignty over space by stating that "[o]uter space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."²⁸³

The two primary players in the space arena at the time of the Outer Space Treaty, the United States and the Union of Soviet Socialist Republics ("USSR"), each believed that the treaty still gave them the right to determine who would benefit from their efforts in space, and thus did not impose on either of them the obligation to share any of their extraterrestrial bounty with any other nation.²⁸⁴ However, no one argues with the proposition that the Outer Space Treaty identifies space as *res communis*—that is, space belongs to everyone, collectively, and is not *res nullius*, whereby the void of ownership would allow for claims of title and sovereignty by everyone.²⁸⁵

266. Kiss & Shelton, *supra* note 261, at 32.

267. *Id.*

268. *Id.*; Convention on the Conservation of Antarctic Marine Living Resources, May 20, 1980, 19 I.L.M. 841 [hereinafter CCAMLR].

269. Kiss & Shelton, *supra* note 261, at 32–33; Protocol on Environmental Protection to the Antarctic Treaty, Oct. 4, 1991, 30 I.L.M. 1455 [hereinafter Madrid Protocol].

270. Multilateral Antarctic Treaty, Dec. 1, 1959, 12 U.S.T. 794, 795, T.I.A.S. 4780 (1961).

271. *Id.*

272. CCAMLR, *supra* note 268, pmbi.

273. *Id.*

274. Madrid Protocol, *supra* note 269, at 1461.

275. Convention for the Regulation of Antarctic Mineral Resource Activities, June 2, 1988, 27 I.L.M. 859 [hereinafter CRAMRA].

276. Colin Deihl, *Antarctica: An International Laboratory*, 18 B.C. ENVTL. AFF. L. REV. 423, 424 (1991).

277. Madrid Protocol, *supra* note 269, at 1464.

278. For an interesting history of the disputed claims of sovereignty over the Antarctic region going back to the early to mid 20th century, see Jonathan D. Weiss, Comment, *The Balance of Nature and Human Needs in Antarctica: The Legality of Mining*, 9 TEMP. INT'L & COMP. L.J. 387, 392–93 (1995).

279. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, done Jan. 27, 1967, 18 U.S.T. 2410 [hereinafter Outer Space Treaty].

280. See Eric Husby, Comment, *Sovereignty and Property Rights in Outer Space*, 3 J. INT'L L. & PRAC. 359, 362 (1994).

281. Outer Space Treaty, *supra* note 279, pmbi.

282. *Id.* art. I.

283. *Id.* art. II.

284. Husby, *supra* note 280, at 364.

285. *Id.* at 364–65.

The principle of the common concern of humanity is also embodied in the 1979 Bonn Convention on the Conservation of Migratory Species of Wild Animals, the Convention on the Conservation of European Wildlife and Natural Habitats, the World Charter for Nature, the 1992 Convention on Biological Diversity, and the U.N. Framework Convention for Climate Change.²⁸⁶ While the concept of common concern of humanity cannot yet be said to represent customary international law, and is still tempered with notions of sovereignty, it represents an emerging and recognized trend. One can also argue that the waters contained in fossil aquifers qualify as a common concern of humanity. As global fresh surface water is plundered and polluted, these reservoirs will be a critical source of freshwater for future generations of humans and other organisms. Fossil aquifers differ in character from the Antarctic and the moon, but the logic that drove the community of nations to reach agreement on those two areas can be extended to fossil aquifers as well—a recognition that some resources are vitally important to all of us and that concerted effort is required to preserve them.

C. Common Heritage of Mankind

Closely related to the concept of common concerns of humanity is the idea that certain areas and resources should benefit from global protection, and usage of those resources should be determined only by consensus of the global community; that is, these areas and resources are the common heritage of mankind.²⁸⁷ The notion that areas and resources can be the common heritage of mankind evolved naturally from the concept of common concern of humanity and was born in an impassioned speech to the U.N. General Assembly in 1967 by Arvid Pardo, then the Permanent Representative of Malta to the United Nations.²⁸⁸ Pardo's plea that ocean resources be considered as "the common heritage of mankind"²⁸⁹ led to the adoption of the Law of the Sea Convention ("LOSC").²⁹⁰ He explained his reasoning as follows:

The objective of the Maltese proposal was to replace the principle of freedom of the seas by the principle of common heritage of mankind in order to preserve the greater part of ocean space as a commons accessible to the international community. The commons of the high seas, however, would be no longer open to the whims of the users and exploiters; it would be internationally administered. International administration of the commons and management of its resources for the common good distinguished the principle

of common heritage from the traditional principle of the high seas as *res communis*.²⁹¹

References to the concept of the common heritage of mankind abound throughout the LOSC. In the preamble we find the following statement of intention, clearly showing the overriding influence of the concept:

Desiring by this Convention to develop the principles embodied in resolution 2749 (XXV) of 17 December 1970 in which the General Assembly of the United Nations solemnly declared *inter alia* that the area of the seabed and ocean floor and the subsoil thereof, beyond the limits of national jurisdiction, as well as its resources, are the common heritage of mankind, the exploration and exploitation of which shall be carried out for the benefit of mankind as a whole, irrespective of the geographical location of States . . .²⁹²

Article 125 allows landlocked states to have access to international waters to exercise their rights "relating to the freedom of the high seas and the common heritage of mankind."²⁹³ Further, the common heritage of mankind principle is explicitly mentioned in Article 136, which states that "[t]he Area," defined in Article 1 to mean "the sea-bed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction,"²⁹⁴ "and its resources are the common heritage of mankind."²⁹⁵ Article 137, titled "Legal status of the Area and its resources," clarifies the matter:

1. No State shall claim or exercise sovereignty or sovereign rights over any part of the Area or its resources, nor shall any State or natural or juridical person appropriate any part thereof. No such claim or exercise of sovereignty or sovereign rights nor such appropriation shall be recognized.
2. All rights in the resources of the Area are vested in mankind as a whole, on whose behalf the Authority shall act. These resources are not subject to alienation. The minerals recovered from the Area, however, may only be alienated in accordance with this Part and the rules, regulations and procedures of the Authority.

291. L.F.E. Goldie, *A Note on Some Diverse Meanings of "the Common Heritage of Mankind,"* 10 SYRACUSE J. INT'L L. & COM. 69, 86-87 (quoting Arvid Pardo, *Law of the Sea Conference—What Went Wrong*, in *Managing Ocean Resources: A Primer* 137, 139 (Robert L. Friedheim ed., 1979)).

292. U.N. Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397, 398 [hereinafter LOSC]. LOSC was amended twelve years after its initial adoption in order to implement changes to Part XI, which established the Area whose resources are deemed to be the common heritage of mankind. Agreement Relating to the Implementation of Part XI of the U.N. Convention on the Law of the Sea, Annex § 2(3), adopted on July 28, 1994, 1836 U.N.T.S. 3. [hereinafter 1994 Implementing Agreement]. In this article, the term LOSC will refer to the Law of the Sea Convention as amended by the 1994 Implementing Agreement. While the idea of a common heritage of mankind was first articulated on behalf of developing nations in connection with the LOSC negotiations, it was incorporated into the 1979 Moon Treaty three years prior to finalization of LOSC. Agreement Governing the Activities of States on the Moon and other Celestial Bodies, opened for signature Dec. 5, 1979, 18 I.L.M. 1434 (entered into force July 11, 1984).

293. *Id.* at 444.

294. *Id.* at 399.

295. *Id.* at 446.

286. Kiss & Shelton, *supra* note 261, at 33-34.

287. Christopher C. Joyner, *The Concept of the Common Heritage of Mankind in International Law*, 13 EMORY INT'L L. REV. 615, 620 (1999) (reviewing KEMEL BASAR, *THE CONCEPT OF THE COMMON HERITAGE OF MANKIND IN INTERNATIONAL LAW* (1998)).

288. Press Release, U.N. Info. Serv., Dr. Arvid Pardo, Father of the Law of the Sea Conference, Dies at 85, in Houston, Texas, U.N. Press Release SEA/1619 (July 16, 1999).

289. *Id.*

290. *Id.*

3. No State or natural or juridical person shall claim, acquire or exercise rights with respect to the minerals recovered from the Area except in accordance with this Part. Otherwise, no such claim, acquisition or exercise of such rights shall be recognized.²⁹⁶

Article 140, titled "Benefit of mankind," develops the idea even further:

1. Activities in the Area shall, as specifically provided for in this Part, be carried out for the benefit of mankind as a whole, irrespective of the geographical location of States, whether coastal or land-locked, and taking into particular consideration the interests and needs of developing States and of peoples who have not attained full independence or other self-governing status recognized by the United Nations in accordance with General Assembly resolution 1514 (XV) and other relevant General Assembly resolutions.
2. The Authority shall provide for the equitable sharing of financial and other economic benefits derived from activities in the Area through any appropriate mechanism, on a non-discriminatory basis²⁹⁷

Other references in the LOSC to the common heritage or common benefit of mankind can be found in Article 143, on "[m]arine scientific research[.];" Article 149, on "[a]rchaeological and historical objects;" Article 150, on "[p]olicies relating to activities in the Area;" Article 155, on "[t]he Review Conference [of the International Seabed Authority];" and Article 246, on "[m]arine scientific research in the exclusive economic zone and on the continental shelf."²⁹⁸ Further, in Article 311 the parties agree prospectively "that there shall be no amendments to the basic principle relating to the common heritage of mankind set forth in article 136 and that they shall not be party to any agreement in derogation thereof."²⁹⁹

Thus, in the LOSC we see the parties to the treaty willingly agreeing to cede sovereignty over resources that may be garnered from an area of the ocean beyond just their jurisdiction. The seabed contains minerals that would bring financial gain but no direct sustenance, yet nations were willing to share the benefits deriving from those resources with other nations. The willingness to refrain from making claims of sovereignty in the LOSC goes one step further than the same willingness that was expressed in the Outer Space Treaty because many nations had the capacity to exert claims of sovereignty over the high seas, whereas not many nations had the capacity to launch vehicles into space.³⁰⁰ The agreement to declare the Antarctic free from the sovereignty of any nations had much more practical impacts because nations had already begun arguing over their rights to the territory.³⁰¹ However, nations were willing to relinquish whatever rights

they may have had to the territory to preserve the land and its resources for all of mankind.³⁰²

Fossil aquifers, which contain life-giving waters, should be granted the same status as the seabed, the moon, and the Antarctic, so that their freshwater resources may be preserved and shared by the global community for generations to come. Indeed, the waters in fossil aquifers can be viewed as being even more deserving of global protection and management than ocean, lunar or polar minerals, because without these waters land-based life forms could not survive. The money gained from selling minerals on the global market may bring financial returns to the exploiters and merchants, but without water to drink, those same exploiters and merchants would wither and disappear far more quickly than their bank accounts. If nations can agree on a global management system for minerals that are not vital to life, they should be even more compelled to treat water—especially water in systems so weakly linked to the surface and thus outside their sovereign control—as both the common concern of humanity and the common heritage of mankind. Such global consciousness and subordination of nationalistic concerns to the common good would set the stage for a communal governance of fossil aquifers.

D. A Proposal for Aquifer Governance

If waters in fossil aquifers are the common heritage of mankind, with the nations lying above those aquifers no longer having exclusive claims of sovereignty over them, some method of governance must be developed to fill the void. Before designing such a method, it would be instructive to analyze joint management mechanisms that have already been designed or implemented. The LOSC established the International Sea-Bed Authority ("ISA") to administer the resources in "the Area," as that term is defined in the Convention.³⁰³ The Bellagio Treaty, which was the culmination of the work of eminent water scholars, presented a proposal for governance modeled after the International Boundary and Water Commission that was put into place by the 1944 United States-Mexico Water Treaty³⁰⁴ as a mechanism for monitoring and managing the transboundary waters between the United States and Mexico.³⁰⁵ This Section compares the ISA with the governing body proposed in the Bellagio Treaty in an effort to propose a solution for joint management of fossil aquifers.

The LOSC devotes almost thirty articles³⁰⁶ to establishing the ISA and describing its functions. The headquarters of the ISA is in Jamaica, a developing, island nation, and all states that are parties to LOSC are automatically members of the ISA.³⁰⁷ Article 157 sets forth the "nature and fundamental

302. See *id.* at 396–97.

303. LOSC, *supra* note 292, art. 156, para. 1, art. 157, para. 1.

304. Treaty on the Waters of the Colorado and Tijuana Rivers, and of the Rio Grande, U.S.-Mex., art. 2, para. 2, Feb. 3–Nov 14, 1944, 3 U.N.T.S. 313.

305. Nicole Ries, *The (Almost) All-American Canal: Consejo de Desarrollo Económico de Mexicali v. United States and the Pursuit of Environmental Justice in Transboundary Resource Management*, 35 *Ecology L.Q.* 491, 500–01 (2008).

306. LOSC, *supra* note 292, arts. 156–83.

307. *Id.* art. 156, paras. 2, 4.

296. *Id.*

297. *Id.* at 447 (footnote omitted).

298. *Id.* at 448, 450–51, 497–98.

299. *Id.* at 519.

300. See Husby, *supra* note 280, at 362.

301. See Weiss, *supra* note 278, at 392–94, 396–98.

principles" of the ISA, which give it both express and incidental powers, grant equality to all members, and call for good faith implementation:

1. The Authority is the organization through which States Parties shall, in accordance with this Part, organize and control activities in the Area, particularly with a view to administering the resources of the Area.
2. The powers and functions of the Authority shall be those expressly conferred upon it by this Convention. The Authority shall have such incidental powers, consistent with this Convention, as are implicit in and necessary for the exercise of those powers and functions with respect to activities in the Area.
3. The Authority is based on the principle of the sovereign equality of all its members.
4. All members of the Authority shall fulfil [sic] in good faith the obligations assumed by them in accordance with this Part in order to ensure to all of them the rights and benefits resulting from membership.³⁰⁸

The ISA structure is quite complicated, with an Assembly, a Council, a Secretariat, and an Enterprise.³⁰⁹ The cost of the Enterprise, which would have conducted the intended activities in the Area and managed transport, processing and marketing of minerals taken from the Area, caused much concern among the parties.³¹⁰ As a result, the 1994 Implementing Agreement, which amended the original LOSC, provided that no state or party would be responsible to fund any mine site or finance any Enterprise operations.³¹¹ Thus, the Enterprise remains essentially a theoretical solution to sharing of mineral resources in the seabed, but the design of its structure can still provide inspiration for solutions to sharing other resources.

The Assembly is comprised of one representative of each member of the ISA³¹² and has a broad range of powers and functions, including establishing general policies; electing the Secretary-General, members of the Council, members of the Governing Board of the Enterprise and the Director-General of the Enterprise; setting up subsidiary organs; assessing contributions of the members; approving the Council's recommendations on policies and procedures regarding equitable sharing of the benefits derived from the Area; determining the amount of the equitable sharing; approving the budget; initiating studies to promote international cooperation and to encourage development of related international law; considering particular problems of developing nations; and suspending membership.³¹³

The Council has only thirty-six members. Membership on the Council is determined by a complex system that chooses four representatives from nations that consume or

import commodities derived from minerals in the Area, four representatives from nations that have large investments in mineral extraction activities in the Area, four representatives from nations that export minerals such as those found in the Area, six representatives from developing nations, and eighteen representatives chosen to ensure balanced geographical representation.³¹⁴ Landlocked, geographically disadvantaged, and coastal states are guaranteed representation.³¹⁵ The Council functions as the organizational arm of the ISA and is charged with supervising and coordinating implementation of all matters within the jurisdiction of the ISA; it may also enter into agreements with other international organizations on behalf of the ISA.³¹⁶ To assist in carrying out its duties, the Council has an Economic Planning Commission and a Legal and Technical Commission, each composed of fifteen members.³¹⁷ The Secretariat branch is comprised of the Secretary-General, who serves as the chief administrative officer³¹⁸ and principal diplomat of the ISA,³¹⁹ and the ISA staff.³²⁰ LOSC sets up a layered system of governance that provides for management representation by concerned parties and parties that might otherwise be underrepresented. Day-to-day management is left to a subset of the Council, and a separate technical committee is charged with managing any extraction of minerals.

As discussed earlier,³²¹ Article III of the Bellagio Treaty³²² takes a different approach by establishing a Commission to manage the transboundary aquifers that are agreed to fall under its jurisdiction. The Commission is given a technical staff to work with member governments³²³ and is specifically authorized to "declare Transboundary Groundwater Conservation Areas, Drought Alerts, Drought Emergencies and Public Health Emergencies, and to promulgate the corresponding plans and Depletion Plans."³²⁴ The Commission's determination that an area needs special protection through classification as a Transboundary Groundwater Conservation Area is final unless a member government objects within 180 days.³²⁵ Once the Commission has formally declared an area to be a Transboundary Groundwater Conservation Area, the Commission must produce and submit to the member governments a Comprehensive Management Plan that similarly becomes formally adopted if no member government objects

308. *Id.* art. 157.

309. *Id.* art. 158.

310. David Freestone, *A Decade of the Law of the Sea Convention: Is It a Success?*, 39 GEO. WASH. INT'L L. REV. 499, 512 (2007).

311. 1994 Implementing Agreement, *supra* note 292.

312. LOSC, *supra* note 292, art. 159, para. 1.

313. *Id.* art. 160.

314. *Id.* art. 161, para. 1.

315. *Id.* art. 161, para. 2. Article 70(2) of LOSC defines "geographically disadvantaged States" to mean "coastal States, including States bordering enclosed or semi-enclosed seas, whose geographical situation makes them dependent upon the exploitation of the living resources of the exclusive economic zones of other States in the subregion or region for adequate supplies of fish for the nutritional purposes of their populations or parts thereof, and coastal States which can claim no exclusive economic zones of their own."

316. *Id.* art. 162.

317. *Id.* art. 163, paras. 1–2.

318. *Id.* art. 166, para. 3.

319. *Id.* art. 169.

320. *Id.* art. 167.

321. *See supra* Part I.D.

322. Bellagio Treaty, *supra* note 30.

323. *Id.* art. III, para. 2.

324. *Id.* art. III, para. 3.

325. *Id.* at 692 (presenting art. VII, ¶¶ 1–3).

within 180 days.³²⁶ Governments may assign the Commission jurisdiction over other activities concerning the members' border regions,³²⁷ and they collectively may refer other matters to the Commission for investigation or action.³²⁸ An individual government, or a set of affected governments, may request advice from the Commission on a matter concerning a particular border area.³²⁹

In the commentary to the Bellagio Treaty, Hayton and Utton clarify their intention that the parties to the treaty may utilize a "joint or international" organization that already exists to perform the functions assigned to the Commission, or the parties may use the framework outlined in the treaty to create a new entity to function as the Commission.³³⁰ Hayton and Utton also strongly recommend that the Commission have jurisdiction over both surface water and groundwater, since "conjunctive management" would produce the most cost-effective and efficient results.³³¹

In Article IV, the Commission is tasked with conducting a biennial "review of the water quality and quantity control measures taken within each Party's territory affecting the border region." The parties are obligated to cooperate by providing the Commission with information necessary to perform its review, and once the Commission has completed its review it must issue a report on its findings.³³² The parties are also responsible for issuing a biennial report on water quality and quantity control measures undertaken in their jurisdictions.³³³ The commentary states that the Commission is not an enforcement agency, but serves to review the activities and reports of the parties.³³⁴ One of the major functions of the Bellagio Treaty Commission is maintenance of the database³³⁵ because, as Hayton and Utton note, "[t]here can hardly be anything more important in effecting international water resources management than the factual basis required for rational decision making."³³⁶ In Article X, the Commission is authorized to make a proposal for the planned depletion of an aquifer over a calculated period of time, but that plan must be approved by the parties.

The LOSC system was designed to facilitate participation by the global community in decisionmaking related to the exploitation of resources and in sharing the benefits gained from those resources. The Bellagio Treaty is intended to leave the management of aquifer systems to those countries that share the water basin, but provides that the management of the water basin be guided by science. One proposal for a

management system for fossil aquifers could combine aspects of the two regimes.

This Article presents arguments for viewing the water contained in fossil aquifers as the common heritage of mankind because its limited connection to the surface should place it outside the sovereign reach of any nation. The most difficult part of achieving a global regime for fossil aquifers would obviously be convincing the nations under whose land they lie that a new system of sovereignty should be adopted and that the water resources belong to the world community at large. From a practical standpoint, persuading those nations with water under their lands to cede some or all of those current rights to less fortunate nations will require considerable diplomacy and horse-trading. The current international system penalizes those who give up a current right without some recompense in return and gives no reward for altruism. However, from a theoretical standpoint, one can postulate that as globalization and telecommunications link nations and their peoples more closely together, global consciousness and action will be possible and necessary to address the water crises we will face in coming decades. Nations lying atop fossil aquifers may have to be granted certain concessions and benefits by the global community in order to convince them to refrain from asserting sovereignty over fossil waters. However, assuming that the nations with current claims over the aquifers could be convinced to eschew those claims for the benefit of all of mankind and nature, and that those nations could also be convinced to allow access to the aquifers through their territories, certain structures could then be put into place.

Under the current system of world order, agreements between nations take the form of treaties, and a treaty would certainly be necessary to delineate the rights and obligations of the parties sharing fossil waters. That treaty could be negotiated under the auspices of the United Nations or by an ad hoc group. Since neither of the U.N. draft treaties concerning water has entered into force, one could argue that political will within the halls of the U.N. is lacking where water issues are concerned and that an ad hoc group would therefore be advisable. Indeed, an arrangement for sharing fossil aquifers could be tested on a regional basis first. The Joint NSAS Authority is an attempt to allocate the fossil waters in the Nubian Sandstone Aquifer, but the water is only shared among those nations located atop the aquifer, thus preserving the current notions of sovereignty. Further, while Libya continues draining the aquifer with its Great Man-Made River Project, the Joint NSAS Authority has not even reached agreement on gathering and sharing information. In order to balance science and equity, a treaty addressing fossil aquifers—whether global or regional—should include some or all of the aspects discussed in the following paragraphs.

The Bellagio Treaty was correct in placing a high value on the science of hydrogeology, because a keen understanding of aquifers and water flows would limit the over-utilization, subsidence, and contamination that could doom an aquifer. Ideally, scientists would remain above the political fray and would be capable of rendering unbiased opinions on the

326. *Id.* at 695, 697 (presenting art. VIII, ¶¶ 1, 4). Interestingly, the language "all the relevant factors" in article VIII, paragraph 3, of the Bellagio Treaty—describing the factors that the Commission must take into consideration when making allocations of water under a Comprehensive Management Plan—has become nearly universally accepted language since the adoption of the Helsinki Rules in 1966. *Id.* at 699.

327. *Id.* at 684 (presenting art. III, ¶ 4).

328. *Id.* (presenting art. III, ¶ 7).

329. *See id.* (presenting art. III, ¶ 7).

330. *Id.* at 684–85.

331. *Id.* at 685.

332. *Id.* art. IV, para. 2.

333. *Id.* para. 3.

334. *Id.* at 687.

335. *Id.* art. V.

336. *Id.* at 688–89.

health and sustainability of aquifers based on measurements and data. Therefore, a scientific committee similar to the Bellagio Commission should be established with noted experts from various representative countries serving pre-determined terms. Having pre-determined term limits for the committee members would help prevent voting blocks from forming and would allow for fresh ideas and opinions to be presented to the committee. This scientific committee should be given the power to recommend to an executive committee when and to what extent withdrawals should be made from the aquifers to address current demands, while not compromising the ability of the aquifer to meet future needs. The scientific committee could also, by the vote of a super-majority, override withdrawal requests made by the executive committee when those withdrawal requests would, in the opinion of the scientific committee, jeopardize the health or sustainability of the aquifer. There would, however, be no need for Bellagio-style Transboundary Groundwater Conservation Areas because the water resources in each fossil aquifer would always be conserved to the extent possible, so that every fossil aquifer would be a conservation area.

The executive committee, which would be similar to the LOSC Council, should be composed of all the nations deemed to have actual or threatened water scarcity issues, and who thus would be eligible for receipt of the water extracted from the aquifers, as well as a representative from the country under whose borders the aquifer lies. The definition of water scarcity would be established as part of the negotiation process, but could be viewed in terms of gallons of available fresh water per capita. The executive committee would be charged with adopting and executing recommendations made by the scientific committee regarding withdrawals and apportionment of the water in the aquifer. The executive committee could also make requests to the scientific committee for withdrawals, which the scientific committee would be obliged to consider. Absent a super-majority vote against a withdrawal within an established timeframe, which could be as little as sixty days or as much as six months, the executive committee request would be adopted.

Under what circumstances should a withdrawal be requested and granted? Once again, we can turn for guidance to the Bellagio Treaty, which recommended that droughts, drought emergencies, and public health emergencies be considered special circumstances. Under the proposed new regime, severe droughts and public health emergencies could similarly be the subjects of withdrawal requests by the executive committee to the scientific committee. Since every withdrawal from a fossil aquifer is unsustainable, no more than a pre-determined number of gallons would be withdrawn from any aquifer in any one year, unless an equivalent amount were committed to be used to recharge another aquifer. Special consideration should be given to those water-poor or drought-stricken nations under whose borders a fossil aquifer is located. In addition, because other land-based creatures depend on fresh water for survival and healthy eco-systems are vital to biodiversity and human existence, requests for withdrawals could also be made when an eco-

system is in danger of collapse, even when no human lives are directly endangered. Indeed, a species equity principle could be considered as a logical and necessary corollary to the generational equity principle.

As mentioned, withdrawals from an aquifer must be made with precision and great care in order to avoid contamination and pollution. If an organization similar to the LOSC Enterprise were established, it would implement extractions based strictly on advice from the scientific committee. However, because the number of wells and pipelines into the fossil aquifers would probably be limited, the size of the extraction group would be small and composed of hydro-engineering firms under contract to the executive committee. These hydro-engineering firms would have to demonstrate a high level of expertise and experience in order to compete for the contracts, and contracts would be for a limited duration to reduce the dangers of entitlement and corruption.

Who would provide funding for the aquifer management regimes? Should the nations who are providing access to the aquifers through their territories be compensated in some way? Those countries that are members of the executive committee and who would benefit from the withdrawals should jointly bear the overhead cost of the executive committee, the scientific committee, and the hydro-engineering firms performing the withdrawals. Those nations under whose borders fossil aquifers are found, and whose sovereignty would be impinged by the new system's withdrawal activities, should be compensated for any damage to their territories and should be granted negotiated trade concessions by those countries benefiting from the water resource to compensate them for the loss of their sovereignty over a natural resource. These trade concessions should comport with the rules of the World Trade Organization but could take many forms, including preferential tariffs on certain goods, guaranteed imports of certain commodities, and discounted interest rates on loans. Granting trade concessions and a seat on the executive committee to the nation under whose borders a fossil aquifer lies may obviate the need for an enforcement mechanism, since those concessions and the seat can be withdrawn should the nation prevent access to the aquifer for withdrawals. As we have seen in recent years with petroleum, nations will resort to warfare when their vital interests are deemed to be threatened, and under any perspective water is a vital interest to all creatures. In order to reduce the risk of conflict, the new system should provide a voice and benefits for all of the stakeholders.

Conclusion

As we have seen, none of the proposed agreements addressing groundwater has won enough acceptance in the global community to enter into force. These proposals and draft articles, written by experts who are mired in the same thought patterns, repeat the familiar refrain of reasonable use trumping adequate protection of water resources, and they protect the sovereign right of states to utilize resources within their jurisdictions. Meanwhile, fossil aquifers are being drained at a

furious pace in support of unsustainable agricultural production and economic growth. Water that was sheltered in secret pockets for thousands of years has been tapped and depleted at an alarming rate over the course of only a few decades and, in some cases, may be exhausted no later than mid-century.

Two groundwater experts have postulated that, given the vast amount of groundwater that exists and the small amount that is passing through the hydrological cycle, "an enormous quantity of the groundwater reserve may consist of fossil groundwater contained in confined aquifers isolated from surface waters and the hydrologic cycle in general."³³⁷ If these experts are correct, and there is still much more water waiting to be discovered underground, it is time to devise another system of governance because the current theories and practices simply are not working. Indeed, as Joseph Dellapenna remarked, in an era of climate change and the resulting demands being placed on fresh water, pressures are mounting both nationally and internationally to reform the old rules governing sharing of waters and replace those with rules that take changing needs into account.³³⁸ The situation is too urgent to wait for customary law to develop on this issue.

This Article proposes that fossil aquifers that have limited connection to the surface should be viewed as the common heritage of mankind and declared to be outside the sovereign reach of any nation. A proposed system of governance has also been advanced, whereby those nations that have a water deficit should have the right to share the waters that are in fossil formations. Little can be done to change the present system of state sovereignty over known fossil aquifers, because no nation that currently relies on that water will voluntarily cede ownership or control. However, if predictions of exhaustion of some aquifers by mid-century are even close to being accurate, and if predictions of vast aquifers lying undiscovered are also accurate, then there is little time to lose in forming a new, equitable, sustainable system of governance to manage those fossil aquifers that have yet to be found, so that their treasure trove of a resource vital to all terrestrial life may be available to serve us in the parched years to come.

337. Krishna & Salman, *supra* note 104, at 164–165.

338. Dellapenna, *supra* note 76, at 52.