

The Water Giant Awakes: An Overview of Water Law in Brazil

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I. Introduction

Brazil is home to the largest reserve of water resources on the planet,¹ containing approximately 8% of the world's existing freshwater.² Its territory encompasses several gigantic water basins,³ including the vast Amazon River basin.⁴ Except for the Northeast,⁵ the entire country possesses an enviable abundance of water, for it sits upon enormous underground water

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1. Maude Barlow & Tony Clarke, *The Struggle for Latin America's Water*, Polaris Institute, at http://www.polarisinstitute.org/polaris_project/water_lords/articles/latin_america_water.html.

2. *Briefs on Afghanistan, Thailand, South Korea, Brazil, Spain, and Sweden*, EXPORT AMERICA, Sept. 2002, at 5, available at http://www.ita.doc.gov/exportamerica/GlobalNewsLine/gnl_0902.html. With annual renewable water resources of 6,950 cubic kilometers per year, Brazil is the richest country in the world in fresh water, followed by Russia (4,498 cubic kilometers per year), and the United States (2,478 cubic kilometers per year). PETER H. GLEICK, *THE WORLD'S WATER 1998-1999: THE BIENNIAL REPORT ON FRESHWATER RESOURCES* 238-40 (1998).

3. In international and national literature, Brazilian forests and their deforestation receive a great deal of attention. See, e.g., Cristina Schwanssee Romano, *Brazilian Government Policies Towards the Amazon Rain Forest: From a Developmental Ideology to an Environmental Consciousness?*, 1998 COLO. J. INT'L ENVTL. L. & POL'Y 65. This is not the case with water resources. The same is true of the Amazon: "Specialists call more attention to deforestation . . . [Yet] focusing on water permits a deeper study of socio-environmental correlations. Furthermore, water is a fundamental element in the biological life of the region." MAURO LEONEL, *A MORTE SOCIAL DOS RIOS: CONFLITO, NATUREZA E CULTURA NA AMAZÔNIA* [THE SOCIAL DEATH OF RIVERS: CONFLICT, NATURE AND CULTURE IN THE AMAZON] 23 (1998) (translated by author).

4. See J. TIMMONS ROBERTS & NIKKI DEMETRIA THANOS, *TROUBLE IN PARADISE: GLOBALIZATION AND ENVIRONMENTAL CRISES IN LATIN AMERICA* 132 (2003).

5. The so-called semiarid Northeast occupies less than 10% of the nation's land. Aldo da C. Rebouças, *Água Doce no Mundo e no Brasil* [Fresh Water in the World and in Brazil], in *ÁGUAS DOCES NO BRAZIL: CAPITAL ECOLÓGICO, USO E CONSERVAÇÃO* [FRESH WATER IN BRAZIL: ECOLOGICAL CAPITAL, USE AND CONSERVATION] 29 (Aldo da C. Rebouças et al. eds., 2d ed. 2002).

reserves estimated to total 112,000 cubic kilometers.⁶ While in theory there are nearly 34 million liters of water available for each of Brazil's inhabitants, the truth is that water is distributed unevenly throughout the territory. The North and Central-West, for instance, have both the highest mean water discharge rate and the lowest population density in Brazil.⁷

Brazil is the largest country in South America; with an area of more than 8.5 million square kilometers,⁸ it is larger than the contiguous United States. Brazil shares a border with ten countries, a fact that highlights the importance of adding international legal arrangements to the national system of water use regulation. Organized into a federal republic (a fact that, as will be seen, creates both difficulties and opportunities in the legal-administrative organization of a water resources system), Brazil is divided into 26 states and a federal district (Brasília). There are distinct variations in size, population, and wealth among the states, and this diversity determines, to a greater or lesser degree, the level of investment in the implementation of policies and norms for water use and basic sanitation.

From geographic and political-administrative perspectives, the territory of Brazil is composed of five principal regions:

Northern Region.—With approximately 3.5 million square kilometers (more than 42% of the entire nation's land), this region is known for the world's largest river basin: the Amazon.⁹ The rivers that constitute the Amazon River Basin are divided into three types. First, there are the rivers of the right bank of the Amazon River (or south bank), with crystalline waters that arise in large part from the Central Brazilian Plain (Rivers Tapajós, Madeira, and Xingu). Second, there are the largely sediment-filled rivers that form part of the Andes Range tributaries (River Solimões). Third, there are the dark rivers of the left bank of the Amazon River (or north bank) that are born in the Guianas Plain (Rivers Negro, Trombetas, Paru, and Jari). In addition, there are the smaller Tocantins River and its principal tributary, the Araguaia, which drain out near Marajó Island into the estuary of the Amazon.¹⁰

Central-Western Region.—This region is dominated by the Central Brazilian Plain, which comprises a good part of the basins of the

6. Agência Nacional de Águas, *The Evolution of Water Resources Management in Brazil*, at <http://www.ana.gov.br/ingles/Portais/02-contents.html> [hereinafter *The Evolution of Water*].

7. *Id.*

8. *Id.* (General Aspects).

9. Manuel Picasso Botto, *The Amazon Cooperation Treaty: A Mechanism for Cooperation and Sustainable Development*, in *MANAGEMENT OF LATIN AMERICAN RIVER BASINS: AMAZON, PLATA, AND SÃO FRANCISCO* 68, 68–70 (Asit K. Biswas et al. eds., 1999) [hereinafter *MANAGEMENT OF LATIN AMERICAN RIVER BASINS*].

10. The Amazon River estuary at Marajó Island, near the mouth of the River Tocantins, represents the confluence of two great water basins. In the Tocantins Hydrographic Region, 81% of the demand for water is for irrigation, with only 2% for industrial uses, 7% for livestock, and 10% for the human population. Overview of Hydrographic Regions in Brazil: The Hydrographic Region of the Amazon, at http://www.ana.gov.br/ingles/Portais/folder/tocantins/03-Availability_Use.html.

Rivers Amazonas, Paraná, and São Francisco. The largest freshwater wetlands in the world, the Pantanal, are located in this region.¹¹

Northeastern Region.—The most heterogeneous of the regions, this region has four zones: the Mid-North,¹² the coastal Atlantic Forest, the Agreste,¹³ and the Sertão.¹⁴ In the Sertão, rains are sparse and there are periodic droughts.¹⁵ The principal river of the Northeast is the São Francisco.¹⁶

Southeastern Region.—The economic heart of the country, this region brings together the states with the greatest population and industrial production. The Rivers São Francisco and Paraná, two of the most important in Brazil, have large extensions of their water basins in the Southeast. The River Grande, which divides the states of Minas Gerais and São Paulo, and the Tietê, which crosses the state of São Paulo, are two of the principal tributaries in the southeast Paraná Basin.

Southern Region.—Predominantly a subtropical climate due to the low latitudes, this is the coldest region of Brazil, with frequent frosts and, in the mountains of the states of Santa Catarina and Rio Grande do Sul, even snow. The rivers that cross the region form the Paraná Basin almost in its entirety; they are crucially important for the country, above all for their hydroelectric potential. Itaipu, the largest

11. The Pantanal is located in the basin of the Alto Paraguai River system in the states of Mato Grosso and Mato Grosso do Sul. The principal activities are fishing, agriculture, and fishing-based tourism. This fragile wetlands ecosystem is threatened by encroaching agriculture and its resulting pollution and erosion. Living Lakes Partnership, Pantanal Wetlands, at <http://www.livinglakes.org/pantanal/>.

12. The Mid-North refers to the transition region between the Amazon and the Northeast proper.

13. Agreste is a region of the Brazilian Northeast, located between the Atlantic rain forest and the Caatinga. Enciclopédia Portuguesa, Agreste, at <http://encyclopaedic.net/portug/ag/agreste.html>. It is characterized by rocky soil and scarce vegetation. *Id.*

14. The Sertão area, part of Brazil's "polygon of drought," is a "semiarid hinterland of [northeastern] Brazil . . . Its characteristic landscape is the caatinga, or thorny scrub forest." THE COLUMBIA ENCYCLOPEDIA 2481 (Barbara A. Chernow & George A. Vallasi eds., 5th ed. 1993). The Caatinga, located in the heart of the Brazilian Northeast, has a semiarid climate with annual median temperatures between 27° and 29° C and average rainfall of less than 800 millimeters. The region's rivers flow intermittently and their courses are interrupted during the dry season. Meio Ambiente, Caatinga, at <http://www.mre.gov.br/cdbrasil/itamaraty/web/port/meioamb/ecossist/caatinga/>.

15. Meio Ambiente, Caatinga, at <http://www.mre.gov.br/cdbrasil/itamaraty/web/port/meioamb/ecossist/caatinga/>.

16. On the São Francisco River and its management, see Larry D. Simpson, *The Rio São Francisco: Lifeline of the North-East*, in MANAGEMENT OF LATIN AMERICAN RIVER BASINS, *supra* note 9, at 207.

hydroelectric plant in operation in the world, is located in the state of Paraná.¹⁷

One not familiar with the Brazilian reality might think that such an abundance of water and hydrological diversity would naturally have led to the development of a well-organized, centuries-old legal system for water. It may thus be a surprise to learn that the situation is exactly the opposite—only in the last 70 years has the country begun to be concerned about water regulation. Historically, water was treated as “a free good—a gift of God.”¹⁸ As Vladimir Passos de Freitas explained, “The use and importance of water were never a concern of the Brazilian people.”¹⁹

This disregard for water stems not only from culture, norms, and institutions, but also from jurisprudence. Carvalho de Mendonça, one of the first national jurists to dedicate himself to the subject, referred in 1909 to “infrequent controversies over waters.”²⁰ He also added that “there is no theme in Brazil in which the jurisprudence has been exercised less than in questions over water. Rare, extremely rare, are higher courts’ decisions in this matter. However, never has there been a country with such abundant rivers and water currents as ours.”²¹ Perhaps it is due to the abundance of water that the legal treatment of Brazilian water is superficial, marginal, and fragmentary. Aldo Rebouças, the leading Brazilian scientist on the topic, confirmed this suspicion when he noted that Brazil’s abundance of water “has served as support for a culture of disregard for available water, [stifling] the realization of investments necessary for its use and most efficient protection, and [contributing to] its low economic valuation.”²²

Because of history’s superficial legal treatment of water, which lasted from the discovery of Brazil in 1500 until 1934, Brazil is still in the process of consolidating its legal water regime, a regime that currently reflects the

17. The Itaipu Hydroelectric Plant was jointly developed by Paraguay and Brazil, and is the result of their joint effort to harness the hydraulic resources of the Paraná River. In 2000, the plant was supplying 95% of the electric power consumed in Paraguay and 24% of the electric power used in Brazil. Itaipu Binacional, at <http://itaipu.gov.br>.

18. MUSA ASAD ET AL., MANAGEMENT OF WATER RESOURCES: BULK WATER PRICING IN BRAZIL 17 (World Bank Technical Paper No. 432, 1999), available at http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/1999/10/07/000094946_99092311540412/Rendered/PDF/multi_page.pdf.

19. Vladimir Passos de Freitas, *Águas—Considerações Gerais* [Water—General Considerations], in *ÁGUAS: ASPECTOS JURÍDICOS E AMBIENTAIS* 17 (Vladimir Passos de Freitas ed., 2000) [hereinafter WATER: LEGAL AND ENVIRONMENTAL ASPECTS] (translated by author).

20. MANOEL IGNASIO CARVALHO DE MENDONÇA, RIOS E ÁGUAS CORRENTES EM SUAS RELAÇÕES JURÍDICAS [LEGAL STATUS OF RIVERS AND WATER CURRENTS] VI (1909) [hereinafter LEGAL STATUS OF RIVERS] (translated by author).

21. *Id.* (translated by author).

22. Aldo da C. Rebouças, *Proteção Dos Recursos Hídricos* [Protecting Water Resources], in 1 LAW, WATER AND THE WEB OF LIFE 247, 275 (Antonio Herman Benjamin ed., 2003) (translated by author).

uncertainties of the old law through commentaries on current legislation.²³ So strong is the old mindset that commentators and jurists risk analyzing the current normative situation, which includes the modern and inclusive regulatory framework of the Federal Constitution of 1988 and the National Water Act of 1997,²⁴ with eyes turned back to the past. Furthermore, it is only quite recently that Brazil has begun to see its border rivers as serving functions other than the “function of separation.”²⁵ The problem of managing these transnational hydrological resources is growing day by day, from the River Plate to the Amazon.

For the reasons that follow, it is surprising that the National Water Act’s promulgation was able to resolve any of the legal uncertainties surrounding the subject. First, the Act must be read together with various provisions of the Federal Constitution of 1988, and many of these provisions are unclear—especially those that deal with union and state water ownership and their respective legislative and enforcement powers. The situation is further complicated by state constitutions that also address the issue. Second, because the National Water Act did not wholly revoke the Water Code of 1934, doubts remain as to which provisions of the original text remain in effect. Third, the new Civil Code (revised by a Commission of Jurists in the 1970s but promulgated only in 2002, *after* the National Water Act) also addresses waters. Finally, although the matter now has a clear legislative nucleus, it is still subject to a heterogeneous mosaic of federal and state laws that govern policies directly or indirectly related to water, such as environmental protection, health, basic sanitation, and energy (in particular, hydroelectricity).²⁶

This Article attempts to provide a panoramic view of the legal treatment of waters in Brazil beginning with the earliest laws of the Portuguese colonial days and continuing through modern water legislation and regulation. It carefully considers the special cases of groundwater, drinking water, and sanitation. Part I presents both the historical evolution and the current status

23. See Jerson Kelman, *Evolution of Brazil’s Water Resources Management System*, in WATER RESOURCES MANAGEMENT: BRAZILIAN AND EUROPEAN TRENDS AND APPROACHES 27–28 (Gilberto Valente Canali et al. eds., 2000), available at <http://www.ana.gov.br/jersonkelman/pdf/watersource.pdf>.

24. Lei da Política Nacional de Recursos Hídricos [National Water Act], Lei No. 9.433, de 8 janeiro de 1997, D.O.U. de 09.01.1997, amended by Decreto No. 2.612, de 6 de março de 1998, D.O. de 04.06.1998. For a discussion of the history and impact of the 1988 Constitution and the National Water Act, see generally Monica Porto & Jason Kelman, *Water Resources Policy in Brazil* (unpublished manuscript), available at http://www.ana.gov.br/jersonkelman/pdf/water_resources_policy_in_brazil.pdf.

25. Alejandro Iza, *Desafíos Para La Conservación de los Recursos Hídricos en los Procesos de Integración* [Challenges for Conservation of Water Resources in the Integration Cases], in 1 LAW, WATER AND THE WEB OF LIFE, *supra* note 22, at 27, 27–28 (translated by author).

26. Municipalities are not included because they lack legislative jurisdiction over matters of water in the strict sense, but in theory they can regulate water indirectly as to quality, based on municipalities’ jurisdiction to legislate on “issues of local interest.” CONSTITUIÇÃO FEDERAL [C.F.] [Constitution] art. 30, I, VIII (Braz.) (translated by author).

of national legislation and administrative institutions on water resources. It then provides a detailed account of the changes in the law through the centuries based on different priorities of water use and a major change in water ownership mandated by new codes and the Constitution of 1988. Part II analyzes the international normative landscape concerning Brazilian water resources, especially transboundary groundwaters, and references international soft law, customary law, a multilateral treaty, and regional norms and treaties for several important Brazilian water basins. Part III recommends future changes in national and regional law on groundwater, focusing on the case of the Guarani Aquifer underlying Brazil, Argentina, Uruguay, and Paraguay. The Article concludes by proposing a specific legal regime for groundwaters both within Brazil and shared across national borders. The proposal suggests a cooperative plan for the integrated water resources management of transboundary aquifers like the Guarani.

A. *Historical Evolution of the Legal Regime for Water in Brazil*

The legal treatment of waters in Brazil can be organized into three distinct historical periods. The first—the Navigability Phase—ended with the enactment of the Water Code of 1934, at which point the second—the Hydroelectricity Phase—began. The third period—the Environmental Phase—started in the 1980s and 1990s, with the publication of the *Lei da Política Nacional do Meio Ambiente* (National Environmental Policy Act) in 1981, the new Federal Constitution in 1988, and the *Lei da Política Nacional de Recursos Hídricos* (National Water Act) of 1997.

1. *The Navigability Phase.*—Until the beginning of the 1930s, the legal regime for water followed the tradition laid down by the Portuguese in the *Ordenações do Reino* (Ordinances of the Kingdom)²⁷ and the Civil Code of 1916.²⁸ The primary concern of the *Ordenações* was navigation.²⁹

In the Civil Code of 1916 (recently replaced by the Civil Code of 2002), bodies of water were treated as *things*. Rivers were considered *bens públicos de uso comum do povo* (public property for the shared use of the people).³⁰ Such public property could be used for free or at a cost, depending on what system was established by the *Poder Público* (Public Authorities).³¹ Navigability and the ability to float cargo downstream were no longer the principal criteria for river regulation. Article 66 articulated “common use by

27. See Solange Teles da Silva, *Regime jurídico das águas subterrâneas* [The Legal Regime of Subterranean Water], in 1 LAW, WATER AND THE WEB OF LIFE, *supra* note 22, at 817, 821–30 (describing the evolution of Brazil’s groundwater legal regime from Roman law through the 2002 Civil Code).

28. Lei No. 3.071, de 1 de janeiro de 1916, D.O.U. de 05.01.1916, revoked by Lei No. 10.406, de 10 de janeiro de 2002, D.O.U. de 11.01.2002.

29. *Id.*

30. CÓDIGO CIVIL [CIVIL CODE] [C.C.] art. 66, I (1916) (Braz.) (translated by author).

31. *Id.* art. 68 (translated by author).

the people” as the only prerequisite for the characterization of watercourses as “public property.”³² However, doctrine and jurisprudence were still profoundly influenced by the *Ordenações do Reino*’s emphasis on navigation.

In its section dedicated to the *Direitos de Vizinhança* (Law of Good Neighborliness),³³ the Code established that “[t]he owner of a spring that is not captured . . . cannot impede the natural course of water through the downstream properties.”³⁴ Furthermore, the Code ordered that “rain waters that flow across public lands, *as well as the waters of public rivers*, can be used by any individual landowner they pass by, in accordance with administrative regulations.”³⁵ The Code addressed water contamination by prohibiting those activities capable of polluting or making unfit for ordinary use waters from preexisting wells or springs.³⁶ Finally, the Code specifically addressed underground water by prohibiting excavations that removed all water from a neighbor’s well. However, excavation was permitted if it merely reduced the neighbor’s water supply, provided that the excavation was not deeper than the neighbor’s well.³⁷

2. *The Hydroelectricity Phase.*—The model of weak individualistic regulation in the Civil Code did not survive the fall of the Old Republic.³⁸ The cycle of deep political, social, and legal reforms, set up under the leadership of Getúlio Vargas, influenced the way in which water was seen from that time forward. Responding to the growing demand for energy and the necessary consequence of exploring its immense hydroelectric potential, the country awoke to the advantages of instituting a specific legal regime for water resources apart from that in the Civil Code.

The Water Code promulgated in 1934 by Getúlio Vargas³⁹ gave water its own legal regime and revoked the treatment of water in the Civil Code. In a country that industrialized rapidly and whose cities grew suddenly, it is no surprise that the Code departed from the historical tradition of emphasis on agriculture and navigation by adopting an *industrial vision* of water. Problematically, however, such a transformation occurred only because the Code elevated water’s use to generate energy above other uses, so much so that federal water management passed to the electric sector. This choice did

32. *Id.* art. 66.

33. *Id.* § V (translated by author).

34. *Id.* art. 565 (translated by author). This section allowed a spring owner to utilize the spring in order to “satisf[y] his necessities of consumption.” *Id.* (translated by author).

35. *Id.* art. 566 (emphasis added) (translated by author).

36. *Id.* art. 584.

37. *Id.* art. 585.

38. The Old Republic, otherwise known as the “First Republic,” lasted from the end of the monarchy and proclamation of the Republic (1889) until the Revolution of 1930, led by Getúlio Vargas. THE NEW ENCYCLOPEDIA BRITANNICA 208 (Philip W. Goetz ed., 15th ed. 1985).

39. Decreto No. 24.643, de 7 de outubro de 1934, D.O. de 27.07.1934. This executive decree, which established the CÓDIGO DAS ÁGUAS [WATER CODE] [C.A.] (Braz.), was subsequently changed by Decreto-Lei No. 852, de 11 de novembro de 1938.

not adequately take into account the complexity and multiplicity of water uses.⁴⁰ In any case, it is undeniable that the Code reflects the notable expansion of hydroelectricity generation in Brazil.⁴¹ The new law was justified as a reaction to the regulation of the use of water “by an obsolete law, contrary to the needs and interests of the national collectivity.”⁴² The principal intention was to endow the country with adequate legislation that, in accordance with current trends, permitted the public authorities to control and stimulate industrial utilization of water’s hydraulic energy potential through measures that facilitated and guaranteed rational utilization.⁴³

In order to make the industrial utilization of water viable, it was necessary to clarify the public nature of rivers. Consequently, the power of private owners to block such uses was reduced. This trend of growing publicization did not stop with the Water Code and, as seen below, ultimately resulted in the Federal Constitution of 1988’s characterization of all waters as public goods belonging either to the union or to the states.

The 1934 Water Code classified water resources as: (a) águas públicas (public waters);⁴⁴ (b) águas comuns (common waters);⁴⁵ and (c) águas particulares (private waters).⁴⁶ Thus, despite its expansion of the domain of public waters, the Code did not entirely abandon the category of private waters.⁴⁷ Springs and all waters found on private property were also private if they were not classified as common waters or public waters.⁴⁸ As Pádua Nunes stressed, “[t]he notion of private waters is created by exclusion.”⁴⁹

Although public waters were considered inalienable, the Code allowed for rights to use these waters,⁵⁰ assuring their utilization by everyone in conformity with administrative regulations.⁵¹ Nevertheless, if a use demanded “diversion” of water, the capture required an administrative

40. See generally Maria Manuela Martins Alves Moreira, *A Política Nacional de Recursos Hídricos: avanços recentes e novos desafios* [National Water Resources Policy: Recent Advances and New Challenges], in *USO E GESTÃO DOS RECURSOS HÍDRICOS NO BRASIL: VELHOS E NOVOS DESAFIOS PARA A CIDADANIA* [USE AND MANAGEMENT OF WATER RESOURCES IN BRAZIL: OLD AND NEW CHALLENGES FOR THE PEOPLE] 70 (Norma Felicidade et al. eds., 2003).

41. For a brief overview of hydroelectricity in Brazil, see The Evolution of Water, *supra* note 6 (“The power generation matrix in Brazil is heavily weighted towards the hydroelectric mode, [which accounts] for approximately 91% of the total.”).

42. C.A. pmbl. (Braz.) (translated by author).

43. *Id.*

44. *Id.* arts. 1–6 (translated by author).

45. *Id.* art. 7 (translated by author).

46. *Id.* art. 8 (translated by author).

47. ANTÔNIO DE PÁDUA NUNES, *NASCENTES E ÁGUAS COMUNS* [SPRINGS AND SHARED WATERS] 74 (1969).

48. C.A. arts. 1–6 (Braz.).

49. 1 ANTÔNIO DE PÁDUA NUNES, *CÓDIGO DE ÁGUAS* [WATER CODE] 30 (2d ed. 1980) [hereinafter NUNES, WATER CODE].

50. C.A. art. 46 (Braz.).

51. *Id.* art. 36.

permit.⁵² The permit was not necessary in the case of “insignificant” diversion.⁵³ In every case, a preference for supplying water for human consumption was guaranteed.⁵⁴ Furthermore, public rivers were the property of the union, the states, and the municipalities.⁵⁵ Common waters were mainly restricted to non-navigable currents.⁵⁶

Underground waters received modest treatment in six articles of the 1934 Water Code. The Code allowed the owner of a given property to appropriate, by wells, galleries, or other means, water existing beneath the surface of his property, as long as the appropriation did not harm existing utilization by others and did not affect the natural course of other surface waters.⁵⁷

The 1934 Water Code did not embrace an ecological perspective on water use regulation. Water was not seen as one of the natural resources that deserved conservation or sustainable use regulation.⁵⁸ In this regard, there is little difference between the Water Code and the Civil Code of 1916. Although still in force, the Water Code was revoked in many significant ways by three important recent enactments: the Federal Constitution of 1988 (which excludes private property in waters), the National Water Act, and the Civil Code of 2002.

3. *The Environmental Phase.*—The legal regime for water continued without major changes until 1981, when the National Environmental Policy Act was promulgated.⁵⁹ This Act recognized for the first time water’s *environmental value*. A few years later, the *Assembléia Nacional Constituinte* (National Constitutional Assembly) elaborated a new constitution that symbolized the end of the military regime installed in 1964. At the end of the 1990s, a set of new laws was enacted. Among them was the 1997 *Lei da Política Nacional dos Recursos Hídricos* (National Water Act), for whose implementation the *Agência Nacional de Águas* (National Water Agency or ANA) was subsequently created. These laws signaled a departure from the 1934 Code’s vision of water as an inexhaustible, power-generating resource.⁶⁰ The National Environmental Policy Act defines environmental resources as: the atmosphere; internal waters, both surface and

52. *Id.* art. 43, para. 2. The permits allowed use for fixed periods not to exceed 30 years.

53. *Id.* art. 43.

54. *Id.* art. 36, para. 1.

55. C.A. art. 29 (Braz.).

56. *Id.* art. 7.

57. *Id.* art. 96.

58. MARIA LUIZA MACHADO GRANZIERA, DIREITO DE ÁGUAS E MEIO AMBIENTE [THE LAW OF WATER AND THE ENVIRONMENT] 48–49 (1993) [hereinafter GRANZIERA, THE LAW OF WATER].

59. Lei No. 6.938, de 31 de agosto de 1981, D.O.U. de 02.09.1981.

60. *Id.*

underground; estuaries; the territorial sea; the soil and the subsoil; and fauna and flora.⁶¹

One of the National Environmental Policy Act's most important principles is the *racionalização do uso* (sustainable use) of soil, subsoil, water, and air.⁶² The law also outlines the responsibilities of the *Conselho Nacional do Meio Ambiente* (National Council on the Environment or CONAMA) "to establish norms, criteria and methods for the control and maintenance of the quality of the environment, with a view towards the rational use of environmental resources, *principally waters*."⁶³

The shift to an environmentally focused legal water regime was spearheaded by President Fernando Henrique Cardoso.⁶⁴ In the words of the former President, water resource management must be "comprehensive" and is "relevant to all Brazilians."⁶⁵ Evidencing an intergenerational concern, Cardoso also noted that "one of the principal problems for the next century will be the question of what to do about water and water resources in general."⁶⁶

Brazil's tradition of legislative neglect of its abundant water resources is undeniable. To what, then, can the complete shift of the last 20 years be attributed? Law is a vehicle for cultural, economic, and political transformations. It responds to international movements or pressures. The growing preoccupation with water shortages and pollution finally forced Brazilian policymakers to realize that water is a finite resource that requires ecological considerations, and that its management must be national, integrated, and participatory. Progress in the last 70 years has been remarkable. The current model of water management laws certainly would be unrecognizable to the crafters of the 1916 Civil Code, not only because of the current model's rejection of private water ownership, but also and principally because it is based on new concepts like the user-pays principle, water basin committees, participatory management, and ecological concerns.

61. *Id.* art. 3, V.

62. *Id.* art. 2, II.

63. *Id.* art. 8, VII (emphasis added).

64. President of Brazil from 1996–2004.

65. Fernando Henrique Cardoso, *Água, O Desafio do Próximo Milênio* [Water, The Challenge of the Next Millenium], Address at the *Palácio do Planalto* [Planalto Palace], Brasília, Announcing the Creation of the Brazilian National Water Agency (July 27, 1999) (translated by author), available at http://www.ana.gov.br/Institucional/docs/oq_discur.doc.

66. *Id.* (translated by author).

B. The Constitutional System and Its Impact on the Water Regime

The texts of the Brazilian Constitutions of 1934,⁶⁷ 1937,⁶⁸ 1946,⁶⁹ and 1967⁷⁰ all assigned dominion over rivers and lakes. The approach to water in the Federal Constitution of 1988 is fuzzy and still not totally settled. It addresses water in two main ways;⁷¹ it assigns the ownership rights and legislative and enforcement responsibilities of the union, the states, and the municipalities.⁷² The Federal Constitution of 1988 marks the end of the 1934 Water Code's private ownership system and (following the example of the Constitution of 1967) the elimination of its provision for municipal river ownership.

Brazilian law still does not clearly address the question of a fundamental right to water. In the same way that the Constitution protects the right to life and the dignity of human beings, the right to water should also be seen as a fundamental human right since "life without water" does not exist. "Access to water of sufficient quality and quantity to serve human needs can be found, then, among the indispensable prerequisites for the existence of a dignified life."⁷³

67. "Property of the Union: II – Lakes and any water currents on Federal lands or which flow over more than one state, serve as the border with other nations, or extend into foreign territory." C.F. art. 20 (Braz.) (1934) (translated by author). "Property of the States: II – Banks of navigable rivers and lakes designated for public use if no title exists for Federal, municipal or private ownership." *Id.* art. 21 (translated by author). The 1934 Brazilian Constitution is available at <http://www.georgetown.edu/pdba/Constitutions/Brazil/brazil34.html>.

68. "Property of the Union: b) Lakes and any water currents on Federal lands or which flow over more than one state, serve as the border with other nations, or extend into foreign territory." C.F. art. 36 (Braz.) (1937) (translated by author). "Property of the States: b) Banks of navigable rivers and lakes designated for public use, if no title exists for Federal, municipal or private ownership." *Id.* art. 37 (translated by author). The 1937 Brazilian Constitution is available at <http://www.georgetown.edu/pdba/Constitutions/Brazil/brazil37.html>.

69. "Property of the Union: I – Lakes and any water currents on Federal lands or which flow over more than one State, serve as the border with other nations or extend into foreign territory, as well as flood islands in zones with other countries." C.F. art. 34 (Braz.) (1946) (translated by author). "Property of the States: Lakes and rivers on state lands and those with springs and falls in state territory." *Id.* art. 35 (translated by author). The 1946 Brazilian Constitution is available at <http://www.georgetown.edu/pdba/Constitutions/Brazil/brazil46.html>.

70. "Property of the Union: II – Lakes and any water currents on Federal lands or which flow over more than one state, that serve as the border with other nations or extend into foreign territory, and oceanic islands as well as flood islands in zones with other countries." C.F. art. 4° (Braz.) (1967) (translated by author). "Property of the States: Lakes and rivers on state lands and those with springs and falls in state territory, flood islands and those not covered in the previous article." *Id.* art. 5° (translated by author). The 1967 Brazilian Constitution is available at <http://www.georgetown.edu/pdba/Constitutions/Brazil/brazil67.html>.

71. The Federal Constitution has been criticized for its lack of attention to the theme of water. GRANZIERA, *THE LAW OF WATER*, *supra* note 58, at 128.

72. Carlos Teodoro José Hugueneu Irigary, *Água: Um Direito Fundamental ou uma Mercadoria?* [*Water: A Fundamental Right or a Market?*], in 1 *LAW, WATER AND THE WEB OF LIFE*, *supra* note 22, at 385, 396.

73. *Id.* (translated by author).

1. *Ownership of Water.*—Under the Federal Constitution of 1988 and the National Water Act of 1997 all Brazilian waters are publicly owned.⁷⁴ The Constitution states that “the lakes, rivers and any watercourses in lands within its domain or that bathe more than one state, that serve as boundaries with other countries or that extend into foreign territory or proceed therefrom, as well as bank lands and river beaches” are the public property of the union.⁷⁵

Federal waters include, for example, the Rivers Amazon (crossing the states of Amazonas and Pará), Paraná (forming the frontier of Brazil, Argentina, and Paraguay), and São Francisco (bathing the states of Minas Gerais, Bahia, Pernambuco, Alagoas, and Sergipe), as well as Lake Mirim (forming the frontier of Brazil and Uruguay).

The Federal Constitution of 1988 designates as state property “surface or subterranean waters, flowing, emerging or in deposit, with the exception, in this case, of those resulting from work carried out by the union, as provided by law.”⁷⁶ Waters belonging to the states include the Rivers Tietê (State of São Paulo), Das Velhas (State of Minas Gerais), and Jaguaribe (State of Ceará), as well as the Lake dos Patos (State of Rio Grande do Sul).

Thus, the great water basins contain rivers that belong to both the union and the states. This “double dominion” may be more of a theoretical than a practical problem, but it certainly makes the operation of a national water management system difficult, as it “demand[s] coordinated and harmonized actions by the Union and the states.”⁷⁷

2. *Legislative and Enforcement Jurisdiction.*—The 1988 constitutional regime established a political-administrative organization consisting of three levels: union, states, and municipalities. Each level is autonomous, and each has the power to adopt and implement laws.

The union was entrusted with certain exclusive legislative powers in areas such as water,⁷⁸ navigation,⁷⁹ mineral resources,⁸⁰ and indigenous peoples.⁸¹ Note, however, that various matters relating directly or indirectly to water are subject to the concurrent jurisdiction of the union, the states, and the federal district. These include fishing; conservation of nature; defense of soil and natural resources; protection of the environment and control of

74. Note, however, that some concern exists regarding the de facto privatization of water through governmental concessions to powerful private interests.

75. C.F. art. 20, III (Braz.) (1988). An English translation of the 1988 Brazilian Constitution is available at <http://www.georgetown.edu/pdba/Constitutions/Brazil/english98.html>.

76. C.F. art. 26, I (Braz.) (1988) (translated by author).

77. Irigary, *supra* note 72, at 397.

78. C.F. art. 22, IV (Braz.) (1988).

79. *Id.* art. 22, X.

80. *Id.* art. 22, XII.

81. *Id.* art. 22, XIV.

pollution;⁸² protection of the historic, cultural, artistic, touristic, and landscape patrimony;⁸³ liability for harm to the environment and to aesthetic, touristic, and landscape patrimony;⁸⁴ and the protection and defense of health.⁸⁵

The Constitution stipulates that the union is limited to establishing general norms,⁸⁶ which can then be supplemented by state legislation,⁸⁷ in instances of concurrent state and federal jurisdiction. In the absence of federal legislation, the states may exercise full legislative authority.⁸⁸ Overall, general federal laws supercede the effect of state laws passed contrary to national norms.⁸⁹ Municipalities can only legislate on “matters of local interest”⁹⁰ or to “supplement federal and state legislation as appropriate.”⁹¹

Before and after the 1997 promulgation of the National Water Act, different states, including São Paulo, had promulgated broad laws on water resources.⁹² The unresolved question is how to make these state laws compatible with the union’s exclusive legislative power over water issues. Some advocates for states’ legislative jurisdiction argue that state legislation does not per se “regulate” water, but rather that such legislation serves to protect the environment and control pollution, matters over which the states and the union share concurrent jurisdiction. Others prefer to read the constitutional grant of exclusive legislative power as applicable only to waters owned by the union.

3. *State Constitutions.*—State constitutions also address water issues. The following discussion analyzes the state constitutions of two very contrasting states—São Paulo⁹³ and Amazonas.⁹⁴ These states differ from each

82. *Id.* art. 24, VI.

83. C.F. art. 24, VII (Braz.).

84. *Id.* art. 24, XII.

85. *Id.* art. 24, XII.

86. *Id.* art. 24, para. 1.

87. *Id.* art. 24, para. 2.

88. C.F. art. 24, para. 3 (Braz.).

89. *Id.* art. 24, para. 4.

90. *Id.* art. 30, I (translated by author).

91. *Id.* art. 30, II (translated by author).

92. *See infra* note 130.

93. With 36 million inhabitants, the State of São Paulo comprises 22% of the Brazilian population, with a per capita income of \$8,300 (twice as large as Mexico’s). Governo de Estado de São Paulo, Invest in São Paulo, at <http://www.saopaulo.sp.gov.br/ingles/invista/index.htm>. The state has more than 36 cities with a population over 100,000. *Id.* Its GDP amounts to \$302 billion, the highest in Brazil. *Id.*

94. Situated in the heart of the Amazon forest, the State of Amazonas is more than 1.5 million square kilometers in area, equivalent to 18% of the total area of Brazil (8.5 million square kilometers). Political division, Amazonas, at <http://www.mre.gov.br/cdbrazil/itamaraty/web/ingles/divpol/norte/am/apresent/apresent.htm>. Its population is approximately 2,389,279, and it is one of the least densely populated states in the country. Press Release, Conservation International Brasil, The State of Amazonas, Brazil (Sept. 10, 2003), available at <http://www.conservation.org/>

other in their geographical locations, stages of economic development, population density levels, territorial extension activities, and water resources diversity.

The Constitution of the State of São Paulo dedicates an entire section to water resources.⁹⁵ Its main features include: the obligation of sustainable use of surface and underground water; the placement of priority on human water use; the recognition of multiple water uses; the protection of waters against activities that may compromise current and future use; and the integration of water resource management (taking into account the unique characteristics of water basins) with the decentralized and participatory management of other natural resources.⁹⁶ The most controversial provision of São Paulo's Constitution⁹⁷ prohibits the discharge of untreated effluent and urban and industrial sewage into the state's watercourses.⁹⁸

The State of Amazonas contains Brazil's most important water basins and sub-basins, yet its constitution does not separately treat water resources. Instead, treatment of the state's water management powers is incorporated into a few provisions in the constitution's chapter on the environment. The main features of these provisions include: the authorization of control over polluting industrial activities, especially those located at the edge of watercourses;⁹⁹ the protection of water resources through water basin management;¹⁰⁰ the establishment of "areas of permanent environmental preservation," including springs,¹⁰¹ river heads as spawning grounds for aquatic species,¹⁰² and river banks where turtles deposit their eggs;¹⁰³ the relinquishment of power to municipalities to establish "fishing reserves" in lakes and rivers for stocking fish;¹⁰⁴ and the assignment of governmental priority to the reforestation of riverbanks and lake banks.¹⁰⁵

ImageCache/news/content/press_5freleases/2003/september/amazonas_5fkit/amazonas_2epdf/v1/amazonas.pdf. The state includes "extensive portions of tropical rainforest" and "harbors important parts of the largest river system on Earth, the mighty Amazon basin." *Id.*

95. CONSTITUIÇÃO DO ESTADO DE SÃO PAULO [Constitution] [C.E.S.P.] art. 205 (São Paulo, Braz.).

96. Press Release, Conservation International Brasil, *supra* note 94.

97. See Erika Bechara, *Tratamento de Esgoto Doméstico pelo Poder Público: Discricionariedade ou Vinculação?* [*Treatment of Domestic Sewage by the Public Authorities: Discretion or Duty?*], in 1 LAW, WATER AND THE WEB OF LIFE, *supra* note 22, at 513, 523–24.

98. C.E.S.P. art. 208 (São Paulo, Braz.).

99. CONSTITUIÇÃO DO ESTADO DO AMAZONAS [Constitution] [C.E.A.] art. 230, XI (Amazonas, Braz.).

100. *Id.* art. 230, XII.

101. *Id.* art. 231, I (translated by author).

102. *Id.* art. 231, VI.

103. *Id.* art. 231, VII.

104. *Id.* art. 231, § 3.

105. *Id.* art. 231, § 5.

C. *The National Water Act*

The heart of federal legislation applicable to water is the *Lei da Política Nacional de Recursos Hídricos* (National Water Act) of January 8, 1997,¹⁰⁶ the substance of which was strongly influenced by European law. The Act brings together the objectives, principles, and legal instruments of the National Policy on Water Resources Management. The National Water Act espouses three main objectives,¹⁰⁷ which provide judges and administrative enforcement agents with an important road map for the Act's interpretation. The first and second objectives express intergenerational concerns for water protection. The Act's first objective is to preserve water *quantity* and *quality* for present and future generations.¹⁰⁸ The Act's second objective is to assure the *sustainability* of water uses.¹⁰⁹ The Act's third objective is to protect human beings and the environment against what it calls *critical hydrological events*, both natural and man-made.¹¹⁰

The National Water Act also lists seven fundamental legal principles¹¹¹ that provide a coherent structure for the system.¹¹² First, it treats water as public property,¹¹³ as mandated by the Federal Constitution. Second, it treats water as a limited natural resource,¹¹⁴ contrary to Brazil's traditional vision of water's inexhaustibility. Third, it recognizes that water, along with its ecological attributes, has economic value¹¹⁵ that justifies charging for its use. Fourth, the Act requires that water management value multiple uses.¹¹⁶ Fifth, it makes the use of water for human and animal consumption an absolute priority in times of shortage.¹¹⁷ Sixth, it designates the water basin as the

106. Lei da Política Nacional de Recursos Hídricos [National Water Act], Lei No. 9.433, de 8 de janeiro de 1997, D.O.U. de 09.01.1997, amended by Decreto No. 2.612, de 6 de março de 1998, D.O. de 04.06.1998. The Act's most important elements include: provision for water resources plans; division of water into classes, according to their preponderant uses; provision for the issuance of permits to use water resources; allowance for charges for water resources use; establishment of the *Sistema de Informação sobre Recursos Hídricos* (Information System on Water Resources (SIRH)); enumeration of the responsibilities of public authorities; establishment of the *Sistema Nacional de Gerenciamento de Recursos Hídricos* (National Management System for Water Resources (SNGRH)); provision for management by water basin committees; provision for the establishment of water agencies; and specification of violations and penalties. *Id.*

107. Lei No. 9.433 art. 2.

108. *Id.* art. 2, I.

109. *Id.* art. 2, II.

110. *Id.* art. 2, III.

111. *Id.* art. 1.

112. See Juliana Santilli, *Política Nacional de Recursos Hídricos: Princípios Fundamentais [National Water Resources Policy: Fundamental Principles]*, in 1 LAW, WATER AND THE WEB OF LIFE, *supra* note 22, at 647, 647–62 (discussing the fundamental legal principles of the National Water Act and the interplay between them).

113. Lei No. 9.433 art. 1, I.

114. *Id.* art. 1, II.

115. *Id.*

116. *Id.* art. 1, IV.

117. *Id.* art. 1, III.

territorial unit for the implementation of the National Policy and the National System of Water Resources Management.¹¹⁸ Finally, it determines that water management should be decentralized and democratic.¹¹⁹

The National Water Act specified several instruments for use in implementing the objectives and principles discussed above. These include water resources plans, water classification schemes, water use rates, and water resource information systems.¹²⁰

1. *Water Administration Structure.*—The Water Code of 1934 assigned water resource management to the Minister of Agriculture. This assignment indicated the Code's continued preference for agricultural uses, despite the industrial philosophy that guided its drafting. During the height of the country's hydroelectric infrastructure development in the 1960s,¹²¹ this authority was passed on to the electric sector and its *Ministério de Minas e Energia* (Ministry of Mines and Energy), which administered water programs through the *Departamento Nacional de Águas e Energia Elétrica* (National Department of Water and Electric Energy). This system lasted until 1995, when the separate position of *Secretaria de Recursos Hídricos* (Secretariat of Water Resources) was created under the *Ministério do Meio Ambiente* (Ministry of the Environment).¹²²

Brazil's current administrative organs for water management include the National Council for Water Resources (CNRH), the National Secretariat for Water, the National Water Agency, Water Basin Committees, and State Water Agencies. The National Secretariat of Water Resources (answerable to the Environmental Ministry), the National Water Agency, and the National Council for Water Resources sit atop the federal administrative structure. Water Basin Committees and state agencies have been established in various regions of the country.

2. *National Water Agency.*—The *Agência Nacional de Águas* (National Water Agency) is the independent federal entity responsible for implementing the National Water Act and coordinating the National System of Water Resources Management. A five-member management team heads the Agency. Each member is nominated by the President of the Republic and confirmed by the Senate; team members serve staggered four-year terms with

118. *Id.* art. 1, V.

119. *Id.* art. 1, VI.

120. *Id.* art. 5.

121. Long before this, management of water resources observed the importance of the electric sector in the Water Code, which strongly emphasized such use. See Moreira, *supra* note 40, at 70.

122. Secretaria de Recursos Hídricos, Ministério de Meio Ambiente, Atribuições [Secretary of Water Resources, Ministry of the Environment, Overview], at <http://www.mma.gov.br/port/srh/index.cfm>.

the possibility of a single second consecutive term.¹²³ The President of the Republic also chooses the director of the National Water Agency.¹²⁴

3. *Secretariat of Water Resources.*—Created in 1995 as part of the structure of the Ministry of the Environment, the Secretariat of Water Resources's responsibilities are regulated by Decree No. 2.972 of February 26, 1999.¹²⁵ The Secretariat's duties include formulation of the National Policy on Water Resources, integration of water management with environmental management, and service as Executive Secretary of the National Council on Water Resources. The Secretariat is also the "national focal point" of the United Nations Convention to Combat Desertification,¹²⁶ and as such is required to develop a National Plan to Combat Desertification.

4. *Water Basin Committees.*—Until quite recently, Brazil administered water programs in a fragmentary manner—management either took into account certain users' interests (such as those of the hydroelectric establishment) or sectoral political concerns (such as the pressure to combat drought or floods), without considering the effects of water management decisions on the basin at large.¹²⁷ Therefore, two of the National Water Acts' most important innovations are its provision for management by water basin units and its creation of water basin committees. The committees are responsible for decisions about the use of water resources in their designated basins.¹²⁸ Note, however, that committees have not yet been created in the majority of the country's water basins.¹²⁹

This delay in establishing water basin committees demonstrates that, despite the legal advances envisioned by the National Water Act, it is at the institutional level that the new system's effectiveness will be tested. The committees that have thus far been established are predominantly located in the developed regions of the country. As such, large portions of Brazil (including the Amazon) are still without these participatory decisionmaking bodies. Water basin committees were created early on in Brazil's southern

123. Lei No. 9.984 art. 9, de 17 de julho de 2000, D.O. de 18.07.2000.

124. *Id.* art. 9, para. 1.

125. Decreto No. 2.972, de 26 de fevereiro de 1999, D.O. de 01.03.1999. The Secretariat's duties were later changed by Lei No. 9.984.

126. *Directory of Focal Points for the United Nations Convention to Combat Desertification*, U.N. Convention to Combat Desertification, 5th Sess., at 4, U.N. Doc. ICCD/COP(5)/INF.3 (2001), available at <http://www.unccd.int/focalpoints/focalpoints.php>.

127. See discussion *supra* section I(C)(1).

128. Lei No. 9.433 arts. 37–40.

129. Water Basin Committees have been created in the southern Brazilian states of São Paulo, Paraná, Santa Catarina, and Rio Grande do Sul, some of the same states where the Guarani Aquifer is located. The Basins of the Uruguay and Paraná Rivers, for example, are themselves part of the larger basin of the River Plate. Oscar Cordeiro Netto, *Water Legislation and Regulation in Brazil*, Presentation at OIEau Meeting (Sept. 20, 2004), available at <http://www.riob.org/transfrontalier/dakar-2004/Brazil.pdf>.

and southeastern regions, which have an institutional tradition of environmental resource management. But because not all of Brazil's regions have such a tradition, successful implementation of the National Water Act will require time for adjustment as well as enormous financial and social investments in all parts of the country.

D. State Legislation

Despite the Federal Constitution's reputedly exclusive grant of legislative jurisdiction over water issues to the union, states have continued to pass water resource legislation.¹³⁰ Practically all the Brazilian states (with the exception of Roraima) have now promulgated state laws on water resources. As discussed above, two arguments have been expounded to justify the constitutionality of state legislative intervention. One argument maintains that under Article 26(1) of the federal constitution states have the jurisdiction to pass legislation concerning their own waters. The second argument insists that states retain the legislative jurisdiction to pass laws on "environmental" aspects of water, even if they are prohibited from legislating on the subject per se.¹³¹ Even if either of these two arguments is valid, state legislation still cannot validly undercut the minimum standards set by federal statutes. As a rule, those states that have enacted water laws tend to follow the model of the National Water Act, which requires water permits and a management system consisting of a state council, a state water management body, and state water basin committees.

*E. Multiple Uses*¹³²

Several Brazilian authorities have recognized and addressed the potential for conflicts created by water's suitability to multiple uses. Former President Fernando Henrique Cardoso made the following announcement upon the National Water Agency's creation:

Now, we have to discuss not only the availability of water but also the demand for water. Water has multiple uses. Many of these uses are concurrent, which may, eventually, lead to conflicts. It is necessary to better regulate this issue since water is public property in order that the 'law of the water jungle' does not govern . . . [and] the user of the river is not exempt from responsibility for the use of water.¹³³

130. Before the promulgation of the National Water Act, ten states and the Federal District had already approved their state laws on water resources. These states include: São Paulo in 1991, Ceará in 1992, Santa Catarina and the Federal District in 1993, Minas Gerais and Rio Grande do Sul in 1994, and Sergipe and Bahia in 1995. *The Evolution of Water*, *supra* note 6.

131. C.F. art. 24 (Braz.) ("The Union, the States and the Federal District have concurrent jurisdiction over . . . forests, game, fish, fauna, conservation of nature, defense of the soil and of natural resources, protection of the environment, and control of pollution.") (translated by author).

132. For a discussion of the principle of multiple uses under the National Water Act, see, e.g., *The Evolution of Water*, *supra* note 6.

133. Cardoso, *supra* note 65 (translated by author).

The National Water Act expressly embraces the principle of multiple uses¹³⁴ that was imperfectly addressed by Article 143 of the 1934 Water Code.¹³⁵ In rare instances, such as energy production and flood control, uses of water resources are compatible with one another. Otherwise, uses tend to conflict, especially in areas and periods characterized by water shortages. For example, water use for industrial waste discharge plainly conflicts with its use for human consumption. During drought periods, the Act prioritizes the supply of water available for human and animal consumption.¹³⁶ Other uses, including hydropower generation, irrigation, navigation, industrial supply, and leisure are given no such priority.

Multiple uses have also been addressed at the state level. The Constitution of the State of São Paulo, for example, mandates that “the State will take into account multiple uses and the control of water, drainage, the correct utilization of fields, aquatic flora and fauna, and the preservation of the environment.”¹³⁷

F. Water Permits

The Federal Constitution of 1988 abolished private ownership of water. However, it continues to recognize rights to private use.¹³⁸ Since waters are public property, the government must issue a permit (*outorga de uso*¹³⁹) prior

134. Maria Luiza Machado Granziera, *O Princípio “Usuário-Pagador” e os Recursos Hídricos* [The “User Pays” Principle and Water Resources], in 1 LAW, WATER AND THE WEB OF LIFE, *supra* note 22, at 675, 677–78 [hereinafter Granziera, *The User-Pays Principle*].

135. Article 143 states:

In all uses of hydraulic energy, demand shall be satisfied for general interests in: (a) food and necessities of river bank dwellers; (b) public health; (c) navigation; (d) irrigation; (e) flood protection; (f) conservation and free movement of fish; [and] (g) drainage and rejection of waters.

Decreto No. 24.643, de 11 de novembro de 1930, D.O.U. de 10.07.1934 (translated by author), available at <http://www.hidricos.mg.gov.br/legisla/codaguas.htm>. In Article 73 (addressing sharing common waters), the Code established that “whenever possible,” “the interests of agriculture” should be harmonized with “those of industry,” and the judge has the ability to decide “ex-bono et aequo.” *Id.* (translated by author).

136. Lei 9.433, art. 1, III.

137. C.E.S.P. art. 212 (São Paulo, Braz.) (translated by author).

138. Well before the promulgation of the Water Code of 1934 and even before the Civil Code of 1916, Carvalho de Mendonça, a respected conservative jurist and outspoken defender of *laissez-faire*, opposed the attempts at legislative reform, especially those that referred to the extension of ownership and control of waters by the state. He stated: “One must willfully ignore the interior of our great country and the daily needs of her population spread across a vast territory, which lacks the most basic means of communication and produces day by day only a meager subsistence through crude water-powered machinery, in order to want to extend public ownership over these [waters]” LEGAL STATUS OF RIVERS, *supra* note 20, at 183 (translated by author).

139. “Outorga” means an “authorization, consent, concession.” DICIONÁRIO JURÍDICO DA ACADEMIA BRASILEIRA DE LETRAS JURÍDICAS [LEGAL DICTIONARY OF THE BRAZILIAN ACADEMY OF LEGAL LETTERS] 395 (3d ed. 1995) (translated by author). “Outorga” can also mean an “authorization,” “consensus,” “permission for a person to perform a certain act, without which it would not be valid,” or a “grant of power by means of a mandate.” MARIA HELENA DINIZ, 3 DICIONÁRIO JURÍDICO [LEGAL DICTIONARY] 282 (1998) (translated by author). Under the National

to any private interference with the *quantity* (such as capture for domestic, industrial, or irrigation uses) or *quality* (such as discharge of industrial or urban effluent or construction of dams and canals) of water contained in rivers, lakes, or aquifers.¹⁴⁰ There are common sense exceptions to the permit requirement, however, such as when the diversion, capture, or discharge is “insignificant.”¹⁴¹ The National Water Agency issues permits for the use of federal waters; state agencies issue all other permits.¹⁴² The permit must be published in the official publication of the authority granting it (the *Diário Oficial da União* in the case of the National Water Agency).

G. The User-Pays Principle and Charges for Water Use

Charging fees for the use of water encourages its conservation.¹⁴³ Brazil’s National Environmental Policy Act of 1981 based the authority for water-use charges on the user-pays principle.¹⁴⁴ This principle was vaguely referred to in the Civil Code of 1916, which permitted the utilization of public property either *gratuito* (free) or *retribuído* (for payment).¹⁴⁵ This language was repeated in the Water Code of 1934.¹⁴⁶ The same principle

Water Act, the Water Permit is “an administrative act by means of which the permitting Public Authority [Union, states or Federal District] allows the permittee [user of water] to use water for a specified purpose, under express conditions related to the specific act.” Luciano Meneses Cardoso da Silva & Roberto Alves Monteiro, *Outorga de Direito de Uso de Recursos Hídricos: Uma das Possíveis Abordagens* [*Permits for the Use of Water Resources: One of the Possible Approaches*], in GESTÃO DE ÁGUAS DOCES [MANAGEMENT OF FRESH WATER] 135–78 (2004) (translated by author). See also Martha Regina von Borstel Sugai, *Outorga de Direito de Uso de Recursos Hídricos* [*Permits for the Use of Water Resources*] 32 (2003) (“A permit confers to the water user a right to use: a specific amount of water, from a specific source, for a particular use during a specified amount of time.”) (translated by author), available at http://www.ana.gov.br/gestaoRecHidricos/TecnologiaCapacitacao/EstadodasAguas/Capitulo_04.pdf.

140. In many of these cases, a water permit (issued by the water agency) and an environmental permit (issued by the environmental protection agency) must be simultaneously obtained.

141. A similar rule was foreseen in the Water Code: “Public waters cannot be diverted for agricultural applications, for industry, or for hygiene, without the existence of an administrative concession, in the case of a public utility, and without verifying whether the administrative authorization will be unnecessary . . . in case of an *insignificant use*.” C.A. art. 43 (Braz.) (emphasis added) (translated by author).

142. See Jerson Kelman, *Outorga e Cobrança de Recursos Hídricos* [*Water Resource Permits and Charges*], in A COBRANÇA PELO USO DA ÁGUA [CHARGING FOR THE USE OF WATER] 93, 95 (Antonio Carlos de Mendes Thame et al. eds., 2000) (noting that the power to grant water use rights belongs either to the federal government or to state governments, depending on the particular circumstances), available at http://www.ana.gov.br/jersonkelman/pdf/a_cobranca.pdf.

143. Brazilian jurisprudence prior to the Federal Constitution of 1988 and the National Water Act had already legitimized the right of the Public Authority to assess fees for the discharge of industrial wastes into their waters. STF, Relator: Adauto Cardoso, 05.03.1968, D.J.U. 28.03.1968, p. 41,073, reprinted in 96 REVISTA DE DEREITO ADMINISTRATIVO [JOURNAL OF ADMINISTRATIVE LAW] 47, 47–49 (1969).

144. Granziera, *The User-Pays Principle*, *supra* note 134, at 675.

145. C.C. art. 68 (Braz.).

146. C.A. art. 36, para. 2 (Braz.) (“Common use of waters can be free or for a fee, in conformity with the laws and regulations of the administration to which they belong.”) (translated by author).

appeared in state laws. The São Paulo Constitution, for example, declared that the “use of water resources will be charged according to the particular characteristics of each hydrographic basin.”¹⁴⁷

The National Water Act specifies three justifications for its imposition of charges for water use.¹⁴⁸ First, the Act classifies water as an economic good. As such, the government may charge the user for the actual value of the water being utilized. Second, the Act intends the charges to create incentives for the rational use of water. And third, the Act aims to amass resources for the implementation of water programs and projects through the collection of water charges.

Charges only apply to uses that require a permit.¹⁴⁹ Thus, insignificant uses, diversions, captures, or discharges of water are free.¹⁵⁰ The determination of what qualifies as an insignificant use requires the consideration of specific criteria. When issuing permits for diversions, capture, or extraction, authorities consider the volume withdrawn and the degree of fluctuation of the water level.¹⁵¹ For waste discharges, authorities consider the volume discharged and the degree of fluctuation of the water level, as well as the physical, chemical, and biological characteristics of the effluent, including its toxicity.¹⁵²

One problem with the application of the user-pays principle is the destination of the fees collected. The National Water Act clearly states that the funds should be used to maximize the utilization of each water basin at its source,¹⁵³ to improve the quality and quantity of water, and to cleanup polluted bodies of water.¹⁵⁴ Another problem is industry and interest group opposition to the charges. With the exception of a few states (such as Ceará),¹⁵⁵ Brazilian water agencies do not regularly collect charges at this time.

H. Groundwater

The current body of Brazilian water legislation was clearly designed to address surface water regulation. As such, the problems facing underground water supplies have been largely ignored. Groundwaters do not yet have the benefit of a special legal regime that takes into consideration their own

147. C.E.S.P. art. 211 (São Paulo, Braz.) (translated by author).

148. Lei No. 9.433 art. 19.

149. *Id.* art. 20.

150. *Id.* art. 12, para. 1.

151. *Id.* art. 21, I.

152. *Id.* art. 21, II.

153. Lei No. 9.433 art. 22.

154. *Id.* art. 22, para. 2.

155. See ASAD ET AL., *supra* note 18, at 18 (noting that the state of Ceará already has a bulk water tariff system in place).

particular characteristics, their fragility, and their economic and social importance.

In Brazil, groundwater plays a significant social role. For example, over 60% of the water demands of São Paulo's 5.5 million people are satisfied "totally or partially from groundwater sources."¹⁵⁶ As Afranio de Carvalho asserts:

Groundwaters increase in importance as the human population grows and, with it, the consumption of water; what is naturally scarce in some regions becomes scarce in others because of the intensity of use. The importance of groundwater [protection] grows after the discovery that, alongside permeable layers of rock that are rechargeable, exist others that are not renewable, constituting immense closed basins in the subsoil.¹⁵⁷

It is estimated that around 90% of the rivers, lakes, and lagoons in Brazil are supplied by underground waters, especially in periods of drought.¹⁵⁸ The potential volume of exploitable rechargeable water in Brazil is approximately 112,000 cubic kilometers.¹⁵⁹

Both the Federal Constitution and the National Water Act contain references to groundwater that raise as many questions as they resolve.¹⁶⁰ The National Water Act has been justly criticized for its inadequate treatment of groundwater. For example, the entire text refers generically to "water resources" and "water," giving the sense that its protections apply primarily to surface waters.

Groundwaters are not explicitly mentioned in Article 20(III) of the Federal Constitution, which defines the property of the union. But they are named directly in Article 26(I), which pertains to the property of the states.¹⁶¹ These different forms of expression have led most scholars to defend the idea

156. Ismael Piedra-Cueva, *Context and Perspectives of the Plata Basin 10* (2002) (unpublished manuscript), available at <http://www-tc.iaea.org/tcweb/abouttc/strategy/thematic/pdf/presentations/RiverBasinManagement/ContextandPerspectivesofthePlataBasin.pdf>.

157. AFRANIO DE CARVALHO, *ÁGUAS INTERIORES, SUAS MARGENS, ILHAS E SERVIDÕES* [INTERIOR WATERS, THEIR BANKS, ISLANDS, AND TRIBUTARIES] 80 (1986).

158. Secretaria de Recursos Hídricos, Ministério de Meio Ambiente, *Atribuições* [Secretary of Water Resources, Ministry of the Environment, Overview], at <http://www.mma.gov.br/port/srh/index.cfm>.

159. *Id.*

160. Various other laws and norms are applicable to groundwater. See CÓDIGO DE MINERAÇÃO [MINERAL CODE] [C.MIN.] (Braz.) (Decreto-Lei No. 227, de 28 de fevereiro de 1967, D.O.F.C. de 28.02.1967); CÓDIGO DE ÁGUAS MINERAIS [CODE OF MINERAL WATERS] [C.M.W.] (Braz.) (Decreto-Lei No. 7.841, de 8 de agosto de 1945); Portarias do Departamento Nacional de Produção Mineral; Portarias e Resoluções da Agência Nacional de Vigilância Sanitária; Resoluções do Conselho Nacional do Meio Ambiente; Resoluções do Conselho Nacional de Recursos Hídricos; and Decreto No. 4.755, de 20 de junho de 2003, D.O.U. de 23.06.2003. Mineral waters are regulated by the Code of Mineral Waters, in the manner foreseen by the Mineral Code, which grants to the National Department of Mineral Production the authorization to exploit these waters. Decreto-Lei No. 227, art. 10.

161. C.F. arts. 20, 26 (Braz.).

that groundwaters are—always and in whatever circumstances—owned by the states and not the union. This appears to be an equivocal interpretation of the constitutional text. First, on the teleological level, the terms of Article 20 of the Federal Constitution justify federal ownership of surface waters—waters occupying federal lands, flowing over more than one state, marking an international border, or arising from a foreign country.¹⁶² Underground waters in the same circumstances should be considered property of the union in the same way. Second, although Article 20 uses broader terms than Article 26, it does not clearly exclude groundwater. It speaks of “the lakes, rivers and any watercourses in lands within its domain or that flow over more than one state, that serve as boundaries with other countries or that extend into foreign territory or proceed therefrom, as well as bank lands and river beaches.”¹⁶³ This section of the Constitution does not make any reference to whether such rivers, lakes, and currents are, in fact, surface or underground waters.

On the other hand, Article 26 had to specify the term “groundwater.” Otherwise, it risked the interpretation that groundwaters belonged to the union in all circumstances, because it is currently impossible to determine the exact perimeter of an aquifer to measure whether groundwaters are totally within one state. Therefore, one may conclude that the union is not excluded from ownership of groundwater, but that a piece of that ownership is guaranteed to the states under the same terms as surface waters.

In any case, whether groundwaters belong to the federal or state governments, it is certain that in Brazil privately owned groundwaters no longer exist. This fact reflects a major departure from previous legal regimes. It is also certain that the National Water Act made the use of groundwater subject to water permits.¹⁶⁴ On the state level, the Constitution of the State of São Paulo declares that “groundwaters, strategic resources for economic and social development and valuable for supplying water to the population, should have a permanent program of conservation and protection against pollution and overexploitation, as a matter of law.”¹⁶⁵

Although the 1934 Water Code contains an entire title on groundwater,¹⁶⁶ it should be read in conjunction with the 1988 Federal Constitution and the National Water Act. Likewise, the new Civil Code of 2002, which also addresses groundwater, should be read in conjunction with

162. *Id.* art. 20.

163. *Id.* (translated by author).

164. Lei No. 9.433, art. 12, II.

165. C.E.S.P. art. 206 (São Paulo, Braz.) (translated by author).

166. C.A. arts. 96–101 (Braz.). Of relevance is the power given to the Administration to suspend the specific use of groundwater, if it is harming surface waters. In addition, “[c]onstruction that is capable of polluting or rendering water from a preexisting well or spring unusable for ordinary use is expressly prohibited.” *Id.* art. 98 (translated by author). Finally, opening a well on publicly owned property requires an administrative permit. *Id.* art. 101.

these two enactments.¹⁶⁷ Finally, CONAMA Resolution Number 20, the main statute for the control of water pollution in Brazil, expressly prohibits the release of pollutants into groundwaters.¹⁶⁸

I. Control of Water Pollution

In Brazil, as in other countries, economic development in the areas of agriculture and industry proceeded without major concern for protection of the environment or water resources. Up to a certain point, such disregard can be explained by the abundance of natural resources and the vastness of the territory, which gave Brazilians the false impression that their country's resources were inexhaustible. This mistaken perception caused systematic degradation of Brazilian water resources,¹⁶⁹ especially those serving rapidly expanding urban centers.¹⁷⁰

Brazilian water resources are currently protected from pollution through administrative, penal, and civil provisions of law. Nothing similar to the United States' Clean Water Act exists in Brazil, which leaves the matter to be governed by an accumulated complex of federal and state norms. It is interesting to note that the National Water Act does not address water pollution *per se*, but cedes regulation of the matter to other environmental statutes.¹⁷¹

The 1934 Water Code established that “[n]o one has the legal right to pollute or contaminate the waters they consume, to the prejudice of third parties.”¹⁷² Commenting on this provision in 1962, Antônio de Pádua Nunes recognized that “[t]he problem of water pollution assumes ever greater importance due to the increasing frequency of contamination of the rivers

167. C.C. arts. 98–101 (Braz.).

168. Resolução CONAMA No. 20, art. 17, de 18 de junho de 1986, D.O.U. de 30.07.1986.

169. See Organization of American States, Implementation of Integrated Watershed Management Practices for the Pantanal and Upper Paraguay River Basin, at <http://www.oas.org/usde/ALTOPARA/rca.htm> (noting that human activity has “contributed almost exclusively to the degradation” of the Upper Paraguay River Basin, the second largest river system in Brazil).

170. “Between 1950 and 1995 [the population of Brazil] grew from 51.9 million to over 155 million.” Embassy of Brazil, London, United Kingdom, How Will Brazil's Population Change in the Future? (2005), at <http://www.brazil.org.uk/page.php?cid=163&offset=1>.

171. The situation was much worse before the creation of the Ministry of the Environment and of IBAMA (the Brazilian Environmental Protection Agency). In the 1970s, Cid Tomanik Pompeu, one of the first to study the legal aspects of water pollution in Brazil, lamented that even though there were five Ministries with jurisdiction to combat water pollution, the effort to fight such pollution was hampered by a lack of effective coordination between them. See generally CID TOMANIK POMPEU, REGIME JURÍDICO DA POLÍCIA DAS ÁGUAS PÚBLICAS [LEGAL REGIME OF POLICING PUBLIC WATERS] 129 (1976).

172. C.A. art. 109 (Braz.) (translated by author).

and streams caused by the waste from industrial establishments.”¹⁷³ The states have also legislated on this subject.¹⁷⁴

The 1940 Penal Code’s text included provisions protecting water, though not all types of water.¹⁷⁵ Thus, for example, Article 271 made it a crime, punishable by two to five years’ imprisonment, “[t]o corrupt or pollute *drinking water*, for shared or individual use, making it unclean for consumption or a threat to health.”¹⁷⁶ Today, water pollution is covered by the *Lei dos Crimes contra o Meio Ambiente de 1998* (Law on Crimes against the Environment of 1998).¹⁷⁷

J. Classification of Waters

Watercourse classification is one of the instruments of the National Water Resources Policy promulgated by the National Water Act. Bodies of water are organized or divided into classes according to their primary uses. The National Water Act has two objectives: first, to guarantee that the quality of water is compatible with the most demanding uses for which it is destined,¹⁷⁸ and second, to reduce the costs of combatting water pollution by means of permanent prevention.¹⁷⁹ Here, water legislation and environmental legislation intersect. The National Water Act states that “[t]he classes of water bodies are to be established by environmental legislation.”¹⁸⁰ The system of classification of waters in Brazil, as well as the regime controlling emissions of pollutants, is regulated by CONAMA Resolution Number 357 of March 18, 2005.¹⁸¹

K. The Civil Code of 2002

After more than twenty years of discussion in the National Congress, a new Civil Code was approved in 2002 that revoked the 1916 Code.¹⁸² The Code addresses water resources in various parts of the text,¹⁸³ but does so

173. NUNES, WATER CODE, *supra* note 49, at 407.

174. Ana Cláudia Bento Graf, *A Tutela dos Estados sobre as Águas [State Guardianship over Water]*, in WATER: LEGAL AND ENVIRONMENTAL ASPECTS, *supra* note 19, at 51, 59–72.

175. Decreto-Lei No. 2.848, de 7 de dezembro de 1940, D.O. de 31.12.1940.

176. *Id.* art. 271 (emphasis added) (translated by author).

177. Lei No. 9.605, de 12 de fevereiro de 1998, D.O.U. de 13.03.1998.

178. Lei No. 9.433, art. 9, I.

179. *Id.* art. 9, II.

180. *Id.* art. 10 (translated by author).

181. Resolução CONAMA No. 357, de 17 de março de 2005, D.O.U. de 18.05.2005. Prior to this resolution, the matter was regulated by Resolução CONAMA No. 20, de 18 de junho de 1986, D.O.U. de 30.07.1986. CONAMA stands for O Conselho Nacional do Meio Ambiente and is the Brazilian National Council on the Environment.

182. Lei No. 10.406, de 10 de janeiro de 2002, D.O.U. de 11.01.2002.

183. Celso Antonio Pacheco Fiorillo, *Águas no novo Código Civil [Waters in the new Civil Code]*, in 1 LAW, WATER AND THE WEB OF LIFE, *supra* note 22, at 401, 401; Eduardo Coral Viegas, *Publicização da Propriedade das Águas e o Código Civil de 2002 [Public Ownership of Waters and the Civil Code of 2002]*, in 1 LAW, WATER AND THE WEB OF LIFE, *supra* note 22, at 463, 463.

principally in its chapter on nuisance (“*direitos de vizinhança*”). As a consequence of its 1975 drafting, the Code conflicts with the language of the Federal Constitution. For example, it refers to the “individual owner of the spring.”¹⁸⁴ As we have seen, there are no private waters in the 1988 constitutional regime.

Another provision that must be harmonized with the Constitution of 1988 (especially with the right to an ecologically balanced environment) is Article 1.291, which affirms that “the one who possesses land upstream cannot pollute *water that is indispensable for the primary necessities of life* of the downstream landowners; other waters that he pollutes should be restored, [and he should pay] compensation for damages suffered by the downstream landowners if restoration or diversion of the polluted waters are not possible.”¹⁸⁵ Current Brazilian environmental law prohibits any form of discharge without a permit, so in this context it is irrelevant whether the water is “indispensable for the primary necessities of life” or not.

Finally, the Code prohibits activities capable of polluting or rendering unfit for ordinary use preexisting wells or springs arising elsewhere.¹⁸⁶ It also prohibits excavations or any works that affect a neighbor’s well or spring water that is needed for ordinary use.¹⁸⁷ A violator of these provisions is obligated to demolish the works, and is responsible for losses and damages.¹⁸⁸ All these provisions have to be read in harmony with the 1988 Constitution, the National Water Act, and other relevant environmental statutes.

II. “Hidden Treasures”: Groundwaters in Brazil and the Relevance of International Law in the Case of the Guarani Aquifer¹⁸⁹

Brazil is rich in surface waters. Thus, lawmakers concentrate primarily on rivers and make few references to Brazil’s hidden treasure: groundwaters.¹⁹⁰ The largest of the country’s subterranean reserves is the giant Guarani Aquifer that underlies Argentina, Brazil, Uruguay, and

184. C.C. art. 1.290 (Braz.) (translated by author).

185. *Id.* art. 1.291 (emphasis added) (translated by author).

186. *Id.* art. 1.309.

187. *Id.* art. 1.310.

188. *Id.* art. 1.312.

189. Groundwater is described as a “hidden” treasure in Gabriel E. Eckstein, *Protecting a Hidden Treasure: The U.N. International Law Commission and the International Law Transboundary*, 5 SUSTAINABLE DEV. L. & POL’Y, Winter 2005, at 5–12, available at http://www.wcl.american.edu/org/sustainabledevelopment/2005/v5_1.pdf.

190. For purposes of this Article, the terms “groundwater” and “underground water” are used synonymously. The term “aquifer” means the “permeable rocks that are able to store and transmit groundwaters within their pores and fractures.” NADIA RITA BOSCARDIN BORGHETTI ET AL., AQUÍFERO GUARANI, A VERDADEIRA INTEGRAÇÃO DOS PAÍSES DO MERCOSUL [THE GUARANI AQUIFER, A TRUE INTEGRATION OF THE COUNTRIES OF MERCOSUL] 23 (2004) (Executive Summary in English).

Paraguay. Named in honor of the Guarani Indigenous Nation,¹⁹¹ the Guarani Aquifer is estimated to cover an area of 1.2 million square kilometers.¹⁹²

The Guarani Aquifer, more so than other Brazilian aquifers, is a good case for exploring the challenges and potential of supranational regulation of an important water resource in the South American context. The discussion is relevant not only for the Guarani itself, but it also illustrates the complexity and opportunity for integrated management of the great surface water basins such as the Amazon and the Plate.

Because the uncertainties in this field are great, it is likely that Brazil will find it difficult to protect its water resources without the cooperation of its neighbors. Advances in Brazilian law in the past few years, especially the National Water Act of 1997 and the creation of the National Water Agency, are not sufficient, as many of the sources of rivers that cross Brazilian territory are in other countries, principally those of the Amazon Basin. In the case of the Plate Basin, the question is not so much one of protecting the sources of rivers, since most are within Brazil, but is rather one of the creation of mechanisms for shared management of the Guarani Aquifer.

While other regions of the world, most notably Europe, have begun addressing transboundary groundwaters, the continent containing some of the largest reserves of groundwater in the world is only now beginning to consider the formulation of an appropriate legal framework. Part II of this Article provides information about the Guarani Aquifer and its importance to Brazil, describes several draft proposals for international groundwater law, and reviews selected articles of the only multilateral treaty on the subject—the 1997 United Nations Convention on the Non-Navigational Uses of Transboundary Watercourses, a document which applies to both surface waters and some types of groundwaters. This existing international law may be relevant to Brazil in drafting future integrated water resources management plans as well as a regional legal regime for the Guarani Aquifer.¹⁹³

Part I of this Article presented the evolution of Brazilian water law, focusing on the national regulatory system, especially in reference to surface

191. Members of the Guarani Indigenous Nation lived in areas located above the Guarani Aquifer in Paraguay, Argentina, and Brazil, including the Brazilian state of Rio Grande do Sul. Piedra-Cueva, *supra* note 156, at 9.

192. *Id.*

193. See Laura Martins Miller, *A aplicação dos princípios da cooperação hídrica internacional e da precaução na gestão das águas subterrâneas transfronteiriças: o caso do Aquífero Guarani* [Application of the Principles of International Water Cooperation and of Precaution in the Management of Transfrontier Groundwater: The Case of the Guarani Aquifer], in FAUNA, POLÍTICA PÚBLICAS E INSTRUMENTOS LEGAIS [FAUNA, PUBLIC POLICY AND LEGAL INSTRUMENTS] 853, 854–55 (Antonio Herman Benjamín ed., 2004); see also The International Transboundary Resources Center, *Transboundary Groundwaters: The Bellagio Draft Treaty*, 29 NAT. RESOURCES J. 668 (1989) (discussing the draft international groundwater treaty, which was created in response to increasing demand on basins underlying multiple countries), available at http://www.ana.gov.br/guarani/gestao/gest_tratados.htm.

waters. Part II highlights the question of groundwaters and the role of international cooperation, especially through the institutions of Mercosul and regional projects. As Alejandro Iza recalled, water “is an essential element of our integration procedure.”¹⁹⁴

A. Underground Water in Brazil: “Out of Sight, Out of Mind”

Groundwater forms part of the natural hydrological cycle which takes place within underground strata of porous rock, also called “aquifers.”¹⁹⁵ This kind of water is “out of sight and, unfortunately, all too often out of mind”¹⁹⁶ with lawmakers and those charged with natural resources management responsibilities.¹⁹⁷ Today in South America, groundwater is increasingly understood as a vital source of drinking water, as well as an important resource for industrial and agricultural uses.¹⁹⁸ In Brazil, the Environment Ministry estimated that 51% of the potable water supply originates in groundwater reserves,¹⁹⁹ a figure that is lower than in many other countries,²⁰⁰ although the National Water Agency estimated that 80% of urban centers are served totally or partially by groundwater sources.²⁰¹

Law and policy must now include groundwater as part of the system of water resources, reflecting the scientific understanding that groundwater is

194. Iza, *supra* note 25, at 28.

195. For a scientific explanation of the formation and hydrogeological characteristics of groundwater, and the unique aspects of its pollution, see R. ALLAN FREEZE & JOHN A. CHERRY, *GROUNDWATER* 2–13, 384–487 (1979). See generally Carlos E.M. Tucci et al., *The Hydrology of the Upper Paraguay Basin*, in *MANAGEMENT OF LATIN AMERICAN RIVER BASINS*, *supra* note 9, at 103, 103–22 (describing, among other things, the characteristics of the Upper Paraguay basin aquifers).

196. See, e.g., Theresa Grant-Peterkin, *Groundwater Contamination: Approaches to the Regulation and Clean-Up in the UK and EC*, in *WATER POLLUTION: LAW AND LIABILITY* 335, 337 (Patricia Thomas ed., 1993) (explaining that, notwithstanding environmental protection legislation, groundwater is polluted by development, construction, landfill, and land contamination, all which occur without consideration of the effect on groundwater).

197. On groundwater cleanup in the UK and EC, see *id.* at 339–43. On the Canadian experience, see Roger Cotton, *Regulation and Clean-Up of Groundwater Contamination: A Canadian Perspective*, in *WATER POLLUTION: LAW AND LIABILITY*, *supra* note 196, at 363, 363–76.

198. Passos de Freitas, *supra* note 19, at 24.

199. MINISTÉRIO DO MEIO AMBIENTE [MINISTRY OF THE ENVIRONMENT], *PROGRAMA DE ÁGUAS SUBTERRÂNEAS* [GROUNDWATER PROGRAM], 10 (2001).

200. To compare to international standards, see Albert E. Utton, *The Development of International Groundwater Law*, in *INTERNATIONAL GROUNDWATER LAW* 1, 3 (Ludwik A. Teclaff & Albert E. Utton eds., 1981) (“Israel relies upon groundwater for more than two-thirds of all the water used in the country, and in Europe more than three-fourths of the public water supply comes from groundwater sources in Denmark, the Federal Republic of Germany, and the Netherlands. In Tunisia and Belgium, nine out of every ten people are dependent upon underground sources . . .”). See also Gabriel Eckstein & Yoram Eckstein, *A Hydrogeological Approach to Transboundary Ground Water Resources and International Law*, 19 *AM. U. INT’L L. REV.* 201, 202 (2003) (“In the United States, ground water provides approximately one half of all drinking water; in rural areas of the country, the percentage is as high as ninety-seven percent.”).

201. See generally Silva, *supra* note 27, at 819.

intimately linked to the quantity and quality of surface waters, hydrological systems, and the biodiversity of a region. Therefore, with the increasing use of groundwater in Brazil, conjunctive legal protection of both groundwater and surface water resources is imperative. Currently, there is only a weak and confusing national regulatory framework for groundwater.²⁰² The problem is only compounded when transboundary aquifers are considered.

In formulating a new federal law, the European example may be an effective model. According to the United Nations Economic Commission for Europe (ECE) Charter on Groundwater, "Ground water—as a natural resource with both ecological and economic value—is of vital importance for sustaining life, health and the integrity of ecosystems."²⁰³ Since the 1980s, a specific ECE directive on the protection of groundwater against pollution caused by certain dangerous substances has been in effect.²⁰⁴ More recently, the European Union has adopted an ecosystem approach to the management of water resources that requires each member state to adopt national laws within the "Water Framework" to protect the water quality and quantity of river deltas and wetlands. This community-wide-framework law will impact groundwater protection as well.²⁰⁵ Both approaches—the control of pollution and integrated water resources management—may be useful in considering a new Brazilian law on protection of groundwater, as well as in designing a regional system to manage a transboundary aquifer.

1. Groundwater and the Brazilian National Council for Water Resources.—Subpart I(H) of this Article discussed Brazilian law's neglect of groundwater regulation, for which the National Water Act has been criticized. With an eye to closing this gap, the *Conselho Nacional de Recursos Hídricos* (National Council for Water Resources (CNRH)) began publishing regulations intended to provide a minimum legal framework for groundwaters. One of these regulatory initiatives was Resolution Number 15 of January 11, 2001, which addressed aquifer pollution as a consequence of opening illegal wells. Pollution is a serious problem when clandestine wells are drilled on private property without water or environmental permits, especially when the wells are abandoned without being properly capped to prevent pollution from entering the aquifer.

202. See generally discussion *supra* subpart I(H).

203. *Charter on Ground-Water Management*, U.N. Economic Commission for Europe, 44th Sess., 10th mtg., at 1, U.N. Doc. E/ECE/1197 (1989), available at http://www.internationalwaterlaw.org/RegionalDocs/Groundwater_Charter.htm.

204. Council Directive 80/68 of 17 December 1979 on The Protection of Groundwater Against Pollution Caused by Certain Dangerous Substances, 1980 O.J. (L 020) 43, available at http://europa.eu.int/smartapi/cgi/sga_doc?smartapi!celexapi!prod!CELEXnumdoc&lg=EN&numdoc=31980L0068&model=guichett.

205. Council Directive 2000/60/EC of 23 October 2000 Establishing a Framework for Community Action in the Field of Water Policy, arts. 1–4, 2000 O.J. (L 327) 1, available at http://europa.ed.int/comm/environment/water/water-framework/index_en.html.

Article 1 of Resolution 15 defines groundwaters as “those that run naturally or artificially in the subsoil.”²⁰⁶ Integrated management of groundwater is addressed in Article 3(I). Article 3(III) concerns water permits.²⁰⁷ Transboundary aquifers are addressed by Article 5. The CNRH promotes the integration of governmental bodies on the federal, state, and federal district level. Nevertheless, the failure, with the notable exception of Resolution 15, to recognize the interrelationships between surface waters and groundwater has resulted in a weak and confusing national regulatory framework.

It is clear that the regulatory intervention of CNRH is not sufficient. The intervention of the National Congress and, in the case of transboundary aquifers, the elaboration of treaties and mechanisms of cooperation are needed to prevent pollution from entering the aquifer and to determine shared criteria for its use. In response to this problem in Brazil, Resolution CNRH Number 15 was adopted.²⁰⁸

2. *Jurisdiction Over Groundwater: Again, States Versus the Union.*— The lack of clarity of state and local governments’ roles in water ownership, coupled with the confusion surrounding legislative jurisdiction over groundwater, have created a regulatory vacuum. While in theory states like São Paulo or Rio Grande do Sul own water assets and are responsible for the underground water reserves in their territory, the fact that the Guarani Aquifer is a transboundary water resource has led to the interpretation (discussed above in Part I) that legislative jurisdiction over international waters belongs to the union.

This position is logical in that the union has the infrastructure and institutional capacity to understand and administer a sensitive natural resource like the Guarani Aquifer, with its national and international importance. Furthermore, any administrative or legal system adopted for this transboundary aquifer will involve sensitive diplomatic measures and negotiation by the federal government of international treaties or agreements with the other nations who share the Guarani Aquifer.

206. Resolução CNRH No. 15, art. 1, de 11 de janeiro de 2001, D.O.U. de 22.01.2001.

207. See *supra* note 139 and accompanying text.

208. Resolução CNRH No. 15. Prior to the adoption of Resolution No. 15, the CNRH instituted the *Câmara Técnica Permanente de Gestão de Recursos Hídricos Transfronteiriços* [Permanent Technical Bureau for Transfrontier Water Resources] in Resolução CNRH No. 10, de 21 de junho de 2000, D.O.U. de 26.06.2000.

B. The Case of the Guarani Aquifer: Rising International Interest in the Giant Aquifer Under Argentina, Brazil, Paraguay, and Uruguay

“Groundwater, like surface water, often ignores political boundaries, and there are many large aquifers, which are shared by several countries.”²⁰⁹ This is the case of the huge Guarani Aquifer, shared by Brazil, Argentina, Uruguay, and Paraguay, which is the subject of rising international interest. The United Nations, the World Bank, the Organization of American States (OAS), and Mercosul are all interested in the sustainability of this trans-boundary groundwater reserve, a source of precious drinking water. In 2004, the OAS recognized the Guarani Aquifer as “an opportunity for international cooperation.”²¹⁰ Technical assistance for research into the physical characteristics of the Guarani Aquifer is being provided by the International Atomic Energy Agency (IAEA),²¹¹ a United Nations specialized agency. The United Nations Food and Agriculture Organization (FAO), the World Meteorological Organization (WMO), the United Nations Children’s Fund (UNICEF), and the World Health Organization (WHO), and other specialized agencies of the United Nations are involved in issues of water and sanitation. The United Nations Environment Programme (UNEP) is working on freshwater protection and sustainable use; the United Nations Commission on Sustainable Development (CSD) is charged with implementing and monitoring Agenda 21 (from the 1992 Rio Conference on Environment and Development); and the Johannesburg Plan of Implementation (JPOI) includes water and sanitation on its work agenda for 2004–2005.²¹² The United Nations Educational, Scientific, and Cultural Organization’s (UNESCO) research and studies on fresh water include the Guarani Aquifer and support the International Groundwater Resources Assessment project (IGRAC) with WMO. A four-year project on the Guarani Aquifer is the first transboundary aquifer project in the world,

209. Robert D. Hayton & Albert E. Utton, *Transboundary Groundwaters: The Bellagio Draft Treaty*, 29 NAT. RESOURCES J. 663, 664 (1989).

210. MICHELA MILETTO & ROBERTO KIRCHHEIM, THE INVISIBLE RESOURCE: TRANSBOUNDARY AQUIFERS: AN OPPORTUNITY FOR INTERNATIONAL COOPERATION 1 (Org. of Am. States, Policy Series No. 3, Aug. 2004), available at www.oas.org/usde/policy_series/3_eng.pdf.

211. The technique of isotope hydrology is being used by the IAEA to explore the Guarani Aquifer’s water. “By determining how rapidly the water is moving and where the system is being recharged, isotopes provide critical information to guide decisions on where to extract water.” *Managing Water Resources Using Isotope Hydrology 2*, IAEA Doc. 02-01578/FS Series 2/03/E (2002).

212. *Freshwater Management: Progress in Meeting the Goals, Targets, and Commitments of Agenda 21, the Programme for the Further Implementation of Agenda 21, and the Johannesburg Plan of Implementation*, U.N. ESCOR, Comm. on Sustainable Dev., 12th Sess., Agenda Item 3(a), U.N. Doc. E/CN.17/2004/1 (2004); *Freshwater Management: Policy Options and Possible Actions to Expedite Implementation*, U.N. ESCOR, Comm. on Sustainable Dev., 13th Sess., Agenda Item 4(b), U.N. Doc. E/CN.17/2005/1 (2004).

funded by the World Bank and Global Environment Facility,²¹³ in cooperation with the OAS and with matching funds provided by the four countries involved. The project has a secretariat in Uruguay located at the headquarters of Mercosul, which itself created an ad hoc committee on the Guarani Aquifer in 2004. The Guarani Aquifer is thus a strategic fresh water resource attracting increased international interest from many sectors.²¹⁴

Before it is possible to develop new institutional responses and the best practices to create cooperative and sustainable management of the Guarani Aquifer, more needs to be known about its dimensions as well as its hydrological and geological characteristics. The Guarani Aquifer lies under parts of the River Plate Basin (or La Plata Estuary),²¹⁵ a large transboundary surface water basin composed of ten rivers (including the Rivers Paraná, Paraguay, Uruguai, Iguacu, Tietê, and Rio Grande) flowing from Brazil, Paraguay, and Bolivia into Uruguay and Argentina. The Guarani Aquifer “extends over an area the equivalent of the territories of England, France and Spain combined.”²¹⁶ The Guarani Aquifer is only partially connected to the surface in limited areas of recharge or “outcropping,” and is primarily a “confined” aquifer in up to 90% of its total area, formed by sandstone covered by a layer of basalt.²¹⁷ The portion of the Guarani Aquifer located within Brazil encompasses more than two-thirds of the total area of the system,²¹⁸ with another 20% within Argentina and the rest within Uruguay and Paraguay.

Other than providing clean drinking water, the aquifer’s uses include industrial and agricultural demands and wastewater treatment. The normal temperature of the aquifer is high enough to indicate a potential use for geothermal energy as well as ecotourism featuring thermal spas. Also important to consider is the allocation of some portion of the groundwater as a permanent undisturbed reserve.

213. See *infra* text accompanying notes 313–18.

214. “There are presently 261 international river basins, and 145 nations have territory in shared basins. Rarely do the boundaries of the watersheds coincide with existing administrative boundaries. . . . [P]rogress in evaluating groundwater resources and producing appropriate systems for collective management is at a very early stage. . . . There is a need to ensure adaptable management structures, with equitable distribution of benefits and a detailed conflict resolution mechanism.” WORLD WATER ASSESSMENT PROGRAMME, UNITED NATIONS, EXECUTIVE SUMMARY: WATER FOR PEOPLE, WATER FOR LIFE 25–26 (2003), available at <http://unesdoc.unesco.org/images/0012/001295/129556e.pdf>.

215. See Piedra-Cueva, *supra* note 156, at 9–10.

216. Secretaria do Meio Ambiente Estado de São Paulo [Secretary of the Environment of the State of São Paulo], Gestão Ambiental do Aquífero Guarani [Environmental Management of the Guarani Aquifer], at http://www.ambiente.sp.gov.br/aquifero/principal_aquifero.htm.

217. BORGHETTI ET AL., *supra* note 190, at 26. The Guarani Aquifer is a sedimentary aquifer, meaning that “water is stored in the pores of its rocks.” *Id.* A “confined” aquifer does not “share a common terminus” and is not otherwise connected to surface waters that are part of an international drainage basin, and thus does not fall under the coverage of the U.N. Convention on the Non-Navigational Uses of International Watercourses, as defined in Art. 2.

218. Piedra-Cueva, *supra* note 156, at 9.

Overall, some 15 million people are estimated to live above the Guarani Aquifer.²¹⁹ Each day, they destroy its freshwater resources through overdrafts (withdrawing more water from the aquifer than can be recharged through natural means) or through pollution, which can result from pesticide runoff or perforation of artesian wells allowing pollution to enter directly into the aquifer.²²⁰ The Guarani Aquifer flows southward from Brazil at an extremely slow rate. Thus, pollution entering the aquifer in one state may not reach another state for many years or even decades, depending on the direction of its flow and other factors affecting velocity and time.²²¹

The quantity of water that can be extracted from the Guarani Aquifer is unknown. Extraction is limited by the aquifer's depths and its recharge capacity, which is still undetermined.²²² Although estimates differ,²²³ some suggest that the aquifer's total recharge area in Brazil covers 100,000 square kilometers and that 160 billion cubic meters of water are recharged annually throughout the entire aquifer.²²⁴ According to a recent study, approximately 8 to 10 million cubic kilometers of water, from a depth of less than 4,000 meters, may be available from the aquifer.²²⁵

Throughout the lands above the aquifer, several locations are especially sensitive to pollution and merit protection. These locations provide either direct recharge, by water filtering through fissures in the adjacent rock; indirect recharge, by water draining into the aquifer as part of surface drainage and subterranean flow; or discharge, by water leaving the aquifer to feed rivers or being extracted through artesian wells.²²⁶

Professor Ludwig A. Teclaff recalled "an old Chinese saying that a city can be moved, but not a well."²²⁷ Once groundwater is contaminated by construction, landfills, sewage, or leakage of toxic substances, "it is extremely slow to purify itself."²²⁸ The cleanup process is not as easy for groundwater as for surface waters, and it is difficult to determine the source of pollution in order to allocate responsibility:

219. *Id.*

220. To access a schematic map of the Guarani Aquifer, see Agencia Nacional de Águas [National Water Agency], Projeto Aquífero Guarani [Guarani Aquifer Project], Mapa Esquemático do Sistema Aquífero Guarani [Schematic Map of the Guarani Aquifer System], at <http://www.ana.gov.br/guarani/sistema/mapa.htm> [hereinafter Schematic Map of the Guarani Aquifer System].

221. BORGHETTI ET AL., *supra* note 190.

222. *See, e.g., id.* at 23 (noting that water at too great a depth could be impossible to use).

223. *See, e.g.,* MILETTO & KIRCHHEIM, *supra* note 210, at 1 (stating that the Guarani Aquifer covers an "area of 1.2 million km and an estimated storage capacity of 40,000 km").

224. Schematic Map of the Guarani Aquifer System, *supra* note 220.

225. BORGHETTI ET AL., *supra* note 190, at 23.

226. Schematic Map of the Guarani Aquifer System, *supra* note 220.

227. LUDWIK A. TECLAFF, WATER LAW IN HISTORICAL PERSPECTIVE 158 (1985).

228. The Berlin Rules on Water Resources, Aug. 21, 2004, 71 I.L.A. 337, 385 (2004) [hereinafter Berlin Rules].

The main risk factor in using the groundwaters comes from the large number of shallow and deep wells that are constructed, operated and abandoned without sufficient technology, due to the lack of control and verification at the federal, state and municipal levels. Studies have shown that the waters of the Guarani Aquifer are still free from contamination. However, considering the fact that the recharge areas coincide with important Brazilian agricultural zones, where herbicides are used intensively, urgent control, monitoring and reduction in the use level of agro-chemicals will become necessary.

Another danger related to the exploitation of the water from the Guarani comes from its uncontrolled and excessive use, mainly in artesian areas, where rigid controls are necessary in order to avoid water waste and a consequent loss in the internal pressure of the system, which would cause damage to other local users of the outpouring spring.²²⁹

[Further], [d]ue to the great differences in use of the Guarani waters among the countries that have access to this resource, it is evident that Brazil's necessities in relation to the aquifer are related more to the protection and sustainable management of this resource, while other countries need to perform research in order to better understand the system in their territories. The lack of knowledge is, however, related to all four countries.²³⁰

C. *International Law and the Guarani Aquifer*

In recent years, groundwater and transboundary aquifers²³¹ have received greater attention in the international community,²³² which has begun to call "for the holistic management of freshwater as a finite and vulnerable resource."²³³ Yet traditionally, international law has focused on the problem

229. BORGHETTI ET AL., *supra* note 190, at 23 (citations omitted).

230. *Id.* at 29 (citations omitted).

231. As noted above in the introduction to subpart II(B), the United Nations and its specialized agencies are studying aquifers. *See also* Eckstein & Eckstein, *supra* note 200, at 206 (explaining that the underlying premise of Barberis's case models is that "ground water resources can have substantial international implications").

232. *See generally* *Agenda 21*, U.N. Conference on Environment and Development, U.N. Doc. A/CONF.151/26 (1992); *Convention on the Law of the Non-navigational Uses of International Watercourses*, G.A. Res. 51/229, U.N. GAOR, 51st Sess., U.N. Doc. A/RES/51/229 (1997); *Report of the World Summit on Sustainable Development*, Annex: Plan of Implementation of the World Summit on Sustainable Development, at 7, U.N. Doc. A/CONF.199/20 (2002); WORLD WATER COUNCIL, *THE 3RD WORLD WATER FORUM: FINAL REPORT* (2003), available at http://www.world-water-forum3.com/en/finalreport_pdf/FinalReport.pdf; *Second Report on Shared Natural Resources: Transboundary Groundwaters*, U.N. GAOR, 56th Sess., U.N. Doc. A/CN.4/539 (2004); Berlin Rules, *supra* note 228, at 384-90 (explaining the need to expand the International Law Association's (ILA) rules on water resources to include groundwater because of its importance to humans and the environment).

233. A. Dan Tarlock, *The Dual Nature of Water: Commodity and Community Resource*, in 1 *LAW, WATER AND THE WEB OF LIFE*, *supra* note 22, at 1, 12.

of transboundary surface waters, referring to transboundary groundwater²³⁴ only marginally or not at all, or limiting the reference to those groundwaters that “flow into a common terminus.”²³⁵ Indeed, until 1997 and the opening for signature of the United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses,²³⁶ no international treaty existed to provide a legal framework for the regulation of transboundary groundwater as well as surface water.²³⁷ Even then, this first framework treaty offered only partial protection for transboundary groundwaters as part of “watercourses” generally, as discussed below. More comprehensive and specific legal principles for transboundary groundwater are found in “soft law”²³⁸ declarations of conferences and global organizations and in the codification of customary international law, particularly in the International Law Association’s (ILA)²³⁹ rules on fresh water, discussed below. Only in

234. See, e.g., Utton, *supra* note 200.

235. See, for example, the 1966 Helsinki Rules on the Uses of the Waters of International Rivers, adopted by the ILA at its fifty-second conference. Helsinki Rules on the Uses of the Waters of International Rivers, Aug. 20, 1966, 52 I.L.A. 484 (1967) [hereinafter Helsinki Rules]. Article II states: “An international drainage basin is a geographical area extending over two or more States determined by the watershed limits of the system of waters, including surface and underground waters, flowing into a common terminus.” *Id.* at 484–85.

The U.N. Watercourses Convention makes a similar distinction between unconfined and confined groundwaters, extending the scope of the convention only to those groundwaters which flow into a common terminus with surface waters. Article 2 states: “For the purposes of the present Convention: (a) ‘Watercourse’ means a system of surface waters and groundwaters constituting by virtue of their physical relationship a unitary whole and normally flowing into a common terminus.” G.A. Res. 229, U.N. GAOR, 51st Sess., Agenda Item 144, at 3, U.N. Doc. A/Res/51/229 (1997), available at <http://daccessdds.un.org/doc/UNDOC/GEN/N97/772/93/PDF/N9777293.pdf?OpenElement>.

Professor Oscar Schachter appreciated early on that “[t]he use of the drainage basin as the territorial unit for sharing does more than delimit a geographical area; it brings within the scope of shareability the whole system of surface and underground hydrological linkages which affect the availability and quantity of water.” OSCAR SCHACHTER, *SHARING THE WORLD’S RESOURCES* 66 (1977). So-called “fossil” groundwater and confined groundwater do not share a common terminus with surface waters; confined groundwater is beyond the scope of both the 1966 Helsinki Rules and the 1997 U.N. Watercourses Convention.

236. Convention on the Law of the Non-Navigational Uses of International Watercourses, opened for signature May 21, 1997, 51 U.N.T.S. 869 [hereinafter U.N. Watercourses Convention] available at <http://www.un.org/law/ilc/texts/nonnav.htm>.

237. For a detailed discussion of the 1997 U.N. Watercourses Convention, see *infra* subsection (II)(C)(1)(b). See also Charles B. Bourne, *The International Law Association’s Contribution to International Water Resources Law*, 36 NAT. RESOURCES J. 155, 205–08 (discussing the pre-1997 development of international definitions and principles regarding groundwater; these “soft law” developments contributed to the 1997 U.N. Watercourses Convention).

238. “Soft law” refers to nonbinding declarations of states or statements adopted at multilateral conferences and reports of nongovernmental organizations which advance the development of international environmental law. Such soft-law principles may become recognized as customary law if adopted into state practice and understood to create binding obligations. Conversely, some soft-law principles have been included in treaties, thus becoming binding international law. For a discussion of the incorporation of soft-law principles into an international treaty, see Bourne, *supra* note 237, at 205–08.

239. The ILA was created in 1873 for the study and development of international law and to foster international goodwill.

the last several years has the United Nations International Law Commission addressed as a specific topic the theme of “Shared Natural Resources: Transboundary Groundwaters,” with a proposed draft convention beginning to be elaborated.²⁴⁰

1. Many International Documents, Yet Still an Insufficient Legal Framework.—

*a. Soft Law Rules on Groundwater: The Bellagio Draft Treaty.*²⁴¹—

A proposed set of rules on groundwater, the Bellagio Draft Treaty, was prepared in 1977 by a group of academics in a U.S.–Mexico Transboundary Resources Study Group.²⁴² The Bellagio Draft Treaty suggests the use of joint commissions in the case of groundwater, a technique especially helpful for information sharing, notification of planned measures, and prevention of harm to groundwater. Further, the document “is based on the proposition that water rights should be determined by mutual agreement rather than be the subject of uncontrolled, unilateral taking, and that rational conservation and protection actions require joint resource management machinery.”²⁴³ The Bellagio Draft Treaty sought to identify the “basic requirements for present and future protection, control and equitable use” of transboundary groundwater, with awareness of the sensitivities involved in any proposed regulation of a natural resource valued on both sides of a national border.

b. The International Law Association Rules.—The International Law Association (ILA) has made major contributions to the codification of customary international law on transboundary waters,²⁴⁴ beginning with its

240. The latest document from the International Law Commission includes a draft convention on the law of transboundary aquifers. *Third Report on Shared Natural Resources: Transboundary Groundwaters*, U.N. GAOR, International Law Commission, 57th Sess., at 19, U.N. Doc. A/CN.4/551 (2005), revised by U.N. Doc. A/CN.4/551/Add.1 (2005) and U.N. Doc. A/CN.4/551.Corr.1 (2005); see also *Second Report on Shared Natural Resources: Transboundary Groundwaters*, U.N. GAOR, International Law Commission, 56th Sess., at 10–15, U.N. Doc. A/CN.4/539 (2004), revised by U.N. Doc. A/CN.4/539/Add.1 (2004) (discussing the initial scope of the proposed convention on the law of transboundary groundwaters); *Shared Natural Resources: First Report on Outlines*, U.N. GAOR, International Law Commission, 55th Sess., at 8–10, U.N. Doc. A/CN.4/533 (2003), revised by U.N. Doc. A/CN.4/533/Add.1 (2003) (reviewing problems that should be addressed concerning transboundary groundwaters).

241. See generally Hayton & Utton, *supra* note 209 (discussing the need for transboundary groundwater agreements, and laying out the process that culminated in the Bellagio Draft Treaty).

242. *Id.* at 665–68.

243. *Id.* at 664.

244. See RAJ KRISHNA & SALMAN M. A. SALMAN, *International Groundwater Law and the World Bank Policy for Projects on Transboundary Groundwater*, in *GROUNDWATER: LEGAL AND POLICY PERSPECTIVES* 163, 170–73 (Salman M. A. Salman ed., World Bank Technical Paper No. 456, 1999) (noting the International Law Association’s “significant contribution to the development of the emerging rules of international [transboundary water] law”).

1966 *Helsinki Rules on the Uses of the Waters of International Rivers*.²⁴⁵ Twenty years later, during the 1986 ILA conference in Seoul, Korea, four additional articles were adopted to include the waters of confined aquifers. Called the 1986 *Seoul Rules on International Groundwaters*, the document reflected concern for the inclusion of all types of groundwater.²⁴⁶ Article 1 of the Seoul Rules defined international groundwaters as the “waters of an aquifer that is intersected by the boundary between two or more States” and declared that “such an aquifer with its waters forms an international basin or part thereof,” characterizing states containing such an aquifer as basin states “within the meaning of the Helsinki Rules whether or not the aquifer and its waters form with surface waters part of a hydraulic system flowing into a common terminus.”²⁴⁷ In 2004, the ILA adopted its *Berlin Rules on Water Resources*, which “express international law applicable to the management of the waters of international drainage basins and applicable to all waters,”²⁴⁸ consolidating many efforts into one code that could be used as a model for the voluntary regulation of a transboundary aquifer like the Guarani Aquifer.

The 2004 Berlin Rules both summarize and expand other specific rules about groundwater. Chapter VIII assures the application of the rules to all aquifers, “including aquifers that do not contribute water to, or receive water from, surface waters or receive no significant contemporary recharge from any source.”²⁴⁹ The Rules apply sustainability concepts to groundwater,²⁵⁰ aim to protect aquifers against pollution,²⁵¹ and recognize that precautionary management of aquifers is necessary.²⁵² The Berlin Rules also call upon states to “manage surface waters, groundwater, and other pertinent waters in a unified and comprehensive manner.”²⁵³ Article 6 calls for management of waters to be integrated with the management of other resources.²⁵⁴

Article 13 on “Determining an Equitable and Reasonable Use” of internationally shared waters expands the factors used in the Helsinki Rules and the United Nations Watercourses Convention, detailed below in subsection II(C)(1)(c), by adding two new factors for water allocation decisions: “the sustainability of proposed or existing uses” and the “minimization of environmental harm.”²⁵⁵ In another departure from the earlier rules, “[t]he term

245. See Helsinki Rules, *supra* note 235 (defining an “international drainage basin” and proposing general rules for interactions among states that share such basins).

246. See Rules on International Groundwaters, Aug. 30, 1986, 62 I.L.A. 251 (1986) (clarifying and augmenting the Helsinki Rules with respect to groundwater).

247. *Id.* at 251.

248. Berlin Rules, *supra* note 228, at 343.

249. *Id.* at 384.

250. *Id.* at 386.

251. *Id.* at 387–88.

252. *Id.* at 385.

253. *Id.* at 349.

254. *Id.* at 351.

255. *Id.* at 363.

'hydrogeographic' has been added [to the] list in (2)(a) to reflect the greater attention in these Rules to groundwater.²⁵⁶

In the chapter on groundwater, the Berlin Rules specifically call for precautionary management,²⁵⁷ sustainability applied to groundwater,²⁵⁸ and protecting aquifers.²⁵⁹ Finally, a specific article addresses transboundary aquifers,²⁶⁰ as explained in the commentary to Article 42:

Paragraph 4 makes explicit the most central obligation regarding internationally shared aquifers. *States cannot exploit more than their appropriate share of groundwater*, whether from a renewable or from a non-renewable aquifer, under the principle of equitable utilization In setting drawdown rates for transboundary aquifers, basin States are to have due regard for the *obligation not to cause significant harm to another State* (Article 16) and to the *obligation to protect aquifers* (Article 41). Paragraph 5 indicates that *States are to cooperate in protecting the recharge of aquifers*.²⁶¹

As reiterated by the Berlin Rules, the general rules of international water law²⁶² are applicable to the use and management of groundwater as well as to surface waters, although there are now some specific rules applicable to groundwater. Most of these rules are recommendations, soft law, or model laws (like the Bellagio Draft Treaty) which can be used as inspiration or as evidence of developing customary law related to groundwater,²⁶³ therefore, they are useful as a framework to integrate planning and management of transboundary water resources even if the rules currently have little legal effect and cannot be enforced in any court. The principles in the Berlin rules, however aspirational, may be a model for regional elaboration measures tailored to a specific aquifer like the Guarani.

Other future-oriented efforts in the international community affecting groundwater include the United Nations Millennium Declaration²⁶⁴ and its

256. *Id.* at 363.

257. *Id.* at 385.

258. *Id.* at 386.

259. *Id.* at 387.

260. *Id.* at 389.

261. *Id.* at 390 (emphasis added).

262. For an example, please see the text of Article I of the Helsinki Rules, which states that "the general rules of international law as set forth in these chapters are applicable to the use of the waters of an international drainage basin except as may be provided otherwise by convention, agreement or binding custom among the basin States." Helsinki Rules, *supra* note 235, at 484.

263. See Berlin Rules, *supra* note 228, at 337–39 (discussing the need to summarize contemporary customary law and arguing that the Rules "provide a clear, cogent, and coherent statement of the customary and international law that applies to waters of international drainage basins, and to the extent that customary international law applies to waters entirely within a State, to all waters as well").

264. The Millennium Declaration contains the following provisions:

IV. Protecting our common environment. 21. We must spare no effort to free all of humanity, and above all our children and grandchildren, from the threat of living on a planet irredeemably spoilt by human activities, and whose resources would no longer

goal of providing clean drinking water to the world's population,²⁶⁵ and the work of the United Nations Commission on Sustainable Development (CSD) on water and sanitation, and its special agenda for annual meetings in 2004 and 2005.²⁶⁶

c. 1997 United Nations Watercourses Convention.—The only international treaty explicitly applicable to groundwaters is the 1997 United Nations Convention on the Non-Navigable Uses of International Watercourses,²⁶⁷ developed through some twenty years' work of the International Law Commission of the United Nations (ILC) under several Special Rapporteurs,²⁶⁸ culminating in a General Assembly Resolution²⁶⁹ adopting the text as a multilateral treaty.²⁷⁰ The treaty has not yet entered into force; the states where the Guarani Aquifer is located have not signed or ratified the Convention, with the sole exception of Paraguay.²⁷¹

Unconfined groundwater is included in the term “watercourses” in the ILC drafts and in the subsequent United Nations Watercourses Convention. As noted by the Special Rapporteur for the ILC draft articles from 1985–1991, Professor Stephen C. McCaffrey:

Up to this point the discussion of fundamental obligations in respect of international watercourses has assumed that the same rules apply to surface water and groundwater alike. Indeed, this conclusion is sug-

be sufficient for their needs. 22. We reaffirm our support for the principles of sustainable development, including those set out in Agenda 21, agreed upon at the United Nations Conference on Environment and Development. 23. We resolve therefore to adopt in all our environmental actions a new ethic of conservation and stewardship and, as first steps, we resolve . . . [t]o stop the unsustainable exploitation of water resources by developing water management strategies at the regional, national and local levels, which promote both equitable access and adequate supplies.

United Nations Millennium Declaration, G.A. Res. 55/2, U.N. GAOR, 55th Sess., Agenda Item 60(b) paras. 21–23, U.N. Doc. A/RES/55/2 (2000)

265. Goal 7, “Ensure Environmental Sustainability,” includes: “Reduce by half the proportion of people without sustainable access to safe drinking water.” United Nations Millennium Development Goals, at <http://www.un.org/millenniumgoals/>.

266. UNITED NATIONS, ECONOMIC AND SOCIAL COUNCIL, COMMISSION ON SUSTAINABLE DEVELOPMENT, DRAFT REPORT, U.N. Doc. E/CN.17/2005/L.2 (2005).

267. U.N. Watercourses Convention, *supra* note 236.

268. The International Law Commission of the United Nations is charged with the codification and progressive development of international law. International Law Commission, Introduction, at <http://www.un.org/law/ilc/introfra.htm>. Special Rapporteurs on the issue of transboundary watercourses included Jen Evensen, Stephen McCaffrey, Richard D. Kearney, and Robert Rosenstock. Special Rapporteurs of the International Law Commission (1949–2001), at <http://www.un.org/law/ilc/membefra.htm>.

269. U.N. Watercourses Convention, *supra* note 236.

270. There are few incentives for states to ratify this treaty, and its main contribution may be as a framework for the future negotiation of regional agreements. *See, e.g.*, ATTILA TANZI & MAURIZIO ARCARI, THE UNITED NATIONS CONVENTION ON THE LAW OF INTERNATIONAL WATERCOURSES: A FRAMEWORK FOR SHARING 302–04 (2001).

271. Paraguay signed the U.N. Watercourses Convention on August 25, 1998. As of August 15, 2002, 12 of the required 35 states had signed or ratified the treaty.

gested by the ILC's draft articles and the UN Convention, both of which define the term "international watercourse" to include groundwater that is related to surface water systems. Yet groundwater has been largely "out of sight and out of mind" in the practice of states and, albeit to a lesser extent, in the work of international organizations and expert groups. This has resulted in a legal regime for groundwater that is rather crude, especially given groundwater's abundance and vulnerability relative to surface water.²⁷²

The scope of the Watercourses Convention is determined by Article 1(1): "The present Convention applies to uses of international watercourses and of their waters for purposes other than navigation and to measures of protection, preservation and management related to the uses of those watercourses and their waters."²⁷³ In a departure from earlier law, including the navigability phase of Brazilian water law discussed in section I(A)(1) above, Article 1(2) of the Watercourses Convention states: "The uses of international watercourses for navigation is not within the scope of the present Convention except insofar as other uses affect navigation or are affected by navigation."²⁷⁴

Article 2 defines the terms used in the Convention:

- (a) "Watercourse" means a system of surface waters and ground waters constituting by virtue of their physical relationship a unitary whole and normally flowing into a common terminus;
- (b) "International watercourse" means a watercourse, parts of which are situated in different States.²⁷⁵

Article 2(a) is the basis for the conclusion that groundwater is only addressed by the Watercourses Convention if it is linked physically with surface water such that it "flows into a common terminus."²⁷⁶ Thus, confined groundwaters, those that do not share a "common terminus" with surface waters, would be excluded from the Convention. Specifically, this weakness in the treaty excludes up to 90% of the Guarani Aquifer from coverage (since the Guarani's groundwater is 90% confined).²⁷⁷

272. STEPHEN C. MCCAFFREY, *THE LAW OF INTERNATIONAL WATERCOURSES: NON-NAVIGATIONAL USES* 414–15 (2001). Note that the ILC adopted a Resolution on Confined Transboundary Groundwater, in Annex III to the Helsinki Rules. See *THE LAW OF THE NON-NAVIGATIONAL USES OF INTERNATIONAL WATERCOURSES: DRAFT ARTICLES ON THE LAW OF THE NON-NAVIGATIONAL USES OF INTERNATIONAL WATERCOURSES AND COMMENTARIES THERETO, ADOPTED ON 2ND READING BY THE INTERNATIONAL LAW COMMISSION AT ITS 46TH SESSION, U.N. Doc. A/CN.4/L493* (1994). See also Gabriel Eckstein, "Fossil" Aquifers, Food and Agriculture Organization of the United Nations, at <http://www.fao.org/Legal/advserv/isarm1.pdf>.

273. U.N. Watercourses Convention, *supra* note 236, art. 1(1).

274. *Id.* art. 1(2).

275. *Id.* art. 2.

276. *Id.* art. 2(a).

277. See *supra* note 217 and accompanying text.

Other important articles in the Watercourses Convention highlight the two most important principles of the treaty: *equitable utilization of watercourses* (Article 5) and the *duty not to cause harm to other states* (Article 7), the latter derived from long customary use rooted in the principle of good neighborliness and the law of nuisance. Of possible relevance to Brazil and the other Guarani Aquifer states are the obligations suggested in Article 5 for sustainable utilization of water and adequate protection of the watercourse, as well as the participatory and cooperative aspects of the use, development, and protection of the resource:

Article 5, Equitable and reasonable utilization and participation

(1) Watercourse States shall in their respective territories utilize an international watercourse in an equitable and reasonable manner. In particular, an international watercourse shall be used and developed by watercourse States with a view to attaining optimal and sustainable utilization thereof and benefits therefrom, taking into account the interests of the watercourse States concerned, consistent with adequate protection of the watercourse.

(2) Watercourse States shall participate in the use, development and protection of an international watercourse in an equitable and reasonable manner. Such participation includes both the right to utilize the watercourse and the duty to cooperate in the protection and development thereof, as provided in the present Convention.²⁷⁸

Of special interest for a regional compact on the Guarani Aquifer may be the factors suggested in Article 6:

(1) Utilization of an international watercourse in an equitable and reasonable manner within the meaning of Article 5 requires taking into account all relevant factors and circumstances, including:

- (a) Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character;
- (b) The social and economic needs of the watercourse States concerned;
- (c) The population dependent on the watercourse in each watercourse State;
- (d) The effects of the use or uses of the watercourses in one watercourse State on other watercourse States;
- (e) Existing and potential uses of the watercourse;
- (f) Conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect;
- (g) The availability of alternatives, of comparable value, to a particular planned or existing use.

. . . .

278. U.N. Watercourses Convention, *supra* note 236, art. 5.

(3) The weight to be given to each factor is to be determined by its importance in comparison with that of other relevant factors. In determining what is a reasonable and equitable use, all relevant factors are to be considered together and a conclusion reached on the basis of the whole.²⁷⁹

These factors are similar to those used in the Bellagio Draft Treaty²⁸⁰ and the Helsinki Rules.²⁸¹ In addition, the Berlin Rules created two additional factors to add to the list, as discussed above in subsection II(C)(1)(a), stressing sustainable use and minimization of environmental harm.

Another important provision of the Watercourses Convention is Article 20 on the protection and preservation of ecosystems: “Watercourse States shall, individually and, where appropriate, jointly, protect and preserve the ecosystems of international watercourses.”²⁸²

The United Nations Watercourses Convention, even if it never enters into force, provides a useful framework or guideline for future regional agreements governing specific transboundary freshwater bodies, including both surface and groundwater: In addition, it serves a purpose as a codification of customary international law on the subject of non-navigational uses of transboundary watercourses, including some types of groundwater:

[T]he authoritative guideline function of the Convention is corroborated by the fact that, even before its adoption, it has served as a model and a catalyst for the conclusion of special watercourse agreements which have applied its basic principles, as they had been drafted by the ILC.²⁸³

d. Progressive Development of International Law on Transboundary Groundwater.—As shown above, these few sources of international law fail to solve the complexity of groundwater law: some exclude the subject of confined groundwater entirely, as in the 1966 Helsinki Rules and the United Nations Watercourses Convention, and some merely acknowledge the difficulty of adapting rules for surface waters to the different geophysical configurations of groundwater, as in the 2004 Berlin Rules of the ILA. The progressive development in international law can be charted in the relationship of the Helsinki Rules to the ILC draft that became the 1997 United Nations Convention on Watercourses and the relationship of both to the 2004 Berlin Rules.²⁸⁴ It is interesting to note, however, that four

279. *Id.*, art. 6.

280. *See supra* subsection II(C)(1)(a).

281. *See supra* note 245.

282. U.N. Watercourses Convention, *supra* note 236, art. 20.

283. TANZI & ARCARI, *supra* note 270, at 306 (citing as examples the Ganges River Treaty and the Mahakali River Treaty).

284. *See, e.g.*, Michelle R. Sergent, Comment, *Comparison of the Helsinki Rules to the 1994 U.N. Draft Articles: Will the Progression of International Watercourse Law Be Damned?*, 8 VILL.

members of the ILC Committee on Water Resources objected to the Committee's effort in the Berlin Rules to engage in the progressive development of international law, rather than simply to codify existing customary law.²⁸⁵ Nevertheless, according to Eckstein, "[t]here is now a growing need for the clarification and progressive development of international law as it applies to ground water resources."²⁸⁶ Other contributions to the progressive development of international law on shared water resources, in addition to sections of the Berlin Rules and the ILC draft treaty on trans-boundary groundwaters, include the IUCN-World Conservation Union Draft International Covenant on Environment and Development.²⁸⁷

In the case of the Guarani Aquifer, the opportunity exists to create new law on groundwater for the prevention of harm and the equitable utilization of the groundwater and to adopt integrated water resources management plans and systems for the four affected states of Argentina, Brazil, Paraguay, and Uruguay.

2. *Regional Efforts Toward Cooperative Management.*—There are very few bilateral or regional environmental treaties concerning water that may apply, directly or indirectly, to groundwater in the region of the Guarani Aquifer.²⁸⁸ Most regional water law, like international water law generally, concerns surface waters without explicitly mentioning groundwater. Two such regional treaties are discussed below: the Treaty of the River Plate Basin and the Treaty on Amazonian Cooperation. With regard to groundwater, one commentator has noted:

In Latin America, major cities have looked more and more to groundwater as the least expensive means of obtaining water, and shortages of surface waters (accentuated by prolonged droughts) have stimulated farmers in arid and semiarid regions to expand the use of groundwater, particularly in those areas which do not have reliable surface water supplies. Again the result often has been the overpumping of aquifers and the consequent deterioration of water

ENVTL. L.J. 435, 453–55 (1997) (noting that “the scope of the Helsinki Rules is more expansive than that of the 1994 U.N. Draft Articles” and pointing to specific examples in support of that observation).

285. ILC Berlin Conference 2004—Water Resources Committee Report: Dissenting Opinion (Aug. 9, 2004), at <http://www.internationalwaterlaw.org/IntlDocs/ILA%20Berlin%20Rules%20Dissent.htm>.

286. Eckstein & Eckstein, *supra* note 200, at 205.

287. IUCN ENVTL. LAW PROGRAMME, ENVTL. LAW AND POL'Y PAPER NO. 31, DRAFT INTERNATIONAL COVENANT ON ENVIRONMENT AND DEVELOPMENT (2004), available at www.iucn.org/themes/law/pdffdocuments/EPLP31EN_rev2.pdf.

288. See, e.g., Statute of the River Uruguay, Feb. 26, 1975, Uru.-Arg. (establishing the Uruguay-Argentina border, but dealing principally with pollution of the river), available at <http://www.caru.org.uy/publicaciones/publicacionesPDFs/The-River-Uruguay-executive-commission-Uruguay-Paysandu.pdf> (containing an unofficial translation of the Spanish original).

quality occurring generally when water pressure of the aquifer is reduced allowing the intrusion of overlying saline waters.²⁸⁹

a. *Treaty on the River Plate Basin.*—One regional treaty relevant to the Guarani Aquifer is the 1969 Treaty on the River Plate Basin.²⁹⁰ The Guarani Aquifer lies under part of the great River Plate Basin. The history of the River Plate has been one of conflict between colonial powers, rights claimed by competing states, and a series of early bilateral and multilateral agreements governing navigation on the river.²⁹¹

A goal of the 1969 Treaty on the River Plate Basin is to “promote the harmonious development and optimum use of the natural resources.”²⁹² Accordingly, most of the articles in the treaty deal with navigation, jurisdictional issues, ports, channels, pilotage, and related issues. This treaty, a product of its time, does not consider ecosystem protection or sustainable use of water, and is geared toward surface waters. Chapter IX deals with pollution, defined as “the direct or indirect introduction by man into the aquatic environment of substances or energy which have harmful effects.” Chapter VII applies to the regulation of exploration and exploitation of natural resources on the river bed and subsoil. An interesting feature is its creation of a joint intergovernmental management committee, known as the CIC.²⁹³

This river basin thus has an established system for joint water management.²⁹⁴ The Treaty on the River Plate Basin has been cited approvingly by two international environmental law scholars as an example

289. Utton, *supra* note 200, at 6.

290. Treaty on the River Plate Basin, Apr. 23, 1969, Arg.-Braz.-Para., 8 I.L.M. 905 (1969).

291. Victor Pochat, *Water-Resources Management of the Plata Basin*, in MANAGEMENT OF LATIN AMERICAN RIVER BASINS, *supra* note 9, at 123, 133–36. The author details a number of binational or trinational agreements related to rivers in the River Plata Basin and joint projects for construction and operation of dams or barrages, such as the Brazilian-Paraguayan Itaipu hydroelectric dam on the Paraná River near Iguassu Falls.

292. The Treaty entered into force on August 19, 1970. Patricia Wouters, *The Legal Response to International Water Scarcity and Water Conflicts: The UN Watercourses Convention and Beyond*, at http://www.thewaterpage.com/pat_wouters1.htm. Through the Brazilian Center for Documentation and Studies of the Plate Basin (CEDEP), library resources and other materials on this treaty are available at the Universidade Federal do Rio Grande do Sul (UFRGS) in Porto Alegre, Brazil. See Centro Brasileiro de Documentação e Estudos da Bacia do Prata [Brazilian Center for Documentation and Studies & the Plate Basin], *available at* <http://www.cedep.ifch.ufrgs.br>. The Treaty on the River Plate Basin was internalized as part of Brazilian law by Decree No. 67.084 of August 19, 1970. *Decreto* No. 67.084, de 19 de agosto de 1970, *available at* <http://www2.mre.gov.br/dai/prata.htm>.

293. See Del Castillo Laborde, *Legal Regime of the Rio de la Plata*, 36 NAT. RESOURCES J. 251, 293–94 (discussing the development and execution of a treaty that created “the Administrative Commission of the Rio de la Plata . . . [that] resolve[s] the disputes and differences which are inevitably bound to arise under such a wide-ranging statute”).

294. *Id.*

of “ecosystem regime building”;²⁹⁵ relevant also to joint management of the River Plate is the call from an OAS scholar for planning at the level of ecosystems, seeking to “link integrated water-resources management programmes to social and economic development and address land and water uses and biodiversity conservation within the context of river basins and aquifers.”²⁹⁶ In addition to the Treaty on the River Plate Basin (a regional treaty affecting the four Guarani Aquifer states), there is the Treaty of Asunción of March 26, 1991, which created Mercosul with the same four states and Bolivia.

b. Treaty for Amazonian Cooperation.—One other regional treaty involving Brazil relates to environmental protection of freshwater resources: the Treaty for Amazonian Cooperation of 1978,²⁹⁷ endorsed subsequently in the 1989 Amazon Declaration.²⁹⁸ Article VII of the Treaty addresses conservation of flora and fauna, Article VIII addresses sanitation, and Article IX addresses technical and scientific cooperation, while other articles address navigation, communications, and tourism. The Declaration acknowledges the Amazon states’ common interest in sustainable development and the need for environmental protection and conservation for the benefit of present and future generations. The importance of Amazonian ecosystems is recognized in the affected states as well as internationally by scholars²⁹⁹ because it addresses the unique conditions existing in the region containing one of the world’s longest rivers as well as an extensive rainforest habitat.

The 1969 Treaty on the River Plate Basin recognizes common interests in navigation, conservation, inventory, and assessment of the area’s natural resources, and “reasonable utilization of water resources, particularly through regulation of water courses and their multiple and equitable uses.”³⁰⁰ Technical experts in various disciplines have contributed to the cooperative

295. Jutta Brunnee & Stephen J. Toope, *Environmental Security and Freshwater Resources: Ecosystem Regime Building*, 91 AM. J. INT’L L. 26, 51 (1997).

296. Newton V. Cordeiro, *Environmental Management Issues in the Plata Basin*, in *MANAGEMENT OF LATIN AMERICAN RIVER BASINS*, *supra* note 9, at 148, 148–73; *see also* Tucci et al., *supra* note 195, at 121 (explaining that “it is possible that minor localized changes may have limited local effects, whilst the combined effect of many such localized changes may affect the character of the Patanal very substantially,” and providing that such changes, for example, would allow a rancher to know when to remove cattle from lowlands when there is a danger of flooding).

297. Treaty for Amazonian Cooperation, July 3, 1978, Bol.-Braz.-Colom.-Ecuador-Guy.-Peru-Surin.-Venez., 17 I.L.M. 1045 (entered into force Aug. 3, 1980).

298. United Nations, Economic and Social Council, The Amazon Declaration; Submitted by the Presidents of the States Parties to the Treaty for Amazonian Co-operation, U.N. Doc. A/44/275, E/1989/79 (1989) [hereinafter Amazon Declaration], *reprinted in* 28 I.L.M. 1303 (1989).

299. *See, e.g.*, AMAZONIA AND SIBERIA: LEGAL ASPECTS OF THE PRESERVATION OF THE ENVIRONMENT AND DEVELOPMENT IN THE LAST OPEN SPACES, at *ix* (Michael Bothe et al. eds., 1993) (“The preservation of the Amazonian environment has stirred public discussion worldwide The main issue has been the preservation of the tropical rainforest, because of its function for the world climate and as a genetic reserve . . .”).

300. Treaty on the River Plate Basin, *supra* note 290, art. I(b).

management of the basin and the success of the “Hydrological Warning System” to prevent damage from floods, for example, through the existing system of a Coordinating Intergovernmental Committee (CIC) and Conference of Ministers of Foreign Affairs, but one of the Treaty’s “fundamental flaws is due to the lack of a permanent technical organization.”³⁰¹

The 1978 Treaty for Amazonian Cooperation provides for exchange of information and operational agreements to achieve the goals of “harmonious development . . . in such a way that these joint actions produce equitable and mutually beneficial results and achieve also the preservation of the environment, and the conservation and rational utilization of the natural resources of those territories.”³⁰² In 1989, heads of states party to the treaty met to promote “co-operation between our countries in all areas of common interest for the sustainable development of the Amazon region,” and they issued a statement known as the “Amazon Declaration.”³⁰³ The scope of the Treaty itself is extremely broad, but the system of joint work programs in specific areas has produced research and publications as well as meetings of experts and representatives of governments from the region; the creation of a Permanent Executive Secretariat of the treaty in Brasília may reinforce the institutional network and facilitate the political dialogue at governmental levels.³⁰⁴

c. The Water Basin Unit and Groundwater in Regional Agreements.—Seventy percent of the freshwater in South America is contained in the basins of the two great rivers, the River Plate and the Amazon River; of these two, 60% and 45%, respectively, of the area of the drainage basins is located in Brazil.³⁰⁵ Both the Amazonian Cooperation

301. Pochat, *supra* note 291, at 144–45. Other issues or “flaws” are the “lack of specific funds for the financing of the programmed activities” and privatization in navigation, construction of hydroelectric plants, and water supply and sanitation.

302. Treaty for Amazonian Cooperation, *supra* note 297, art. I. The mechanism for coordination of compliance with the treaty aims and objectives is the creation of the Amazonian Cooperation Council, which meets annually and is responsible for carrying out decisions taken at meetings of Foreign Affairs Ministers. *Id.* art. XXI. Decisions of the Amazonian Cooperation Council are to be carried out by Permanent National Commissions in each member state. *Id.* art. XXIII.

303. Amazon Declaration, *supra* note 298, para. 3. This Declaration expressed support for a new “Amazonia Special Environmental Commission” and “Amazonia Special Commission on Indigenous Affairs.” *Id.* Other paragraphs repudiate the foreign debt, nuclear weapons, and weapons of mass destruction, and call for transfer of technology and funding for environmental protection in the region. *Id.* paras. 7–9.

304. Botto, *supra* note 9, at 91. The new Secretary General of the Amazon Cooperation Treaty Organization, Rosália Arteaga of Ecuador, just took office. Milena Galdino, *Marrying Growth and Preservation in Brazil’s Amazon*, Brazil Magazine (May 1, 2004), at <http://www.brazzil.com/content/view/1777/59/>.

305. Agencia Nacional de Águas [National Water Agency], ANA Debate Parcerias dos Países da América do Sul em Congresso na Suíça [ANA Partnership Debate of the Countries of South America at the Switzerland Conference], at <http://www.ana.gov.br/destaque/destaque109.asp>

Treaty and the Treaty on the River Plate Basin are based on the water basin concept, found in subsequent soft law documents such as the 1992 Dublin Statement on Water and Sustainable Development,³⁰⁶ which recognized that the “most appropriate geographical entity for the planning and management of water resources is the river basin, including surface and groundwater.” The river basin as a unit of water management is also the unit given official endorsement by the United Nations in the International Law Commission and the Economic Commission for Europe (ECE)³⁰⁷ and in the ILA Helsinki Rules, as well as in regional water agreements in the OECD.³⁰⁸

While regional treaties that focus on transboundary water basins may be useful as a framework for designing a joint management system in the case of the Guarani Aquifer and provide essential information for designed integrated water management systems, there are few explicit references to groundwater in these treaties. The Treaty for Amazonian Cooperation and the Treaty on the River Plate Basin, for example, do not mention groundwater at all; “[t]reaties that focus on pollution usually mention groundwater, but do not quantitatively address the issue.”³⁰⁹ Furthermore, the River Plate Treaty does not contain any criteria for water allocations, nor does it create any supralegal authority, relying for compliance on each member state’s own legal system.³¹⁰

A second problem is the plurality of cooperation treaties in seeking to establish legal obligations and binding principles of law, as well as institutional authority. In the area of the River Plate Basin alone, there are eighteen bilateral and multilateral treaties³¹¹ in addition to the multilateral framework

(stating that “[t]he hydrographic basins of the Amazon and the Prata are responsible for approximately 70% of the available water in South America. They have drainage areas located, respectively, in 60% and 45% of Brazilian territory”) (translated by author).

306. Dublin Statement on Water and Sustainable Development, Int. Conf. on Water & the Env’t (Jan. 31, 1992), available at <http://files.inpim.org/Documents/DublinStatmt>.

307. Convention on the Protection and Use of Transboundary Watercourses and International Lakes, Mar. 17, 1992, 1936 U.N.T.S. 269.

308. LUDWIK A. TECLAFF, WATER LAW IN HISTORICAL PERSPECTIVE 526–27 (1985).

309. HEATHER L. BEACH ET AL., TRANSBOUNDARY FRESHWATER DISPUTE RESOLUTION: THEORY, PRACTICE, AND ANNOTATED REFERENCES 52 (2000). “Only three agreements deal specifically with [transboundary] groundwater supply: the 1910 Convention between Great Britain and the Sultan of Abdali; the 1994 Jordan–Israeli and 1995 Palestinian–Israeli Agreements.” *Id.*

310. *Id.* at 116. A case study of the River Plate Basin notes that the main project in the basin, the “Hydrovia” project to improve barge transportation, was approved in 1989, and involves dredging and straightening “major portions of the Paraná and the Paraguay [Rivers], including through the Pantanal wetlands” despite opposition from environmentalists and those dependent on traditional economies. *Id.* at 115.

311. See Aaron T. Wolf, *Thematic Maps: Visualizing Spatial Variability and Shared Benefits*, in ATLAS OF INTERNATIONAL FRESHWATER AGREEMENTS 14, 14 (United Nations Env’t Program & Oregon State Univ. (OSU) et al. eds., 2002) (illustrating the distribution of water treaties in terms of the geological water basins affected); *id.* at 166–67 (listing each of the treaties affecting the River Plate (La Plata) Basin). See also EDITH BROWN WEISS ET AL., INTERNATIONAL ENVIRONMENTAL LAW AND POLICY 44–52 (1998) (exploring the development of overlapping political structures in international law).

Treaty of the River Plate Basin of 1969. The potential difficulties and duplication of efforts are obvious. “Conflicts between regulations within the same legal system are problematic, from a policy point of view, because they interfere with the coherence and, as a result, the efficiency of the respective legal system.”³¹²

d. A Specific Initiative: The Guarani Aquifer Project.—The “Environmental Protection and Sustainable Development of the Guarani Aquifer System Project” (Guarani Aquifer Project or SAG) is an initiative funded by the Governments of Argentina, Brazil, Paraguay, and Uruguay, matched by funds from the World Bank’s Global Environment Facility,³¹³ with the Organization of American States (OAS) as the project’s administrative agency through its Unit for Sustainable Development and Environment (USDE).³¹⁴

The Guarani Aquifer Project is preventive in nature, seeking to delineate and implement a common institutional framework for managing and preserving the Guarani Aquifer for current and future generations. The long-term objective of the process is thus the sustainable management and use of the Guarani Aquifer. Joint development and implementation of a “Guarani Aquifer Management Framework” is the core of the Project; the other project components are designed to provide the scientific, technical, social, legal, institutional, financial, and economic basis for this framework.³¹⁵

Legal and management regimes needed to protect this resource require better knowledge of the aquifer itself, including delineating the western border of the aquifer in Argentina and determining the character and dimensions of the aquifer as “unconfined” (connected to surface waters).³¹⁶ The Guarani Aquifer Project is preparing comprehensive, standardized inventories of the aquifer data (physical and biological resources, demographic, social, and economic uses). There is also a special academic

312. RÜDIGER WOLFRUM & NELE MATZ, CONFLICTS IN INTERNATIONAL ENVIRONMENTAL LAW 1 (2003).

313. The Global Environment Facility (GEF), with over a billion dollars pledged in the first three-year pilot phase, from 1991 to 1993, was not established by formal treaty but by simple resolution of the World Bank’s Executive Directors; it was subsequently restructured in 1994. PETER H. SAND, TRANSNATIONAL ENVIRONMENTAL LAW: LESSONS IN GLOBAL CHANGE 55–56 (1999). “The GEF’s main function is to support activities and projects aiming at global environmental benefits within four GEF focal areas: global climate protection, biological diversity, international waters and the ozone depletion.” WOLFRUM & MATZ, *supra* note 312, at 196.

314. See MILETTO & KIRCHHEIM, *supra* note 210, at 3 (discussing the Guarani Aquifer Project).

315. As of March 2005, two of the best websites on the Guarani Aquifer are the official project website, available at www.sg-guarani.org, and the Brazilian Government’s National Water Agency website, available at www.ana.gov.br.

316. See, e.g., MILETTO & KIRCHHEIM, *supra* note 210, at 1 (explaining that a general “lack of coherent, systematic information” about aquifers “generally translates into fragmented policies and no long-term management strategies”).

fund for research on the Guarani Aquifer. SAG is developing and implementing a system to collect data, stimulate information exchange, and provide access to data for concerned states, the general public, and nongovernmental organizations (NGOs) for better planning and cooperative management of this resource.

Other priorities of the Guarani Aquifer Project include analyses of the national and international legal framework; enhanced public participation, especially for indigenous peoples; and assessment of the geothermal energy potential.³¹⁷ Four case studies, or pilot projects, focus on important transboundary areas where the quality or quantity of water may be particularly threatened: Concordia-Salto, Rivera-Santana, Encarnación-Ciudad del Este, and Riberião Preto near São Paulo.³¹⁸

There are global and regional benefits to be derived from the Guarani Aquifer Project even at this stage of rudimentary knowledge and administration of the aquifer's waters. The new data and better scientific understanding of the aquifer provide the four countries involved with an opportunity to plan for the integrated management and use of this important reserve of drinking water. SAG thus promises to provide a mechanism and stimulus within a short time frame (2003–2007) to enable the planning of strategic and cooperative measures to protect the transboundary water resource of the Guarani Aquifer.

e. Principles of International Environmental Law and International Water Law Applicable to the Guarani Aquifer.—Soft law, customary international law, and regional and multilateral treaties related to fresh water all contain references to common legal principles that can be used as a foundation for the shared management of the Guarani Aquifer.

International soft law or customary law on the environment³¹⁹ applicable to groundwater, as well as international law on fresh water, such as the framework guidelines of the 1997 United Nations Watercourses Convention, include, at a minimum, the following principles:³²⁰ a duty to

317. *Id.* at 3.

318. *Id.*

319. See, e.g., PATRICIA BIRNIE & ALAN BOYLE, INTERNATIONAL LAW AND THE ENVIRONMENT (2d ed. 2002); ALEXANDRE KISS & DINAH SHELTON, INTERNATIONAL ENVIRONMENTAL LAW (1991); VED P. NANDA & GEORGE (ROCK) PRING, INTERNATIONAL ENVIRONMENTAL LAW AND POLICY FOR THE 21ST CENTURY (2003). One comprehensive recent U.S. casebook and treaty supplement is INTERNATIONAL ENVIRONMENTAL LAW AND POLICY (David Hunter et al. eds., 2d ed. 2002) and INTERNATIONAL ENVIRONMENTAL LAW AND POLICY, TREATY SUPPLEMENT (David Hunter et al. eds., 2002). Principles are also elaborated in the IUCN ENVTL. LAW PROGRAMME, *supra* note 287.

320. See, for example, standard works on international water law, such as TANZI & ARCARI, *supra* note 270 (providing an in-depth analysis of the United Nations Convention on the Law of International Watercourses); TECLAFF, *supra* note 227, ch. XI (providing a brief history of the development of international water law); and Utton, *supra* note 200 (describing the social and environmental changes behind the development of international water law).

cooperate;³²¹ a commitment to balancing short-term demands with long-term objectives in the interest of present and future generations;³²² a commitment to sustainable use and freshwater resource protection;³²³ a commitment to the prevention of harm and the precautionary principle or approach;³²⁴ a duty to notify neighboring states of activities which may affect water quality or quantity (both planned measures and data sharing);³²⁵ a duty to combat pollution;³²⁶ a commitment to the principle of equitable utilization of groundwater resources;³²⁷ a commitment to the principle of causing no

321. U.N. Watercourses Convention, *supra* note 236, art. 8. See e.g., THE IMPACT OF INTERNATIONAL LAW ON INTERNATIONAL COOPERATION: THEORETICAL PERSPECTIVES 1 (Eyal Benvenisti & Moshe Hirsche eds., 2004) (detailing “the influences international norms and institutions have over incentives of states to cooperate on issues such as environment and trade”).

322. See generally THOMAS M. FRANCK, FAIRNESS IN INTERNATIONAL LAW AND INSTITUTIONS 351 (1998) (describing intergenerational equity as one of the motivating forces behind the development of international environmental law); EDITH BROWN WEISS, IN FAIRNESS TO FUTURE GENERATIONS: INTERNATIONAL LAW, COMMON PATRIMONY, AND INTERGENERATIONAL EQUITY (1989) (examining the principle of intergenerational equity in environmental law).

323. Sustainable development is “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” THE WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT, OUR COMMON FUTURE 8 (1987). See also the Rio Declaration of 1992, U.N. DEP’T OF ECON. & SOCIAL AFFAIRS, *Rio Declaration on Environment and Development*, U.N. Doc. A/CONF.151/26 (Vol. I) [hereinafter *Rio Declaration*], reprinted in U.N. DEP’T OF PUBLIC INFO., AGENDA 21: PROGRAMME OF ACTION FOR SUSTAINABLE DEVELOPMENT, U.N. Sales No. E.93.I.11 (1993), available at <http://www.un.org/documents/ga/conf151/aconf15126-1annex1.htm>; ENVIRONMENTAL LAW INSTITUTE, STUMBLING TOWARD SUSTAINABILITY (John C. Dernback ed., 2002); Nicholas Robinson, *Legal Structure and Sustainable Development: Comparative Environmental Law Perspectives on Legal Regimes for Sustainable Development*, 3 WID. L. SYMP. J. 247 (1998).

324. The precautionary principle or approach, as formulated in Rio Principle 15, states: “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.” *Rio Declaration*, *supra* note 323, Principle 15. See also Berlin Rules, *supra* note 228, at 355, 364, 373, 385. See generally THE PRECAUTIONARY PRINCIPLE AND INTERNATIONAL LAW: THE CHALLENGE OF IMPLEMENTATION (David Freestone & Ellen Hey eds., 1996) [hereinafter THE PRECAUTIONARY PRINCIPLE] (collecting scholarly analysis of the precautionary principle).

325. U.N. Watercourses Convention, *supra* note 236, arts. 9, 11–19. For other examples of this principle’s use in multilateral treaties see UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT, CONVENTION ON BIOLOGICAL DIVERSITY, U.N. Doc. ST/DPI/1307 (1992) [hereinafter U.N. CONVENTION ON BIOLOGICAL DIVERSITY], reprinted in 31 I.L.M. 818 (1992); UNITED NATIONS ENVIRONMENT PROGRAMME, STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS, U.N. Doc. UNEP/POPS/CONF/2 (2001) [hereinafter STOCKHOLM CONVENTION], reprinted in 40 I.L.M. 532 (2001).

326. U.N. Watercourses Convention, *supra* note 236, art. 21. This Article adopts the definition of “pollution of an international watercourse” specified by the Convention, as being “any detrimental alteration in the composition or quantity of the waters of an international watercourse which results directly or indirectly from human conduct.” *Id.*

327. MCCAFFREY, *supra* note 272, at 324–44. See also U.N. Watercourses Convention, *supra* note 236, arts. 5–6 (addressing the principle of equitable utilization and specifying the factors to be used in determining equitable and reasonable utilization of water). Equitable utilization was discussed by the ICJ, quoting Article 5(2) of the Watercourses Convention, in its decision in *Gabčíkovo-Nagymaros Project* (Hung. v. Slov.), 1997 I.C.J. 7, 80 (Sept. 25). The U.N. International Law Commission indicated that this principle “leav[es] behind the vexatious and

significant harm to other states,³²⁸ and a commitment to the preservation of ecosystems.³²⁹ Further, the ILA Berlin Rules on Water embrace concepts of ecological integrity³³⁰ and conjunctive management.³³¹

Principles of international water law and management techniques developed for surface waters, such as equitable utilization (and the factors for determining “equitable and reasonable use”) and integrated water resources management (IWRM),³³² are equally applicable to groundwater if care is given to accommodate the special conditions of all types of groundwater and specific characteristics and vulnerabilities of transboundary groundwater resources like the Guarani Aquifer.

These principles of international environmental law and international or transboundary water law were recognized as a basis for cooperative management of a river basin area by the International Court of Justice (ICJ)³³³ in the case concerning the Gabčíkovo-Nagymaros Dam Project between Slovakia and Hungary.³³⁴ The Court addressed Hungary’s contention that changed circumstances (subsequent understanding of the harmful effects of dams on freshwater ecosystems and species) obviated their prior treaty obligations to Czechoslovakia (to which Slovakia succeeded) regarding a joint project to construct a dam on the Danube River,³³⁵ a project that altered the course of the river and otherwise affected wetlands. The

unproductive concern over ‘ownership’ of the perpetually transient waters.” Stephen M. Schwebel, *Third Report on the Law of The Non-Navigational Uses of International Watercourses*, U.N. Doc. A/CN.4/348, reprinted in [1982] 2 Y.B. Int’l L. Comm’n 65, 76, U.N. Doc. A/CN.4/SER.A/1982/Add.1 (Part 1).

328. This concept underlies the earliest international law on transboundary pollution, as in the *Trail Smelter* case between the United States and Canada, *Trail Smelter (United States v. Canada)*, 3 R.I.A.A. 1905 (1941), reprinted in 35 AM. J. INT’L L. 684 (1941), and is part of general principles like good neighborliness. It is an important part of Principle 21 of the STOCKHOLM CONVENTION, *supra* note 325, appearing again in the *Rio Declaration*, *supra* note 323, and in environmental treaties in the 1990s like the U.N. CONVENTION ON BIOLOGICAL DIVERSITY, *supra* note 325.

329. U.N. Watercourses Convention, *supra* note 236, art. 20 (discussing protection and preservation of ecosystems).

330. Berlin Rules, *supra* note 228, at 372.

331. *Id.* at 349.

332. IWRM has been defined by the Global Water Partnership as “‘a process which promotes the coordinated development and management of water, land, and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.’” CARL J. BAUER, *SIREN SONG: CHILEAN WATER LAW AS A MODEL FOR INTERNATIONAL REFORM* 8 (2004), (quoting GLOBAL WATER PARTNERSHIP, *INTEGRATED WATER RESOURCES MANAGEMENT: TECHNICAL ADVISORY COMMITTEE BACKGROUND PAPER NO. 4*, at 22 (2004)).

333. “The International Court of Justice shall be the principal judicial organ of the United Nations.” U.N. CHARTER art. 92, para. 1.

334. *Gabčíkovo-Nagymaros*, 1997 I.C.J. 7.

335. Paul R. Williams, *International Environmental Dispute Resolution: The Dispute Between Slovakia and Hungary Concerning Construction of the Gabčíkovo and Nagymaros Dams*, 19 COLUM. J. ENVTL. L. 1 (1994).

Court upheld the treaty,³³⁶ and ordered the two states to jointly manage the project as originally contemplated, recognizing “[b]oth the obligation of sustainability and the obligation of protection of the environment.”³³⁷ This case has been interpreted as an example of international case law affecting transboundary groundwater.³³⁸ In a famous separate opinion upholding Hungary’s environmental protection claims in this case, Vice President Weeramantry provided a moral, ethical, and religious justification for sustainable development and the protection of water and wetlands that has become frequently quoted by governments and nongovernmental organizations alike, recognizing sustainable development as an integral part of modern international law.³³⁹ It remains to be seen what new cases involving joint management of water resources will arise and in which tribunals.

III. Recommendations for Groundwater Management

A. *Next Legislative Steps: Brazilian National Law on Groundwater*

In the absence of a stable regulatory framework, clarity regarding ownership of assets, or rules governing the award of water permits, it will be very difficult to attract private investments and other forms of private participation in and acceptance of any public management system or legal regime needed for the protection of groundwaters. A federal law on groundwater management and sustainable uses would be a good step for Brazil to take in the near future, including the promulgation of legal provisions tailored specifically to groundwater. For example, there could be a new chapter in the 1997 National Water Act for this purpose. Legislation should include clear definitions of the legislative jurisdiction of the relevant government authorities and application of uniform principles on groundwater based on principles of international environmental law and international water law.

Specifically, governmental rights to control groundwater abstraction and use, as well as all activities with a potential impact on the quantity and quality of groundwater resources, should be explicitly stated. Furthermore, existing provisions of Brazilian law related to water resources generally, explicitly or implicitly including groundwater as outlined in Part I of this Article, should be enforced, including the Constitution of 1988, the 1997 National Water Act, and the Civil Code of 2002. Water Basin Committees

336. Peter H.F. Bekker, *Gabcikovo-Nagymaros Project: International Court of Justice Judgment on Continuing Effect of 1977 Treaty Between Czechoslovakia and Hungary Regarding Danube River Project*, 92 AM. J. INT’L L. 273, 277 (1998).

337. Berlin Rules, *supra* note 228, at 355.

338. 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, 110–12 (1995).

339. *Gabčíkovo-Nagymaros*, 1997 I.C.J. 7 (separate opinion of Vice President Weeramantry).

should be created in all water basins in Brazil pursuant to law, fees for the use of water, as appropriate, should be collected throughout the country, and water permits for every activity, as required by law, should be provided to trained inspectors on a regular basis, with severe penalties for noncompliance with the permit or fee system. References to “multiple uses” should also include “non-use” of some specific quantity of groundwater to be preserved beyond the recharge capacity of the aquifer, adequate to protect biological diversity and ensure availability of clean and sufficient supplies of groundwater in the future.

Public ownership by the national government of *all* groundwater should be clearly defined in national legislation, in Brazil and neighboring countries affecting the Guarani Aquifer,³⁴⁰ through, for example, the cooperative Guarani Aquifer treaty or agreement proposed below. This harmonization effort could reinforce the authority of government to issue permits to restrict the use of groundwater in the public interest, again taking the Brazilian model, and include mechanisms for public participation in groundwater management.

To this end, it would be necessary to draw up precise rules concerning the selection of criteria applicable for the recognition of groundwater use rights and for the granting of permits, taking into account orders of priority for the allocation of available water and the necessities of conservation and sustainable use. Such rules should also determine conditions of transfer, modification, or abolition of use rights. Priorities to use groundwater, however, should be kept flexible so as to satisfy present and future requirements, such as socioeconomic factors. Monitoring and assessment of compliance with regulations, permits, and means of collecting and interpreting data on pollution of groundwater and multiple uses of groundwater need to be recognized as important components of any legal regime or management plan for the transboundary aquifer. In addition, information gathered should be made available to the public and civil society organizations, with an opportunity to comment on or to contribute data.

B. Next Legislative Steps: International Law on the Guarani Aquifer

The exclusion of confined groundwaters makes the applicability of the United Nations Watercourses Convention to the Guarani Aquifer of questionable utility. Conceivably, the Guarani Aquifer (at least as to its limited, unconfined portion) is potentially subject to the Convention, should the relevant states eventually ratify the Watercourses Convention. However, confined aquifers are not subject to the Convention. This is an untenable legal position for a single natural resource. In any case, the Watercourses Convention has not yet created any binding legal obligations on the majority of states involved with the Guarani Aquifer and is unlikely to be signed or

340. See *supra* notes 67–72 and accompanying text.

ratified by Brazil, Argentina, or Uruguay before they must, by necessity, adopt some binding regional arrangements for their shared aquifer.

Nevertheless, it is useful to consider the Watercourses Convention as a guide or framework for a draft regional agreement for the Guarani Aquifer. As Professor McCaffrey noted, “the law of international groundwater may only be said to be, at best, in the embryonic stages of development. The different characteristics and behaviour of groundwater would seem to justify stricter standards and more stringent protection than is applicable to surface water.”³⁴¹ An example of more stringent protection for groundwater would be a requirement to protect fragile recharge zones to prevent pollution of groundwater, which is more sensitive to permanent degradation than surface waters; the legal standard for such an obligation, applying the Watercourses Convention, is that of due diligence.³⁴² Other legal elements of any future law to protect transboundary groundwater could be considered by Brazil, Argentina, Uruguay, and Paraguay in negotiating either a new regional treaty or a joint management plan for the Guarani Aquifer.

I. A New “Guarani Aquifer Cooperation Treaty?”—The current political climate would likely be receptive to a specific treaty dealing with the Guarani Aquifer. Governments in Brazil and Argentina have shown a willingness to engage in environmental treaty-making, and there is a growing regional awareness of the need for integrated water resources management to protect sources of safe drinking water.

Although soft law is *à la mode*,³⁴³ to adequately protect the Guarani Aquifer we need binding obligations enforceable through appropriate dispute resolution mechanisms. A specific new “Guarani Aquifer Cooperation Treaty” would lead to a clearer understanding of the role each state plays in the preservation and equitable utilization of the aquifer and the unique challenges in managing groundwater to prevent pollution and overuse. The first results of the Guarani Aquifer Project could well provide the basis for part of such a treaty or agreement. The practical experience of Argentina, Brazil, Paraguay, and Uruguay with the River Plate Cooperation Committee (CIC)³⁴⁴ and other bilateral agreements constitute positive models for achieving cooperative intergovernmental management of this giant transboundary aquifer. Furthermore, the integration efforts of these same four countries in Mercosul provide an additional cooperative experience on

341. MCCAFFREY, *supra* note 272, at 433.

342. *Id.* at 430–31.

343. It is common to rely on soft law to set out financial duties instead of using treaties to formalize such duties. See, e.g., SAND, *supra* note 313, at 55 (predicting that “today, most treasuries . . . would probably . . . avoid the formalization of financial duties through treaties”). On the success of soft-law instruments like Agenda 21, and the new “fluid” model of environmental regime, see *id.* at 67–71.

344. See *supra* subsection II(C)(2)(a).

which to build a new common groundwater treaty, much as the E.U. is doing through directives and framework policies.

Any Guarani Aquifer Cooperation Treaty should contain, at a minimum, rules on: preventing contamination, especially in sensitive areas of recharge and discharge; liability in case of pollution; allocation of water on an equitable basis including preservation of groundwater; cooperation and sharing of information; participation requirements; and a system of dispute resolution. As a choice of tribunal, recourse to the International Court of Justice seems too remote or expensive for the states involved. Perhaps the new Mercosul Permanent Arbitration Court could be used as optional arbiter of regional disputes arising under the treaty. A nonmandatory provision would allow each state to choose the preferred or appropriate tribunal on a case-by-case basis and to apply to that tribunal with questions on how best to interpret relevant laws. The fact that a comparable approach has already been adopted in Mercosul argues strongly for its incorporation here. This procedure adopted within Mercosul could be useful for inclusion in the proposed Guarani Aquifer Cooperation Treaty³⁴⁵ involving the same four states with scientific and environmental advisors.

2. *A General Regional "Guarani Aquifer Joint Management Agreement?"*—As attainable as it may be, however, a Guarani Aquifer Treaty would not provide a permanent or complete management solution. One danger of focusing on the treaty formulation to solve the Guarani Aquifer problems is that the political will needed to implement the treaty may evaporate in the future. Another risk of depending on a treaty is that the final document may be drafted with too much specificity to allow for flexible management and effective response to changing scientific information, or it may be too general to provide any concrete obligations for the states party. Even if the drafting challenges can be met, perhaps through the use of existing international law as described in this Article, the immediate need to protect the aquifer is too great to wait for new treaties to be negotiated, a process that can be as slow as the flow of groundwater itself.

Other concerns include the potential for political or economic changes in the region over a period of time and the current legitimization crises of Mercosul. Given the shortcomings of a treaty solution, a better approach might be to establish a supranational joint management commission under a very broad regional "Guarani Aquifer Joint Management Agreement," signed by the same four member states. The goal of the commission would be the

345. "Adequate freshwater resources are vital to global economic development, environmental protection, and perhaps security." A. Dan Tarlock, *International Water Law and the Protection of River System Ecosystems*, 10 *BYU J. PUB. L.* 181, 181 (1996). See also Eckstein & Eckstein, *supra* note 200, at 203 ("In particular, with ground water consumption reaching and even exceeding sustainable withdrawals in many parts of the world, and in order to avoid future disputes and maximize beneficial use of this shared but finite resource, there is a need to clarify the rights and obligations that states enjoy vis-à-vis transboundary and international ground water resources.").

joint application of integrated water resources management techniques that are either used elsewhere in the world or suggested by current research. One advantage to this is that an environmental management system has the flexibility to respond to new scientific information and best practices, and can better involve the private sector as well as governments in the effort to prevent pollution or overuse of precious water from the Guarani Aquifer.

The proposed Agreement would rest management authority in a supranational body with representatives from each affected state—the “Guarani Aquifer Joint Management Commission” (GAJMC). To avoid institutional barriers, existing regional institutions, like the CIC and Mercosul itself, should be linked to this new GAJMC,³⁴⁶ creating a network of subcommissions and committees in the region. GAJMC could be modeled on aspects of existing bodies, such as the Brazilian Water Basin Committees³⁴⁷ or the transboundary U.S.–Canada Joint Commission for the Great Lakes.³⁴⁸ The GAJMC would be responsible for developing a plan for integrated water resources management of the Guarani Aquifer that would both protect the resource and permit rational use under specific conditions and priorities to be determined by GAJMC itself in line with the legal principles discussed above.

If Mercosul itself signed the proposed regional Guarani Aquifer Joint Management Agreement as an independent party, the subregional dispute resolution system of the Olivos Agreement and the Permanent Arbitration Tribunal established under Mercosul could be used for dispute resolution, or for preventive consultations on issues related to the Guarani Aquifer.

Some specific elements of a proposed new integrated water resources management system for the Guarani Aquifer, whether established by regional treaty or by management agreement might include:

- developing mechanisms for cooperation with national water basin and aquifer committees to promote collaborative regional management and create a system for information gathering and sharing;
- linking the decisions of the GAJMC with those of the Mercosul Working Group on Environmental Issues and the Ad Hoc Group on the Guarani Aquifer;

346. See, e.g., Carol Reardon, *The International Joint Commission: A Possible Model for International Resource Management*, in INTERNATIONAL ENVIRONMENTAL TREATY MAKING 125, 125–42 (Lawrence Susskind et al. eds., 1992) (proposing a new model of international coordination that takes into account multinational organizations and regulations).

347. See *supra* section I(C)(4).

348. On the 1909 U.S.–Canada International Joint Commission for the Great Lakes, see generally Francis, *Binational Cooperation for Great Lakes Water Quality: A Framework for the Groundwater Connection*, 65 CHI.-KENT L. REV. 359 (1989) (discussing the cooperation between the United States and Canada in groundwater regulation).

- creating a cooperative bridge between existing committees created under bilateral treaties and the Treaty on the River Plate and the new GAJMC;
- eliminating the legal inconsistencies between the treatment of surface water and groundwater;
- using the United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses and the provisions of the ILC Berlin Rules on Water as guidelines in the creation of the Guarani Aquifer Agreement or Treaty; and
- connecting existing international institutions, especially those United Nations specialized agencies and intergovernmental and civil society bodies involved with sustainable development and integrated water resources management, with the new GAJMC.

International, regional, and national institutions must be linked to manage the Guarani Aquifer effectively. “Both international and domestic institutions are essential elements in effective international environmental cooperation. Most *transnational* pollution problems arise as by-products of domestic activities such as production of energy, goods and food.”³⁴⁹ The effectiveness of international environmental regimes thus depends on the extent to which regional and national programs implement legal principles and integrated resource management practices adopted in the treaty or agreement. For the Guarani Aquifer, increased use of groundwater and increased pollution make protection of the resource and development of management plans urgent necessities. Criteria for use of the groundwater and rules for the control of pollution must be established; the factors for determining equitable utilization in the 1997 United Nations Watercourses Convention and the 2004 ILA Berlin Rules on Water may be useful guides in deciding regional criteria applicable to the Guarani Aquifer. In any case, it will be up to the new GAJMC to interpret and apply these factors as a whole in each case where a determination is needed as to whether a proposed activity constitutes “equitable utilization” of the groundwater.

Precautionary and integrated management of surface waters and the waters of the Guarani Aquifer; equitable and sustainable use and protection of groundwater; and special protection for recharge areas are all recommended elements of the proposed new treaty or regional management agreement, along with public participation and information sharing. A unified GAJMC should coordinate the implementation of principles and plans for the Guarani Aquifer with the inter-governmental committees of the Treaty on the River Plate (CIC) and Mercosul.³⁵⁰ Ultimately, this

349. Jon Birger Skaereth, *Managing North Sea Pollution Effectively: Linking International and Domestic Institutions*, INT’L ENVTL. AGREEMENTS: POL. L. & ECON., June 2003, at 167, 167.

350. Mercosul created an Ad Hoc Group on the Guarani Aquifer in 2004, separate from the existing general Working Group on the Environment. *Grupo Ad Hoc de Alto Nivel Acuifero*

cooperation could lead to a harmonized legal regime for all waters in the region which takes into account the special characteristics of groundwater. As the Berlin Rules on Water Resources urge in Article 41, *Protecting Aquifers*:³⁵¹

(2) States in fulfilling their obligation to prevent pollution of an aquifer shall take special care to prevent, eliminate, reduce or control: a. The direct or indirect discharge of pollutants, whether from point or non-point sources; b. The injection of water that is polluted or would otherwise degrade an aquifer; c. Saline water intrusion; or d. Any other source of pollution. . . .

(4) States shall integrate aquifers into their programs of general environmental protection, including but not limited to: a. The management of other waters; b. Land use planning and management; and c. Other programs of general environmental protection.

The Guarani Aquifer is a good example of an internally shared water resource intersected by the boundaries between two or more states, and a good candidate for the development of a regional system of aquifer management. The Berlin Rules regarding Transboundary Aquifers in Article 42(4), apply the principle of equitable utilization as follows:

Basin States shall cooperate according to the procedures in Chapter XI to set drawdown rates in order to assure the equitable utilization of the waters of an aquifer referred in paragraph 1 [an aquifer “intersected by the boundaries between two or more States even without a connection to surface waters that form an international drainage basin”], having due regard for the obligation not to cause significant harm to other basin States and to the obligation to protect the aquifer.³⁵²

The challenge is to find a means of implementation of the principles described above before the aquifer is seriously compromised in quality or quantity. To ensure compliance with the legal regulations and guidelines adopted in the future for the Guarani Aquifer, monitoring and assessment will be essential and will involve civil society, academics, and government officials on relevant national, state, and local levels in the collection and in-

Guarani, MERCOSUL Doc. 25/04 (July 7, 2004), available at <http://www.mercosul.org.uy/espanol/snor/normativa/decisiones/2004/ldec04-2.htm>. The group’s mandate was renewed so that a conference can be held to work out remaining points of contention related to aquifer use. *Acuifero Guarani*, MERCOSUL Doc. 48/04 (Dec. 16, 2004), available at <http://www.mercosur.org.uy/espanol/snor/normativa/decisiones/2004/ldec04-3.htm>.

351. Berlin Rules, *supra* note 228, at 387–88. The Commentary to this article notes that “these obligations apply even to an aquifer entirely within a single State because these principles derive from international environmental law rather than instruments directed specifically at transboundary waters.” *Id.* at 388.

352. *Id.* at 389. The Commentary to Article 42 argues that this is the “most central obligation regarding internationally shared aquifers. States cannot exploit more than their appropriate share of groundwater, whether from a renewable or from a non-renewable aquifer, under the principle of equitable utilization. . . . [T]he rule of preventing significant harm applies to transboundary aquifers, having due regard to the rule of equitable utilization.” *Id.* at 390.

terpretation of data. Finally, the proposed agreement should be flexible enough to permit changes based on new scientific information, including the studies being developed in the SAG project.

Mercosul provides a strong opportunity for Argentina, Brazil, Paraguay, and Uruguay to consider the role of the Guarani Aquifer in social and economic development while providing for environmental protection of the resource. One recent study, based on discussions with the public, agrobusiness, and industrial and thermal tourism users, concluded that the specific rules and legislation for rational use of the Guarani water were necessary; in those rules, control and shared management of the aquifer should be coupled with “an integrated social-environmental responsibility system for use of hydric resources from the Guarani.”³⁵³

IV. Conclusion

The Brazilian Constitution of 1988 and the 1997 National Water Act contain many features of a forward-looking legal regime for water, including allocation of water based on public ownership of water, the multiple uses doctrine, the right to use water under a government-permitting system, and the user-pays principle. In addition, Brazilian water law is affected by developing international norms related to the non-navigable uses of international watercourses, both surface water and groundwater. The growing body of international water law and international environmental law incorporates principles such as equitable utilization,³⁵⁴ the obligation not to cause harm to other states;³⁵⁵ prevention and precaution;³⁵⁶ the duties to cooperate, inform, consult, and negotiate,³⁵⁷ and inter- and intragenerational equity.³⁵⁸

Considering the size and purity of Brazil’s freshwater resources and the growing demand for these waters, as well as the threat to those resources from pollution, it is clear that Brazil is paying attention to the strategic importance of developing cooperative management systems and rules on a national and regional level to protect freshwater resources into the future. In

353. BORGHETTI ET AL., *supra* note 190, at 30. The authors recommend the creation of a “Guarani Management Committee” and a “Social-Environmental Responsibility Fund” to collect user fees and apply the funds to social projects in the region where business users are located as well as to environmental clean-up in cases of pollution and degradation of the aquifer. *Id.* at 31.

354. U.N. Watercourses Convention, *supra* note 236, art. 5 (requiring the “[e]quitable and reasonable utilization” of water resources).

355. NANDA & PRING, *supra* note 319, at 218 (noting that the rule requires states “not to use water in a way that causes ‘significant’ transboundary harm—in quality or quantity—to other basin states’ interests,” and that “[t]his is really just an extension to the water field of the Stockholm 21/Rio 2 prohibition against transboundary damage”). The authors comment on the conflict between the principles of “equitable utilization” and “no significant harm.” *Id.* at 203–07.

356. James Cameron & Juli Abouchar, *The Status of the Precautionary Principle in International Law*, in THE PRECAUTIONARY PRINCIPLE, *supra* note 324, at 29, 29–31.

357. BIRNIE & BOYLE, *supra* note 319, at 105.

358. *See generally* WEISS, *supra* note 322.

this context, preserving Brazil's surface waters and groundwaters requires careful planning to enforce existing laws, meet demands for multiple uses according to rights guaranteed by Brazilian law, prevent pollution, avoid conflicts, and meet international challenges ahead. By using existing international soft law, custom, and treaties relevant to groundwater as potential models for a new regional treaty or management agreement, Brazil and its neighbors may be able to protect the quantity and quality of the waters of the Guarani Aquifer, recognizing the special characteristics of this transboundary groundwater resource.

In fact, the case of the Guarani Aquifer may be the test of Brazil's ability to achieve the lofty goals in the Constitution and National Water Act and the desire to achieve regional integrated management of water resources based on international principles of equitable sharing, prevention and precaution, "no harm," cooperation and consultation, intergenerational equity, and sustainable development. Environmental protection, sustainable economic and social growth, and the ability to meet the water needs of all people in the nation and in the region require no less, now and for future generations.