BLUE RUSH: IS AN INTERNATIONAL PRIVATIZATION AGREEMENT A VIABLE SOLUTION FOR DEVELOPING COUNTRIES IN THE FACE OF AN IMPENDING WORLD WATER CRISIS?

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Water is "[o]ne of the world's great business opportunities. . . . [It] promises to be to the 21st century what oil was to the 20th century: the precious commodity that determines the wealth of nations."[1]

I. INTRODUCTION

Water is essential for all facets of human life.[2] While humans can survive without food for weeks, if deprived of water they will die within a few days.[3] Alarmingly, scholars and researchers predict that by 2015 blue water[4] flows will be unable to meet domestic, industrial, and agricultural needs because pollution, unsustainable use, and exponential increases in the global population have already greatly strained water resources beyond their capacity to recharge.[5] In the face of such a severe water crisis, the international community is searching for a new approach to water resource management.[6] Accordingly, the United Nations General Assembly adopted a draft resolution that proclaims

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1. Shawn Tully, *Water, Water Everywhere*, FORTUNE MAG., May 15, 2000, http://www.mindfully.org/w ater/water-everywhere15may02.htm.

2. DANTE A. CAPONERA, PRINCIPLES OF WATER LAW AND ADMINISTRATION: NATIONAL AND INTERNATIONAL 1 (1992). *See infra* notes 29-37 and accompanying text.

3. JEFFREY ROTHFEDER, EVERY DROP FOR SALE 14 (2001).

4. RETHINKING WATER MANAGEMENT INNOVATIVE APPROACHES TO CONTEMPORARY ISSUES 65 (Caroline M. Figueres et al. eds., 2003) [hereinafter INNOVATIVE APPROACHES]. Blue water is the main source for human use and, thus, the focus of water resource management. *Id.* It is comprised of renewable runoff from streams, lakes, and groundwater recharge. *Id.*

5. *See* NAT'L INTELLIGENCE COUNCIL, GLOBAL TRENDS 2015: A DIALOGUE ABOUT THE FUTURE WITH NONGOVERNMENT EXPERTS 9 (NIC 2000-02, Dec. 2000), http://www.cia.gov/cia/reports/globaltrends2015/gl obaltrends2015.pdf [hereinafter GLOBAL TRENDS 2015]; WORLD WATER ASSESSMENT PROGRAMME, United Nations Educ., Scientific & Cultural Org., WATER FOR PEOPLE WATER FOR LIFE THE UNITED NATIONS WORLD WATER DEVELOPMENT REPORT 251, U.N. Sales No. 92-3-103881-8 (2003) [hereinafter WATER FOR PEOPLE].

6. TERENCE RICHARD LEE, WATER MANAGEMENT IN THE 21ST CENTURY 1 (1999). *See also* Rona Nardone, Note, *Like Oil and Water: The WTO and the World's Water Resources*, 19 CONN. J. INT'L L. 183, 183 (2003). "[T]he international community will have to work together to overcome the substantial cultural, financial, regulatory and operational challenges of the world water crisis". *Id.*

2005 to 2015 as the "International Decade for Action – Water for Life."[7] "The Decade will focus on water-related issues, at all levels and on the implementation of programmes and projects, and the furtherance of cooperation at all levels, in order to help to achieve the internationally agreed water-related goals."[8]

In 1992, delegates at the International Conference on Water and Environment officially encouraged States to treat water as an economic good,[9] giving rise to numerous economic approaches to water management.[10] Since then, uncertain supply and increasing water demands have produced new markets for the international commodification[11] of water.[12] Nevertheless, treating water as an economic good remains a controversial idea.[13] For example, one of the most intensely debated economic approaches to water management is the privatization of water systems.[14] Under this approach, governments, including municipalities, solicit private companies "to take over the management, operation, and sometimes even the ownership of the public water sector."[15]

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7. *International Decade for Action, "Water for Life," 2005-2015*, G.A. Res. 58/217, U.N. GAOR, 58th Sess., Agenda Item 95, at 1, U.N. Doc. A/RES/58/217 (2005), http://www.unesco.org/water/water_ celebrations/decades/water_for_life.pdf [hereinafter U.N. Doc. A/RES/58/217].

8. *UN Declares International Water Decade "Water for Life," at* http://www.gdrc.org/uem/water/decade _05-15/ (n.d.) (last visited Nov. 13, 2005) [hereinafter *Water for Life*].

9. Christopher Gordon, Symposium, *Freshwater Ecosystems in West Africa: Problems and Overlooked Potentials*, (Feb. 1998), http://www.aaas.org/international/africa/ewmi/gordon.htm.

10. *See generally* JAMES WINPENNY, MANAGING WATER AS AN ECONOMIC RESOURCE (1994); JOHN C. BERGSTROM ET AL., THE ECONOMIC VALUE OF WATER QUALITY (2001).

11. PETER H. GLEICK ET AL., PAC. INST. FOR STUDIES IN DEV., ENV'T & SECURITY, THE NEW ECONOMY OF WATER THE RISKS AND BENEFITS OF GLOBALIZATION AND PRIVATIZATION OF FRESH WATER 3 (Feb. 2002), http://www.pacinst.org/reports/new_economy_of_water/new_economy_of_water.pdf [hereinafter New Economy]. "'Commodification' is the process of converting a good or service formerly subject to many non-market social rules into one that is primarily subject to market rules." *Id.*

12. Nardone, *supra* note 6, at 183. For example, there is already an established and rapidly expanding market for bottled water. NEW ECONOMY, *supra* note 11, at 11-12. During the 1990s, bottled water sales alone exceeded 50 billion liters. *Id.* In addition to existing markets, several countries are currently considering proposals for bulk water–trading, including the United States, Canada, Iceland, Malaysia, and Turkey. Nardone, *supra* note 6, at 184.

13. INNOVATIVE APPROACHES, *supra* note 4, at 41-65; THE POLITICAL ECONOMY OF WATER PRICING REFORMS (Ariel Dinar ed., 2000) [hereinafter WATER PRICING]; Maude Barlow, *Water as Commodity –The Wrong Prescription*, 7 BACKGROUNDER 3 (2001) (published by FOOD FIRST: INST. FOR FOOD AND DEV. POL'Y), http://www.foodfirst.org/pubs/backgrdrs/2001/s01v7n3.html. *But see* Palm Beach Isles Assocs. v. United States, 208 F.3d 1374 (Fed. Cir. 2000) (noting that in the United States, commerce clause jurisprudence already recognizes the economic value of water).

14. NEW ECONOMY, *supra* note 11, at 21.

15. *Id.* at i.

Privatization is not a novel idea. In fact, private entrepreneurs have provided water to Latin American cities since colonial times.[16] What is causing all the controversy? Because public water sectors have been unable to satisfy water needs for all people, there has been a substantial increase in the extent of privatization efforts.[17] For instance, international aid agencies and water organizations, such as the World Bank and the World Water Council, strongly encourage developing countries to privatize water and sanitation service provision.[18] Consequently, multinational corporations have aggressively pursued responsibility for a larger portion of the water service market.[19] Economists and scholars further encourage privatization because they believe that allowing developing countries to use their abundant water resources will result in sizeable economic improvements.[20]

At the same time, there is a growing public awareness and attention to problems associated with privatization efforts.[21] Opponents of privatization fear that water privatization will infringe upon the human right to water because profit-driven companies will be reluctant to serve the poor.[22] To add to the opponents' concerns, numerous water privatization projects have recently failed or have caused substantial controversy.[23] For example, in 2002, experts

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16. TOVA MARIA SOLO, THE WORLD BANK, INDEPENDENT WATER ENTREPRENEURS IN LATIN AMERICA THE OTHER PRIVATE WATER SECTOR IN WATER SERVICES 8 (May 2003), *available at* http://www.wsp.org/publications/SSIP.pdf.

17. NEW ECONOMY, *supra* note 11, at 21. *See also* INNOVATIVE APPROACHES, *supra* note 4, at 51. "Between 1984 and 1990, only eight new private water and sewage contracts were signed in developing countries, compared with 97 between 1990 and 1997." *Id.* (citation omitted).

18. NEW ECONOMY, *supra* note 11, at 21. In 2000, the World Water Forum in the Hague called for greater involvement from the private sector to attain funding for solving water problems. *Id.* The "Framework in Action," distributed at the meeting, called for ninety-five percent of new water investments to come from the private sector. *Id.*

19. *Id.*

20. *See* Shashank Upadhye, *The International Watercourse: An Exploitable Resource for the Developing Nation Under International Law?*, 8 CARDOZO J. INT'L & COMP. L. 61, 61-62 (2000).

21. *See, e.g.*, World Bank Group, *Multilateral Initiative To Manage South America's Largest Groundwater Reservoir Launched, at* http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,content MDK:20113114~menuPK:34466~pagePK:64003015~piPK:64003012~theSitePK:4607,00.html (May 23, 2003); ELISABETH TUERK ET AL., CTR. FOR INT'L ENVTL. L., GATS AND WATER: RETAINING POLICY SPACE TO SERVE THE POOR (Aug. 2003), http://www.ciel.org/Publications/GATS_5Sep03.pdf [hereinafter RETAINING POLICY]; Global Exchange, *Top Ten Reasons to Oppose the Free Trade Area of the Americas, at* http://www.globalexchange.org/campaigns/ftaa/topten.html (last modified Sept. 13, 2005).

22. RETAINING POLICY, *supra* note 21, at 2.

23. *See, e.g.*, NEW ECONOMY, *supra* note 11, at 21; CRITICAL MASS ENERGY AND ENV'T PROGRAM, PUB. CITIZEN, WATER PRIVATIZATION CASE STUDY: COCHABAMABA, BOLIVIA, http://www.citizen.org/documents/Bolivia_(PDF).PDF (n.d.) (last visited Oct. 2, 2005) [hereinafter COCHABAMABA]; Dustin Van Overbeke, Project, *Water Privatization Conflicts, Water is Life, at* http://www.uwec.edu/grossmzc/VAN OVEDR/ (Spring 2004); PUB. CITIZEN, WATER PRIVATIZATION FIASCOS: BROKEN PROMISES AND SOCIAL TURMOIL (Mar. 2003), http://www.citizen.org/documents/privatizationfiascos.pdf [hereinafter PRIVATIZATION FIASCOS].

declared one of the world's largest privatization efforts, located in Manila, Philippines, a failure because of several factors, including enormous increases in water rates, an increase in water losses due to leaks or unauthorized connections, inability to attain provision of service goals, and a lack of private funding to continue programs for the urban poor.[24] There is also a cloud of controversy surrounding water privatization schemes in Jakarta, Indonesia.[25] Originally, the World Bank endorsed contracts awarded to companies controlled by the family of the Surharto dictatorship, despite the institution's advocacy of open bidding and transparency in privatization efforts.[26] Although national law and local regulations prohibited foreign investment in drinking water, the government later awarded the privatization contracts to two foreign entities.[27]

With these considerations in mind, this Note explores the potential contribution of an international water privatization agreement to optimize the use of international water resources, focusing on water resources planning for the Guarani Aquifer in Brazil, Argentina, Uruguay, and Paraguay (the Guarani States). Part II discusses the importance of water as a commodity and, specifically, the importance of groundwater resources. Part III examines privatization, concluding that, with proper risk management, it is a viable solution to the world water crisis. However, because the Guarani Aquifer is a transboundary water supply, it is subject to international law.[28] Therefore, the Guarani countries have an obligation to reconcile domestic privatization efforts with international water law principles. Part IV discusses applicable international water law. Part V proposes an international plan for privatization that complies with international water law principles and rules. Such a plan would be among the first to coordinate privatization of a transboundary aquifer at an international level.

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24. Mae Buenaventura et al., *Debt, Trade and the Privatization of Water Services*, *at* http://www.jubileesouth.org/news/EpZyVykZkysCPeKses.shtml (Dec. 12, 2003).

25. PRIVATIZATION FIASCOS, *supra* note 23, at 6.

26. *Id.*

27. *Id.*

28. See Amy Hardberger, Comment, *What Lies Beneath: Determining the Necessity of International Groundwater Policy Along the United States – Mexico Boarder and a Roadmap to an Agreement*, 35 TEX. TECH L. REV. 1211, 1212 (2004) (suggesting that international law applies to bodies of water accessible to more than one country).

II. WHY IS WATER SUCH A VALUABLE COMMODITY?

Since water fulfills vital social and cultural roles,[29] control over water supplies and flow presents a tremendous business opportunity for countries and multinational corporations.[30] Access to a sustainable supply of water is an important building block of social stability and the economic development of any civilization.[31] Such access can alleviate poverty and heath problems,[32] reduce gender inequalities,[33] and foster adequate food supplies.[34] Culturally, water is a symbolic component in ceremonies of most of the world's major religions[35] and in the national identities of many native peoples.[36] In short, the availability of fresh water and how countries choose to use it affects how people live.[37]

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29. NEW ECONOMY, *supra* note 11, at i. *See also* Agenda 21, U.N. Doc. A/CONF.151/4 (1992), ch. 18 ¶ 68(a), ("Water should be regarded as a finite resource having . . . significant social and economic implications reflecting the importance of meeting basic needs"); *Ministerial Declaration of The Hague on Water Security in the 21st Century*, *at* http://www.thewaterpage.com/hague_declaration.htm (Mar. 22, 2000):

> To manage water in a way that reflects its economic, social, environmental and cultural values for all its uses, and to move towards pricing water services to reflect the cost of their provision. This approach should take account of the need for equity and the basic needs of the poor and the vulnerable.

Id.

30. Int'l. Forum on Globalization, *Free Trade of the Americas and the Threat to Water*, *at* http://www.if g.org/programs/ftaawater.htm (n.d.) (last visited Oct. 3, 2005). Globally, water privatization is already a $400 billion per year industry. *Id.* Overall, the privatization of water industry is one-third larger than the global pharmaceuticals industry. *Id. See also* INNOVATIVE APPROACHES, *supra* note 4, at 51 (noting that the U.S. private water sector generates more than $80 billion per year, which is four times the sales of Microsoft Corporation).

31. CAPONERA, *supra* note 2, at 11. "The history of human civilization is intertwined with the history of the ways humans have learned to manipulate and use water resources." PETER GLEICK ET AL., THE WORLD'S WATER THE BIENNIAL REPORT ON FRESHWATER RESOURCES 2002-2003 2 (2002) [hereinafter BIENNIAL REPORT].

32. *See infra* notes 183-188 and accompanying text.

33. *See* WATER FOR PEOPLE, *supra* note 5, at 251 (noting that the lack of water creates particular hardships for women).

34. *See generally id.* at 203-10 (exploring the use of water in agriculture).

35. World Water Assessment Programme, United Nations Educ., Scientific & Cultural Org., *Valuing Water*, *at* http://www.unesco.org/water/wwap/facts_figures/valuing_water.shtml (n.d.) (last visited Oct. 19, 2005) [hereinafter *Valuing Water*].

> Water is used in Buddhist funerals, poured till overflowing into a bowl placed in front of the monks and the dead body. In Christianity, water is used in several rites, including baptism and washing. In this religion, water symbolizes purification and cleansing. To Hindus, all water is sacred, especially rivers. It is thought to have cleansing properties, and is used to attain both physical and spiritual purity. It is an essential element in nearly all rites and ceremonies. In Islam, water is used for ablutions: worshippers must be pure for prayers. Small pools of water are found within or just outside all mosques for this purpose.

Id. (emphasis omitted)

36. NEW ECONOMY, *supra* note 11, at 9.

37. CAPONERA, *supra* note 2, at 7.

Today, States no longer consider water an unlimited resource.[38] In fact, 1.4 billion people, almost twenty percent of the world's population, do not have access to an adequate supply of potable water.[39] Furthermore, 2.4 billion are without sanitation services, and over 450 million people throughout twenty-nine countries suffer from water shortages.[40] The steady increase in the world's population greatly burdens the water resources.[41] "It took [nearly] all of history up to 1830 to put a billion people on the planet but only one hundred years to add the second billion. The third arrived in just forty-four years and the most recent billion came in a scant twelve years."[42] Every year, the world population increases by ninety million people.[43] As a result of the rising population, water use has tripled since the middle of the last century.[44] The increasing population is the most significant factor affecting water supply and water quality,[45] but it is not the only one.

In addition to a substantial increase in water use, pollution greatly strains the remaining freshwater supplies.[46] Natural pollution can occur in urban and irrigation areas when over-pumping of aquifers allows minerals and saltwater to transfer into the groundwater.[47] However, it is industrial and human waste disposal practices that pose the greatest threat to water quality and human health.[48] This threat is not surprising, given that individuals can produce as much as twenty-nine metric tons of waste per year.[49]

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38. U.N. Doc. A/RES/58/217, *supra* note 7.

39. DIANE RAINES WARD, WATER WARS DROUGHT, FLOOD, FOLLY, AND THE POLITICS OF THIRST 2 (2002). *See also* ROTHFEDER, *supra* note 3, at 4. To meet the minimum quality of life, each individual needs fifty liters of water per day (lpd). *Id.* This equation allows five lpd for drinking, ten lpd for cooking, fifteen lpd for bathing and twenty lpd for sanitation. *Id.* Put into context, in the United States, this would not be enough water to flush an average toilet twice. *Id.* Yet in countries such as Haiti and Gambia, people are only able to attain a meager three lpd, or the equivalent of less than two large bottles of Evian a day. *Id.*

40. Nardone, *supra* note 6, at 183. Accordingly, ten million people die every year from water-related diseases, such as cholera and dysentery. ROTHFEDER, *supra* note 3, at 4.

41. WARD, *supra* note 39, at 3.

42. *Id.* at 2-3.

43. *Id.* at 3.

44. *Id.*

45. LUDWIK A. TECLAFF & ALBERT E. UTTON, INTERNATIONAL GROUNDWATER LAW 1 (1981).

46. CONFLICT MANAGEMENT OF WATER RESOURCES 226 (Manas Chatterji et al. eds., 2002). In developing countries, the three main sources of groundwater pollution are untreated waste, industrial waste, and agricultural activity. *Id.*

47. HENRY C. KENSKI, SAVING THE HIDDEN TREASURE THE EVOLUTION OF GROUND WATER POLICY 22 (1990); INNOVATIVE APPROACHES, *supra* note 4, at 123.

48. KENSKI, *supra* note 47, at 23. For example, businesses without access to sewer systems dispose of wastes in shallow underground cesspools/dry holes or septic tanks. Lenntech, *Sources of Groundwater Pollution*, *at* http://www.lenntech.com/groundwater/pollution-sources.htm (n.d) (last visited Dec. 22, 2005). Dry holes and cesspools introduce wastes directly into the ground, often resulting in groundwater contamination. *Id.* On the other hand, septic tanks cannot treat industrial wastes. *Id.*

49. KENSKI, *supra* note 47, at 23.

Another significant source of pollution is agricultural activities.[50] Large-scale farms release an enormous amount of animal waste and nitrogen into the water and soil systems, with lasting damaging effects.[51] Pollution is especially devastating to groundwater resources because cleanup is extremely expensive and restoration is nearly impossible.[52] Remediation of aquifers requires complex technologies to seal off contaminated areas, alter the groundwater flow, neutralize contaminants, and treat the water of the polluted reservoirs.[53]

Other human activities, such as deforestation and urban development, can contribute to the overall depletion of groundwater resources.[54] These activities diminish soil deposits and can reduce the recharge, availability, and renewability of groundwater resources.[55] For example, in forested areas, the rainwater seeps slowly into underground reservoirs, where it is stored for future use.[56] However, where commercial and urban development destroyed the forests, a lack of soil causes the rainwater to run directly into rivers and streams instead of replenishing the groundwater resources.[57]

A. Finite Supply

The total volume of water in nature, 1.4 billion cubic kilometers, is fixed and invariable.[58] If all of the water on Earth was in a solidified cube, each side would measure about 1,120 kilometers, or about twice the length of Lake Superior.[59] Of this water, about ninety-seven percent is salt water and less than three percent is fresh water.[60] The largest amount of fresh water (about seventy-seven percent) is in a solid state in the polar caps and glaciers.[61]

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50. MAUDE BARLOW & TONY CLARKE, BLUE GOLD THE FIGHT TO STOP THE CORPORATE THEFT OF THE WORLD'S WATER 34 (2002) [hereinafter CORPORATE THEFT].

51. *Id.* at 33. A 100,000-gallon spill of animal waste, laced with antibiotics, killed over 700,000 fish in Minnesota. *Id.* at 33-34. More horrifically, fertilizers used throughout the Midwest have leached into the Mississippi River. *Id.* The nitrogen runoff empties into the Gulf of Mexico where it has created an area of 6,900 square miles (about the size of New Jersey) where nothing can survive. *Id.*

52. INNOVATIVE APPROACHES, *supra* note 4, at 122.

53. KENSKI, *supra* note 47, at 26-27; *see* Karin E. Kemper et al., *Management of the Guarani Aquifer System Moving Towards the Future*, 28 WATER INT'L 185, 189 (June 2003) (noting that portions of the Guarani Aquifer are already substantially polluted).

54. ROTHFEDER, *supra* note 3, at 8-9.

55. NEW ECONOMY, *supra* note 11, at 5.

56. Chris Sudzina, Project, *Final: Methods and Effects of Topical Rainforest Deforestation*, *at* http://jrscience.wcp.muohio.edu/FieldCourses00/PapersCostaRicaArticles/Final.MethodsandEffectsof.html (last modified Nov. 27, 2002).

57. *Id.*

58. Julio Barberis, *The Development of International Law of Transboundary Groundwater*, 31 NAT. RESOURCES J. 167, 167 (1991).

59. CORPORATE THEFT, *supra* note 50, at 5.

60. Barberis, *supra* note 58, at 167.

61. *Id.*

Unfortunately, much of this water is inaccessible.[62] Most of the accessible fresh water, about twenty-two percent, is groundwater.[63] Surface water, found in rivers and lakes, constitutes a meager 0.36 percent of all fresh water.[64] Rainfall is the only phenomenon that can renew these accessible resources.[65]

B. Understanding Groundwater Resources

Groundwater is in various types of aquifers.[66] By definition, an aquifer is a geologic formation with sufficient water storage and transmitting capacity to provide enough water for a useful water supply.[67] In short, aquifers act as natural water reservoirs,[68] providing strategic and cost-effective reserves for water supply.[69] Because aquifers are a natural distribution system,[70] access to groundwater can be cheaper than acquiring surface water in many areas around the world.[71] In addition, groundwater generally does not need to be treated for consumption because the natural filtering process of the subsoil produces water above the quality obtained by normal methods of water treatment.[72] Consequently, over half of the world's population is dependent on groundwater.[73]

Because the purpose of water law is to regulate the use of water, it is essential to understand the natural context of water.[74] Lawyers drafting water policies and treaty agreements must understand hydrogeology,[75] considering

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62. CORPORATE THEFT, *supra* note 50, at 5.

63. Barberis, *supra* note 58, at 167.

64. *Id.*

65. *See infra* notes 81-82 and accompanying text.

66. Gabriel Eckstein & Yoram Eckstein, *A Hydrogeological Approach to Transboundary Ground Water Resources and International Law*, 19 AM. U. INT'L L. REV. 201, 210 (2003) [hereinafter *Hydrogeological Approach*].

67. U.S. Geological Surv., *Water Science for Schools*, *at* http://ga.water.usgs.gov/edu/dictionary.html#A (last modified Sept. 1, 2005).

68. *Hydrogeological Approach*, *supra* note 66, at 210.

69. THE WORLD BANK GROUP, GLOBAL ENVIRONMENT FACILITY PROPOSAL FOR PROJECT DEVELOPMENT FUNDS (PDF) BLOCK B GRANT 2, *at* http://wbln0018.worldbank.org/LAC/Guarani/AR/Doclib.nsf/e6cfa f4d4f3083ad 85256896006bfaea/ccad0ecf0e3a3bef852568f2005c9036/$FILE/Guarani%20pdf-final.doc (n.d.) (last visited Dec. 22, 2005) [hereinafter WORLD BANK GROUP].

70. MIMI JENKINS, CONJUNCTIVE USE WITHOUT MANAGEMENT: YOLO COUNTY, CALIFORNIA'S WATER SUPPLY SYSTEM CONJUNCTIVE USE WITHOUT MANAGEMENT ch. 4 A.2 (Sept. 1992), *at* http://www. dcn.davis.ca.us/dcn/projects/conjunctiveuse/chapt4.html. Water can be accessed without building above-ground distribution systems, whereas distribution systems must be constructed to transport surface water from withdrawal points to areas where it is needed. *Id.*

71. Lisa Gaines et al., Guest Editorial, *Transboundary Aquifers*, 28 WATER INT'L 143, 143 (June 2003).

72. WORLD BANK GROUP, *supra* note 69, at 2.

73. *Hydrogeological Approach*, *supra* note 66, at 201-02.

74. CAPONERA, *supra* note 2, at 5.

75. Robert D. Hayton, *The Law of International Aquifers*, 22 NAT. RESOURCES J. 71, 72 (1982).

that hydrological research has greatly affected the rules applying to ground water.[76] The hydrological cycle is the movement of water from the sea to the atmosphere, from the atmosphere to the earth, and from the earth back to the sea.[77] Generally, experts accept that both surface and groundwater are a part of this cycle.[78] Most aquifers flow to a natural discharge site, such as a spring, river, lake, or the sea.[79] Groundwater flow is a function of gravity, soil porosity and permeability, slope of the groundwater table, ambient air pressure, and temperature.[80] Thus, the flow of groundwater is similar to that of water soaking into a sponge.[81] Aquifers can recharge naturally from rainfall, snow, hail, surface water,[82] or from other aquifers.[83] In addition, activities such as irrigation, dike and canal building, and damming projects can recharge aquifers.[84] Exchanges between surface and groundwater are significant because the conditions affecting the quality and quantity of the water on one side can have consequences for interconnected water resources.[85] For example, surface

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76. Barberis, *supra* note 58, at 168; *Convention on the Law of Non-navigational Uses of International Watercourses*, G.A. Res. 51/229, U.N. GAOR, 51st Sess., U.N. Doc. A/RES/51/229 (1998), reprinted in 36 I.L.M. 700 (1997) [hereinafter *Non-Navigational 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;
> (b) "International watercourse" means a watercourse, parts of which are situated in different States.

Id. These definitions reflect a hydrogeological approach to water law by recognizing the interrelationship between surface and ground water. *Hydrogeological Approach*, *supra* note 66, at 229.

77. *Hydrogeological Approach*, *supra* note 66, at 207-08.

> The hydrologic cycle . . . is the system in which water - solid, liquid, gas, or vapor - travels from the atmosphere to the Earth and back again in a constant cycle of renewal. Generally, water falls from the atmosphere in the form of precipitation, such as rain, snow, and sleet. Water that falls on land either runs over the land into streams, rivers and lakes, or it percolates into the earth. Throughout its surface travels and especially when it reaches large bodies of water, it evaporates through the effects of solar energy and returns to the atmosphere where it continues in the cycle. Plants consume or absorb some water, which they then transpire through their leaves back into the atmosphere.

Id. (citations omitted).

78. Barberis, *supra* note 58, at 169. *See also* Hardberger, *supra* note 28, at 1217 (noting that even aquifers restrained between two impermeable geologic layers can have interaction with surface waters).

79. *Hydrogeological Approach*, *supra* note 66, at 217.

80. *Id.* at 218.

81. *Id.* at 217.

82. CAPONERA, *supra* note 2, at 247.

83. *Hydrogeological Approach*, *supra* note 66, at 220.

84. *Id.*

85. *Id.* at 221.

> [I]t is very common to have mutual relationships between surface and underground water resources that vary in time and space. A river, for example, may discharge water into a related aquifer at one point of its course, and receive

waters polluted by various human activities are a source of groundwater pollution.[86] Pollutants, such as urban sewage, pesticides, and oils, seep untreated into rivers and, thus, into aquifers fed by the rivers.[87]

C. *Application of International Law to Aquifers*

There is little water law precedent concerning aquifers.[88] Countries generally use surface water resources first and do not turn to groundwater resources until the surface supplies become insufficient.[89] Historically, groundwater law derived from ancient customs that recognized groundwater resources as incidental to land ownership.[90] However, because ancient customs did not appreciate the mobility of groundwater, many laws did not address actions, such as over-pumping, that affected the quality of neighboring wells and other groundwater resources.[91] Spanish law, a foundation for water law in Latin America, "traditionally held that groundwaters belonged to the owner of the overlying land."[92] Consequently, Brazil,[93] Argentina, Paraguay, and Uruguay recognize private ownership of water resources "in association with land ownership, up to the point where it flows out of the property concerned."[94]

Clearly, the mobility of water prevents one from viewing it solely in a national context.[95] However, because aquifers lie out of sight beneath the surface of the land, this concept can be harder to grasp.[96] As a result, traditional international agreements omitted provisions pertaining to

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> water from ground water at another; or a given stretch of a river may discharge into an aquifer during the autumn season and receive water in the spring.

Id. (citation omitted).

86. Barberis, *supra* note 58, at 172.

87. *Id.*

88. TECLAFF & UTTON, *supra* note 45, at 4.

89. *See id.* at 5-6.

> [B]ecause law, and governments, respond (with few exceptions) only to felt needs of a society it comes as no surprise that traditionally there has been a failure to focus on the regulation and management of groundwater use in most legal systems. Demand for regulatory action simply has not been insistent.

Id. at 6 (quoting Robert D. Hayton, *The Ground Water Legal Regime as Instrument of Policy Objectives and Management Requirements*, 2 ANNALES JURIS AQUARIUM 272, 275 (proceedings of the Second International Conference on Water Law and Administration, Caracas, Venezuela, Feb. 8-14, 1976)).

90. *Id.* at 6.

91. *Id.* at 6-7.

92. *Id.* at 7.

93. CAPONERA, *supra* note 2, at 111. The Brazilian Mining Code handles groundwater as a mineral. *Id.*

94. *Id.* at 110-11.

95. Hardberger, *supra* note 28, at 1212.

96. Tracy Stitt, Note, *Evaluating the Preliminary Draft Articles on Transboundary Groundwaters Presented by Special Rapporteur Chusei Yamada at the 56th Session of the International Law Commission in Geneva*, May 2004, 17 GEO. INT'L ENVTL. L. REV. 333, 333 (2005) (noting that aquifers are generally "out of sight and out of mind").

groundwater and instead focused solely on transboundary surface waters.[97] Presently, a close analysis of an aquifer's hydrologic system determines if the aquifer is, in fact, a transboundary resource subject to international law.[98] Aquifers are part of an international hydrologic system in four main scenarios.[99] In each case, the implications of water use vary for each country, as illustrated below.[100]

The simplest form of a transboundary aquifer is a confined aquifer[101] divided by an international boundary.[102] By definition, a confined aquifer is an underwater resource that is not linked hydrologically with other ground or surface water resources.[103] This situation is similar to that of a mineral or oil deposit that underlies two or more countries. Any use of this resource may negatively affect other states because overall quantity diminishes.[104] Examples of this model include the Nubian Sandstone aquifer underneath Chad, Egypt, Libya, and Sudan and the Qa-Disi Aquifer underlying southern Jordan and northern Saudi Arabia.[105]

Another type of shared aquifer is an aquifer located entirely within the territory of one state and hydrologically linked with an international river.[106] Implications of water use by one country vary with the direction of surface water flow.[107] For example, if the aquifer recharges the river, changes in use of the aquifer may have an impact on that river,[108] and excessive exploitation of the aquifer could decrease the river's volume.[109] On the other hand, if the river recharges the aquifer, use of the water in the river may alter the hydrological regime of the aquifer.[110] Examples of this model include the Red Light Draw, Hueco Bolson, and Rio Grande aquifers that underlie the United States and Mexico.[111]

An aquifer located entirely within the territory of a single state and hydrologically linked with another aquifer in a neighboring state is a more complex type of shared groundwater.[112] So long as there is a difference in the hydraulic levels between the aquifers, groundwater will percolate from one

97. TECLAFF & UTTON, *supra* note 45, at 9.
98. *See, e.g.*, *Hydrogeological Approach*, *supra* note 66, at 221-49.
99. Barberis, *supra* note 58, at 168.
100. Kemper et al., *supra* note 53, at 193-94.
101. *Hydrogeological Approach*, *supra* note 66, at 212. A confined aquifer is an aquifer located between impermeable layers of the earth's subsurface. *Id.*
102. Barberis, *supra* note 58, at 168.
103. *Id.*
104. Kemper et al., *supra* note 53, at 194.
105. *Hydrogeological Approach*, *supra* note 66, at 248.
106. Barberis, *supra* note 58, at 168.
107. *Id.*
108. Kemper et al., *supra* note 53, at 194.
109. Barberis, *supra* note 58, at 168.
110. Kemper et al., *supra* note 53, at 194.
111. *Hydrogeological Approach*, *supra* note 66, at 238.
112. Barberis, *supra* note 58, at 168.

aquifer to the other.[113] Substantial "withdrawals from one aquifer may decrease the water in both aquifers or can even reverse the direction of flow from one aquifer to the other."[114]

Another type of aquifer subject to international law is an aquifer situated entirely within the territory of one state that has its recharge zone in another state.[115] Modifications in the recharge area, such as damming, may affect water availability and quality in the aquifer.[116] An example of this model is the Guarani Aquifer.[117]

III. PRIVATIZATION

Globally, there are enough freshwater sources to meet the current and future needs of the world's population; a simple solution is redistribution of the resources under a new water management scheme.[118] Scholars and economists promote privatization as a solution that allows countries to tailor water management schemes to meet unmet citizen needs and simultaneously generate revenue.[119]

A. *What is privatization?*

The word "privatization" may suggest water supplies free of government oversight or participation, but in fact, this rarely happens.[120] Instead, privatization refers to a variety of partnerships between governments and private companies with varying degrees of governmental control and oversight of water resources and infrastructure.[121] In fact, very few governments allow

113. *Id.*

114. Kemper et al., *supra* note 53, at 194.

115. Barberis, *supra* note 58, at 168.

116. *Id.*

117. *Hydrogeological Approach*, *supra* note 66, at 246.

118. Eyal Benvenisti, *Collective Action in the Utilization of Shared Freshwater: The Challenges of International Water Resources Law*, 90 AM. J. INT'L L. 384, 384 (1996). "[T]he management of freshwater is largely a question of redistribution of a natural resource, given certain physical, economic, environmental and social constraints." *Id. See also* FED. MINISTRY FOR THE ENV'T, NATURE CONSERVATION & NUCLEAR SAFETY & FED. MINISTRY FOR ECON. COOPERATION & DEV., WATER – A KEY TO SUSTAINABLE DEVELOPMENT, INT'L CONFERENCE ON FRESHWATER 8 (Dec. 3-7, 2001), "), http://www.water-2001.de/outcome/reports/Brief_report_en.pdf. "There is enough water in the world for everyone in the world, but only if we change the way we manage it. The responsibility to act is ours – for the benefit of the present and future generations." *Id.*

119. *See* Innovative Approaches, *supra* note 4, at 46-47.

120. NEW ECONOMY, *supra* note 11, at 26.

121. Nardone, *supra* note 6, at 190. Some of the functions that can be privatized include: capital improvement planning and budgeting; finance, design, and construction of capital improvements; operation and maintenance of facilities; pricing decisions; billing and collection management; payroll of employees or contractors; risk management, and oversight of water quality and service standards. NEW ECONOMY, *supra* note 11, at 26. *See also* Jamie Knotts,

the water itself to come into private ownership or permit a laissez-faire (unregulated) engagement of the private sector.[122] Privatization provides incentives for countries and their private partners to redistribute and conserve water resources and promotes efficiency in water and sanitation services.[123] Furthermore, privatization provides a solution for the common problems of developing countries, such as inadequate financing in the provision of public services[124] and political manipulation[125] of state-owned enterprises.[126]

B. Forms of Privatization

1. Joint Arrangements / Mixed Management

The simplest form of privatization is joint arrangements or mixed management.[127] Under this approach, governments outsource specific tasks, such as operation and maintenance contracts, to private firms.[128] The government retains all ownership of physical assets,[129] but its level of oversight will vary according to the specific arrangement.[130] The private firms are often able to provide both managerial and operational expertise to greatly improve efficiency.[131] In addition, these arrangements offer much-needed flexibility for the government, because they can vary in duration and scope and often include performance-based incentives and penalties[132] that are not available in the public sector.[133] Easy modifications of such agreements enable the government

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Privatization When Public Goes Private, ON TAP MAG. (2003), *at* http://www.nesc.wvu.edu/ndwc/ articles/OT/SP03/Privatization.html.

122. Nancy Alexander, Globalization Challenge Initiative, *Service Apartheid: The World Bank's Private Sector Development Strategy and the PRSP*, (noting "[p]rivatization in an unregulated environment is a recipe for disaster"), *at* http://www.africaaction.org/docs01/priv0110.htm (n.d.) (last visited Dec. 21, 2005).

123. INNOVATIVE APPROACHES, *supra* note 4, at 47. Private companies prioritize maintenance and repairs because lost water means lower profits. *See id.*

124. LEE, *supra* note 6, at 103.

125. Helena Kerr do Amaral, Project, *Brazilian Water Resource Policy in the Nineties* (Dec. 1996) (noting that extensive water sector reforms were needed to improve public services that were rapidly deteriorating due to years of political wrangling over public utilities), *at* http://www.gwu.edu/~ibi/minerva/Fall1996/ Helena.Kerr.Amaral.html.

126. NEW ECONOMY, *supra* note 11, at 26. In a fully public water system the water supply and infrastructure are completely controlled, owned, and operated by a governmental agency. *Id.* In addition, public funds are used to finance the water system operation, including maintenance and construction costs. *Id.*

127. LEE, *supra* note 6, at 99; *New Economy*, *supra* note 11, at 27.

128. INNOVATIVE APPROACHES, *supra* note 4, at 47.

129. Nardone, *supra* note 6, at 190.

130. Robert Vitale, *Privatizing Water Systems: A Primer*, 24 FORDHAM INT'L L.J. 1382, 1386 (2001).

131. Knotts, *supra* note 121. *See also* NEW ECONOMY, *supra* note 11, at 27.

132. Knotts, *supra* note 121. "[A]rrangements sometimes allow the private company to share in the revenue increases gained from better management and bill collection." *Id.*

133. LEE, *supra* note 6, at 103.

to explore many different alternatives in order to achieve maximum benefits.[134] A majority of agencies believe that these arrangements have improved competency, independence, and trust with stakeholders.[135] Areas where this approach has proven successful include: the maintenance and repair of equipment, water, and sewage networks and pumping stations; meter installation and maintenance; payment collections, and data processing.[136] In addition, such contracts are common in areas such as Africa, where the institutional capacity of local regulators is weak.[137]

2. *Concession*

Concessions are the most common form of privatization in the water supply and sewage sector.[138] Full concession arrangements transfer full operational and management responsibility of the entire water supply system, including financial and commercial risk, to a private contractor for a fixed term.[139] Partial concession options, defined by the duties transferred to the private entity, also exist.[140] Throughout the arrangement, the government maintains control over the service provision through monitoring and regulations.[141] At the conclusion of the term, the contractor must return the assets to the government in good condition.[142] Concessions reduce the need for more intrusive forms of regulation and ensure that prices do not reach outrageous levels.[143] As an additional advantage, the responsibility for operations, maintenance, and investments lies in a single contractor.[144] More appropriate investment decisions result because the contractor is in the best position to forecast demand and respond to maintenance/repair needs.[145] However, success can be difficult to achieve because both full and partial concessions require clearly defined responsibilities and risks[146] and a comprehensive regulatory scheme.[147]

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134. Vitale, *supra* note 130, at 1387.

135. SOPHIE TREMOLET ET AL., EVT'L. RESOURCES MGMT.,THE WORLD BANK GROUP, CONTRACTING OUT UTILITY REGULATORY FUNCTIONS 31 (Jan. 2004), http://rru.worldbank.org/Documents/PapersLinks/ 2550.pdf.

136. NEW ECONOMY, *supra* note 11, at 27.

137. LEE, *supra* note 6, at 113; TREMOLET ET AL., *supra* note 135, at 28.

138. LEE, *supra* note 6, at 105.

139. INNOVATIVE APPROACHES, *supra* note 4, at 47.

140. Nardone, *supra* note 6, at 191.

141. LEE, *supra* note 6, at 118.

142. *Id.*

143. *Id.* at 105-6.

144. *Id.* at 118.

145. *Id.*

146. NEW ECONOMY, *supra* note 11, at 28.

147. LEE, *supra* note 6, at 108.

One variation on the concession approach is a "build, operate, and transfer contract" (BOT).[148] Under BOTs, the private firm, usually a major construction or engineering company, must finance, build, and operate the system.[149] At the end of the contract, the firm must return all assets to the government.[150] Because the private investor controls every aspect of these long-term projects, from the early design stages to operation and maintenance, BOTs provide significant cost efficiencies.[151]

3. Split Ownership

Under this model, private and public shareholders split ownership of water systems in a corporate utility.[152] Such organizations generally have a corporate infrastructure managed by a board of directors.[153] Usually the public sector retains the majority of ownership because of legal restrictions on private ownership.[154] Generally, governments do not transfer ownership rights because water is essential to public service.[155] Regulation of essential services prevents abuse and provides economic stability.[156] This model of privatization is beneficial because it reconciles two potentially conflicting goals of water supply.[157] The public's concerns of affordability, water quality, equity of access, and expansion of service offset the private owners' objectives to maximize profits and recuperate costs.[158] Presently, split ownership corporations exist in the Netherlands, Poland, Chile, and the Philippines.[159]

4. Divestitures

Divestitures are the most extreme form of privatization.[160] Under this approach, a government sells ownership and operations of the water system to a private company.[161] Common forms of divestiture include selling shares, selling physical assets, opening a government-owned company to private investment, and offering management or employee buy-outs.[162] Divestitures

148. *Id.* at 122.
149. *Id.*
150. INNOVATIVE APPROACHES, *supra* note 4, at 47.
151. LEE, *supra* note 6, at 122.
152. NEW ECONOMY, *supra* note 11, at 27.
153. *Id.*
154. *Id.*
155. Timothy P. Duane, Regulation's Rationale: Learning From the California Energy Crisis, 19 YALE J. ON REG. 471, 477 (2002).
156. *Id.* at 477-78.
157. NEW ECONOMY, *supra* note 11, at 27.
158. *Id.*
159. *Id.*
160. INNOVATIVE APPROACHES, *supra* note 4, at 47.
161. Edwin S. Rubenstein, *The Untapped Potential of Water Privatization* (Oct. 2000), *at* http://www.es rresearch.com/Theprivatewaterindustry.htm.
162. LEE, *supra* note 6, at 100.

can generate substantial improvements in productive efficiency and increase national income.[163] However, regulation of water quality and other public protections may not be available under this model,[164] leaving its use appropriate only in markets with significant unmet demands.[165] The British government applied this approach to ten regional water sectors during the 1980s.[166] This divestiture was largely unsuccessful because there was little incentive for the water companies to make capital investments for rehabilitation and improvement of the water and sewage infrastructures.[167] For example, one water company submitted plans for water treatment plants that it never built.[168] Another company successfully petitioned the government to re-define "waters," allowing the company to dump raw sewage into coastal waters rather than expanding treatment facilities.[169] Use of the divestiture model is rare today.[170]

C. *Drivers of Water Privatization*

1. *Privatization Can Help Satisfy Basic Unmet Human Needs*

As previously noted, approximately twenty percent of the world's population does not have access to a potable supply of water.[171] Water scarcity problems occur most often in developing nations.[172] Governments cannot provide adequate water services to these individuals without major reforms or enormous increases in investment.[173] For example, during the late 1980s, a rapidly deteriorating infrastructure greatly strained the financial resources of the Argentine government.[174] At that time, almost eighty percent of the pipe network was in need of replacement.[175] The government entered into a

163. *Id.* at 101.
164. Nardone, *supra* note 6, at 192.
165. LEE, *supra* note 6, at 129.
166. PRIVATIZATION FIASCOS, *supra* note 23, at 8.
167. *Id.* at 9.
168. *Id.*
169. *Id.*
170. INNOVATIVE APPROACHES, *supra* note 4, at 47.
171. WARD, *supra* note 39, at 2.
172. WATER FOR PEOPLE, *supra* note 33, at 6. "People privileged enough to live in more prosperous parts of the world . . . rarely have to confront the consequences of water scarcity." *Id.*
173. NEW ECONOMY, *supra* note 11, at 21. *See* GEORGE R.G. CLARKE ET AL., WORLD BANK, HAS PRIVATE PARTICIPATION IN WATER AND SEWERAGE IMPROVED COVERAGE? EMPIRICAL EVIDENCE FROM LATIN AMERICA (World Bank Pol'y Research, Working Paper No. 3445, Jan. 2004) (stating that resolving water and sanitation problems will require 600-800 billion dollars), http://wdsbeta.worldbank.org/external/default/WDSContentServer/IW3P/IB/2004/12/08/000012009_20041208141341/Rendered/PDF/WPS3445.pdf.
174. LEE, *supra* note 6, at 119.
175. *Id.*

privatization agreement to obtain the funding for repairs and replacement of the pipe network.[176]

Realistically, government officials are subject to the political process and cannot easily raise water prices without jeopardizing their own positions.[177] Privatization allows officials to avoid this problem and enables them to use public funding to meet other social needs.[178] In addition, the private sector can obtain capital more easily than the public sector, which allows the expansion of service to proceed more quickly.[179] Rapid access to capital is especially relevant in developing countries that face crushing demands to expand coverage in growing urban areas while maintaining current infrastructures and water treatment standards.[180] For example, Kenya would need to invest 4 billion dollars, nearly the equivalent of the country's total annual national budget, to provide all Kenyans with access to clean and safe water.[181] Engagement of the private sector presents a viable solution to these funding needs.[182]

In addition to expansion of service, privatization can also provide higher-quality water.[183] Private companies that own resources within the water sector have a strong motivation to keep the water clean.[184] Improvements in water quality and service lead to improvement in overall public health and welfare.[185] For example, empirical evidence shows that in Latin America water and sanitation services have improved under private-sector engagement.[186] Although few case studies focus on privatization effects on water quality, those that do show an improvement.[187] For instance, case studies in Salta, Argentina, and Conakry, Guinea, show that privatization improved the physical, chemical, and bacterial quality of water resources.[188]

176. *Id.*

177. NEW ECONOMY, *supra* note 11, at 23.

178. *Id.*

179. *Id.*

180. INNOVATIVE APPROACHES, *supra* note 4, at 53. In the Ivory Coast, access to a safe supply of water increased dramatically because a private company was allowed to increase water rates to cover the long-term marginal costs. *Id.*

181. WAMBUA SAMMY, WATER PRIVATIZATION IN KENYA 4 (Global Issue Papers, No. 8, 2004), http://www. boell.de/downloads/global/Water%20Privatisation%20in%20Kenya.pdf.

182. *Id.* at 5.

183. CLARKE ET AL., *supra* note 173, at 3.

184. *See* Roy Whitehead, Jr. et al., *The Value of Private Water Rights: From a Legal and Econ. Perspective*, 9 ALB. L. ENVTL. OUTLOOK 313, 335 (2004).

185. WATER FOR PEOPLE, *supra* note 5, at 122-23.

186. CLARKE ET AL., *supra* note 173, at 7.

187. *Id.* at 11.

188. *Id.*

2. *Need for Efficiency*

Competent and efficient water service provision requires private sector participation.[189] The very nature of the public sector inhibits efficiency in industry because governments use public utilities to pursue goals that are unrelated to their entrepreneurial role.[190] Water resources serve "as vehicles for political patronage, corruption, nepotism, misappropriation of public funds, and . . . as an instrument for furthering the political and material interests of the politicians in office."[191] For instance, an audit of irrigation projects in Orissa, India revealed "serious failures of expenditure control, and widespread mismanagement of funds involving significant excess/undue payments to contractors, as well as extra, unauthorized and wasteful expenditure. . . . [A]s high as 32% of the overall expenditure flowed down the drain of corruption and undue favours to contractors."[192]

A more common form of political misapplication of water resources is the use of water subsidies that promote waste and overuse of water.[193] For example, despite severe water shortages in Jordan, government subsidies encourage "overuse of irrigation water."[194] In addition, users who are already connected to the public water system benefit from water subsidies, rather than the neediest citizens who do not have access to a safe supply of water.[195]

Because private ownership increases the transaction costs of government interference in entrepreneurial decision-making, industries can be protected from undue political influence.[196] Institutional frameworks designed to attract private investments protect private property and limit government intervention.[197] This separation between government regulators and private firms makes intervention relatively more expensive.[198] Unlike public employees, who do not see any of the residual profits from their efforts, private sector managers have a direct personal stake in the profitability of their

189. *See* Alexander Orwin, Env't Probe, *The Privatization of Water and Wastewater Utilities: An International Survey*, *at* http://www.environmentprobe.org/enviroprobe/pubs/ev542.html (Aug. 1999).

190. LEE, *supra* note 6, at 96. *See also* CLARKE ET AL., *supra* note 173, at 3 (stating that governments have a strong incentive to set water rates to cover operating costs but not to provide resources for expansion and maintenance).

191. *Id.*

192. Himanshu Upadhyaya, *India Together: Accelerated Corruption, a Trickle of Irrigation*, *at* http://www .indiatogether.org/2005/jan/gov-aibpcorr.htm (Jan. 29, 2005).

193. LEE, *supra* note 6, at 96.

194. James David, *Water: The More Than 'Silent' Emergency*, 9 INTEGRAL LIBERATION 87, 89 (June 2005), http://www.holycrossjustice.org/pdf/Integral%20Liberation/June%202005/Water%20%20The%20More%20than%20Silent%20Emergency%20%20James%20David.pdf.

195. MARK W. ROSEGRANT ET AL., INT'L FOOD POL'Y RESEARCH INST., WORLD WATER AND FOOD TO 2025: DEALING WITH SCARCITY 10 (2002), http://www.ifpri.org/2020/briefs/number21.htm.

196. LEE, *supra* note 6, at 96.

197. *Id.*

198. *Id.*

enterprises.[199] This interest provides an incentive for private managers to remain innovative and efficient.[200] One example of improved efficiency by engagement of the private sector is the reduction of unaccounted-for water (UfW).[201] By definition, UfW "is the difference between the quantity of water supplied to a [water sector] network and the metered quantity of water used by the customers."[202] Lost water equals lost profits for private companies, thus private managers have a greater incentive to reduce leaks and theft.[203]

While market forces alone cannot protect the vital social and cultural roles of water,[204] there is a necessary cost for the provision of water.[205] Gratuitous price increases are of great concern to opponents of water privatization.[206] However, water pricing schemes can be disproportionate even without private sector involvement, thus high water prices are not a direct consequence of privatization.[207] For example, in fully public water systems, the unserved poor pay up to twenty times the price that served non-poor pay per unit of water,[208] but because of the lack of financing, the government is unable to expand its infrastructure and customer base to provide service to these people and subsidize their water costs.[209]

C. *Risk Management*

Because major international efforts to privatize water systems and markets are a relatively new endeavor, there are many concerns about their ability to adequately protect social objectives.[210] Furthermore, while countries with the weakest public sectors have the greatest need for water services, privatizations have the least chance of success under weak regulatory schemes.[211] However, as demonstrated below, the risks of privatization are

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199. *Id.* at 97.

200. *Id.* at 98.

201. CLARISSA BROCKLEHURST & JAN G. JANSSENS, THE WORLD BANK GROUP, INNOVATIVE CONTRACTS, SOUND RELATIONSHIPS: URBAN WATER SECTOR REFORM IN SENEGAL 5, n.14 (Water Supply & Sanitation Board, Discussion Paper Series No. 1, Jan. 2004), http://iris37.worldbank.org/domdoc/PRD/Other/PRDDContainer.nsf/All+Documents/85256D2400766CC78525700600667888/$File/WSS_Senegal.pdf. UfW can be physical losses from leaking pipes, administrative losses from illegal connections, or both. *Id.*

202. *Id.*

203. *Id.* at 5.

204. BIENNIAL REPORT, *supra* note 31, at 34.

205. NEW ECONOMY, *supra* note 11, at 40.

206. *Id.* at 30.

207. INNOVATIVE APPROACHES, *supra* note 4, at 49.

208. *Id.*

209. NEW ECONOMY, *supra* note 11, at 23.

210. *Id.* at 29.

211. TREMOLET ET AL., *supra* note 135, at 43.

> Paradoxically, those regulators who would most benefit from contracting out are the ones that have the most difficulties in entering into such agreements to bring about a satisfactory outcome, either for lack of financial capacity or capacity to

manageable so long as privatization agreements adhere to three basic principles: 1) manage water in a manner that reflects its social value; 2) use sound economics, and 3) maintain strong governmental regulation.[212]

1. Reflect Social Value in Water Management

In order to reflect the social value in water management, privatization agreements must meet basic human needs for water.[213] Human needs take priority over all other needs. Accordingly, privatization contracts must include a provision requiring fulfillment of unmet human needs to be the first priority of the solicited private entrepreneur.[214] In addition, privatization agreements should include a guaranteed minimum quantity of water for residents within the service area.[215] Although private companies may be reluctant to invest heavily in impoverished communities, governments can use many tools to entice private entrepreneurs to enter into expansion agreements, such as expansion mandates, "quantitative performance indicators, and economic incentives."[216] For example, in Senegal, the government remunerates private companies for water sold, which creates an incentive for the companies to provide water service to the poor.[217] These tools provide incentives for companies to develop low-cost operations and innovative solutions for residents.[218]

The La Paz-El Alto concession in Bolivia provides an excellent illustration of an agreement with explicit expansion requirements.[219] The "expansion mandates" obligated the private company to meet certain levels of service provision and water quality.[220] The contract required the company to install new connections, expand coverage, and extend new services to areas with a specific population density within a specified timeframe.[221]

While these provisions provide a significant level of protection, they are not always enough. In some instances, meeting basic needs for water will require subsidies for impoverished citizens who cannot afford even the most minimal costs.[222] For example, current South African water laws guarantee each citizen twenty-five liters of water per capita per day at no cost.[223]

> monitor performance, or insufficient access to external contractors' supplier market . . . . This institutional approach faces significant challenges in countries with limited technical and financial capacity and fledgling institutions.

Id.

212. NEW ECONOMY, *supra* note 11, at 40-41.
213. *Id.* at 40.
214. *Id.*
215. *Id.*
216. *Id.* at 29-30.
217. BROCKLEHURST & JANSSENS, *supra* note 201, at 16.
218. *Id.*
219. NEW ECONOMY, *supra* note 11, at 29.
220. *Id.*
221. *Id.*
222. INNOVATIVE APPROACHES, *supra* note 4, at 49.
223. *Id.*

Reflecting the social value of water in management will alleviate opponents' fears that profit incentives limit access to a sustainable supply of water. Incorporating the social value of water into management policies balances the two extreme viewpoints: 1) water is a fundamental human right[224] that should be provided free of charge,[225] and 2) the free trade of water alone will solve the shortage problems of the world.[226]

2. *Use of Sound Economics*

When governments seek out private firms to invest in an infrastructure and provide water service, activists point to subsequent price increases as evidence of corporate greed.[227] While it is true that prices generally rise after private sector engagement, the increases are often unrelated to direct corporate involvement.[228] Regardless of ownership, if the prices are less than the cost of provision, then prices must increase until there are enough funds to pay for capital infrastructure, water treatment, sewage treatment, and service to the poor.[229] In some cases, water tariffs must increase two to three hundred percent.[230] These increases may seem outrageous but for consideration of consumers' willingness to pay.[231] For example, in developing countries, where urban water rates are usually less than one-sixth of the full cost of provision, the unserved poor are willing to pay up to four dollars per cubic meter (four times the average cost of water provision),[232] while the served non-poor may pay prices as low as twenty cents per cubic meter.[233] Prices for the unserved poor are high because unregulated vendors control access to water.[234] Government-regulated privatization allows the unserved poor to obtain water services for only one dollar per cubic meter, a fourth of the amount they are willing to pay.[235]

Individuals with low incomes are willing to pay for water and sanitation, so long as the service is reliable and the cost of delivery is available.[236]

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224. World Health Org., *Water for Health Enshrined as a Human Right, at* http://www.who.int/mediacent re/news/releases/pr91/en/ (Nov. 27, 2002). "Water is fundamental for life and health. The human right to water is indispensable for leading a healthy life in human dignity. It is a pre-requisite to the realization of all other human rights." *Id.* (quoting The United Nations Comm. on Econ., Cultural and Soc. Rights).

225. INNOVATIVE APPROACHES, *supra* note 4, at 47.

226. *Id.* at 42.

227. *See* COCHABAMABA, *supra* note 23, at 3.

228. INNOVATIVE APPROACHES, *supra* note 4, at 48.

229. *Id.*

230. COCHABAMABA, *supra* note 23, at 3.

231. INNOVATIVE APPROACHES, *supra* note 4, at 49.

232. *Id.* The average cost of water provision is one dollar per cubic meter. *Id.*

233. *Id.*

234. *Id.*

235. *Id.*

236. NEW ECONOMY, *supra* note 11, at 30.

Furthermore, if a company is able to provide new or improved desirable services, then customers are generally willing to pay more.[237] The more information that is provided to the public concerning the improvement in services and capital investments needed to provide them, the more accepting the public will be to price increases.[238] Large price increases generate strong, at times even violent, opposition if the public is ill-informed.[239] However, linking price increases to improvements in service builds public trust and creates performance incentives for private entrepreneurs.[240] For example, when the government of Conakry, Guinea was no longer able to provide adequate water services to its citizens, it leased water sector assets to a private company.[241] The private operation recuperated a fee that reflected the full operating costs, but it initially charged customers only one-fourth of the full cost.[242] Subsequent increases in rates were contingent upon improvements in service.[243] Within the first five years of the contract, coverage increased by three hundred percent.[244] Overall, experts tout the project as a success.[245]

Furthermore, use of subsidies protects those who cannot afford price increases.[246] To be effective, subsidies must be both economically and socially sound.[247] For instance, if they reduce the price of water too much, subsidies promote inefficient use.[248] Additionally, subsidies are also not effective if used for political wrangling, such as policy favors or social gifts.[249] Subsidies should be subject to regular review to ensure discontinuance of those that are no longer socially beneficial.[250] Nevertheless, a lack of necessary subsidies can be devastating. In South Africa, millions of people went without water because of

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237. *Id.*

238. *Id.*

239. COCHABAMABA, *supra* note 23, at 3-4. In 1999, the Bolivian government granted a forty-year contract to a private company to run a municipal water system. *Id.* at 3. Without explanation, water tariffs increased as much as 200% only a few weeks after the company took over. *Id.* The citizens were unable to survive under this burden and riots broke out, effectively shutting down the city for four days. *Id.* Protests went on for months before the government finally terminated the contract, but in the end, six people died because of the violence. *Id.* at 3-4.

240. NEW ECONOMY, *supra* note 11, at 40-41.

241. INNOVATIVE APPROACHES, *supra* note 4, at 53.

242. *Id.*

243. *Id.*

244. *Id.*

245. *Id.*

246. *Id.* at 49.

247. NEW ECONOMY, *supra* note 11, at 41.

248. ANDREAS KRAEMER & MATTHIAS BUCK, GROUP ON ECON. AND ENV'T POLICY INTEGRATION, ORG. FOR ECON. CO-OPERATION & DEV., WATER SUBSIDIES & THE ENVIRONMENT 37 (ORG. FOR ECON. CO-OPERATION & DEV., PAPER NO. OCDE/GD(97)220, Jan. 15, 1998), http://www.olis.oecd.org/olis/1997doc.nsf/43bb6130e5e86e5fc12569fa005d004c/5bb1a3702e23600cc12565690055d4ba/$FILE/12E77396.DOC.

249. NEW ECONOMY, *supra* note 11, at 31.

250. *Id.* at 41.

substantial increases in water prices without the provision of subsidies.[251] One citizen reflected, "[i]t's actually worse than under apartheid . . . . They're charging people for water in neighborhoods where there is 70 percent unemployment and people don't even operate on a cash economy."[252] Such high prices effectively forced people to drink from polluted streams, resulting in a three-year cholera epidemic.[253] To prevent such incidents, governments must maintain strong regulation over the water sector.

3. *Maintain Strong Government Regulation*

If the government does not retain some control or ownership of water resources, then the social values of water lack adequate protection.[254] Public ownership ensures that citizens have the representation and necessary remedies to correct an imbalance in social and economic concerns.[255] Because privatization does not absolve governments of their duties to protect the environment or public health and safety,[256] the government must carefully draft provisions[257] and regulations to protect social values of water resources.[258] Governments can achieve the goal of protecting the social value of water by monitoring water quality.[259] Improvements in water quality benefit everyone by reducing public health problems.[260] In order to maximize effectiveness, regulatory schemes should be "transparent, accessible, and accountable to the public."[261]

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251. Kari Lydersen & Cleo Woelfle-Erskine, *Drying Up: The Global Water Privatization Pandemic*, LIP MAG., Summer 2004, *at* http://www.lipmagazine.org/articles/featlydersen_water.shtml.

252. *Id.*

253. *Id. See also Privatization in South Africa: Starting Over*, THE DOMINION, Feb. 25, 2004 (stating that the outbreak was "one of the largest outbreaks of cholera in the nation's history"), http://dominionpaper.ca/a ccounts/2004/02/25/privatizat.html [hereinafter DOMINION].

254. INNOVATIVE APPROACHES, *supra* note 4, at 53.

255. NEW ECONOMY, *supra* note 11, at 41.

256. *Id.* at 26. *See also* Paulette L. Stenzel, *Why and How the World Trade Organization Must Promote Environmental Protection*, 13 DUKE ENVTL. L. & POL'Y F. 1, 27 (2002) (noting that corporations now have social responsibilities).

257. BROCKLEHURST & JANSSENS, *supra* note 201, at 7. Affermage contracts are another option for States that do not have a sophisticated regulatory framework because regulatory provisions are built into the contract itself. *Id.* Under this type of contract, the private company is paid a fee to cover the cost of running the system and producing water. *Id.* The private operator collects the consumer payments, retains the previously agreed upon fee, and remits the difference to the government. *Id.* Affermage contracts are advantageous when national law does not provide a foundation for utility regulation or the overall regulatory capacity is inadequate. *Id.*

258. *See* TREMOLET ET AL., *supra* note 135, at 1.

259. NEW ECONOMY, *supra* note 11, at 41.

260. WATER FOR PEOPLE, *supra* note 5, at 123.

261. NEW ECONOMY, *supra* note 11, at 41.

The key to drafting contracts that protect the public interest lies in skillful governmental negotiations with the private entity.[262] Privatization agreements must clearly define the responsibilities of each party, including specific performance criteria and standards and regulatory schemes, to ensure provision of quality services.[263] Dispute resolution procedures are also an essential part of the negotiation process.[264] Contracts with clearly developed and explicit dispute resolution procedures are the most effective.[265] Most importantly, negotiations should be transparent and include affected stakeholders.[266] If citizens believe that an agreement is corrupt or counter to the best interests of the public, then problems will likely arise. Stakeholder participation facilitates discussion of a wide range of viewpoints before acceptance of an agreement and provides the public with a sense of ownership in the final result.[267]

D. Case Studies

1. Argentina

One of the largest privatizations took place in Buenos Aires, Argentina.[268] At the time of the concession, the city maintained an insufficient water supply and poor sewage treatment services.[269] Almost half of the city's population did not have access to potable water, and over sixty percent were without sewage services.[270] In areas where sewage services were available, almost all of the sewage was discharged untreated because of obsolete treatment technology.[271] To further exacerbate matters, almost eighty percent of the pipe network needed to be replaced.[272] A lack of funds hindered maintenance and upgrading, thereby making expansion of service impossible.[273]

To remedy the problem, the Argentine government arranged a thirty-year concession for drinking water supply and sewage services with Aguas Argentina, a consortium led by the French company Lyonnaise des Eaux

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262. *See, e.g.*, BROCKLEHURST & JANSSENS, *supra* note 201, at 43-46 (analyzing a successful privatization agreement).

263. NEW ECONOMY, *supra* note 11, at 41.

264. *Id. See also* BROCKLEHURST & JANSSENS, *supra* note 201, at vii (noting that an effective dispute resolution process prevented a serious clash when the government failed to meet investment requirements).

265. *See* NEW ECONOMY, *supra* note 11, at 41.

266. TREMOLET ET AL., *supra* note 135, at 15, 37.

267. NEW ECONOMY, *supra* note 11, at 42.

268. LEE, *supra* note 6, at 119.

269. *Id.*

270. *Id.*

271. *Id.*

272. *Id.*

273. *Id.*

Dumez.[274] The government transferred full responsibility for the entire drinking water supply and sewage system to the private company.[275] The government established a regulatory body to ensure enforcement of the contract.[276] In addition, the regulatory framework outlined water quality standards and water tariff rate-making provisions.[277] These efforts prompted rapid improvements in water availability.[278] The percentage of the population served increased by fifteen percent,[279] while the water tariffs decreased by twenty-seven percent.[280] In addition, non-payment of water bills decreased from twenty percent to two percent.[281]

Nevertheless, continued success requires regulatory reforms.[282] Politicization and corruption plague the existing regulatory mechanisms.[283] Weak regulatory mechanisms allowed contract modifications and non-compliance with performance objectives.[284] "For example, Aguas Argentinas reneged on a contractual obligation to build a new sewage treatment plant."[285] Consequently, over ninety-five percent of the sewage from Buenos Aires dumps into the Rio del Plata River.[286] Public confidence has begun to deteriorate due to lack of transparency and arbitrary decision-making.[287]

2. *Senegal*

In the mid 1990s, Senegal commenced a major reform of its urban water supply sector in response to a national financial crisis.[288] During this time, only fifty-four percent of the urban population had access to safe water due to saline contamination of the groundwater.[289] The government realized that private funding was essential in order to complete the necessary improvements and expansions.[290] In addition, the government needed greater managerial autonomy to ensure increased productivity and operational efficiency.[291] Senegal officials created a steering committee comprised of representatives

274. *Id.* at 120-21.
275. *Id.* at 121.
276. *Id.*
277. *Id.*
278. NEW ECONOMY, *supra* note 11, at 23.
279. *Id.*
280. LEE, *supra* note 6, at 121.
281. NEW ECONOMY, *supra* note 11, at 23.
282. INNOVATIVE APPROACHES, *supra* note 4, at 54.
283. *Id.*
284. PRIVATIZATION FIASCOS, *supra* note 23, at 2.
285. *Id.*
286. *Id.*
287. *See id.*
288. BROCKLEHURST & JANSSENS, *supra* note 201, at vii.
289. *Id.* at 3.
290. *Id.* at 5.
291. *Id.*

from each government agency concerned with water supply and sanitation.[292] The government dismantled the bankrupt public utility and created a new state asset-holding company to manage the sector.[293] Senegalize officials solicited private companies to manage the water services and to produce and distribute the water.[294] The agreement structured tariffs to recover costs and thereby secure financial sustainability.[295] The contract also addressed social concerns, such as retention of public staff.[296] Moreover, the contract clearly defined the duties, responsibilities, and assets of both the State and private companies.[297] The entire agreement centered on transparency, accountability, autonomy, and incentives to create a balance between the private operators and the State Asset Holding Company.[298] Overall, the agreement has been a success. Large expansions of the water services network resulted in yearly increases in water volume for use in the urban water sector.[299]

In sum, privatization offers developing countries a viable solution to meeting unmet water needs for their citizens and providing efficient water services. Various models allow countries to tailor a privatization agreement to achieve maximum benefits. While there are risks involved, they are manageable through maintenance of social programs, use of sound economics, and retention of public ownership. However, when agreements affect a transboundary resource, increases in privatization could develop into a collective-action problem.[300] Therefore, when privatization agreements have the potential to affect transboundary water resources, they must comply with international water law principles.

IV. INTERNATIONAL WATER LAW

Although international water law alone cannot solve the problems of the present and predicted stresses on water resources, it is an essential element in constructing a solution.[301] Nations involved in cooperative water management schemes need recourse under the law and legal institutions to resolve disagreements.[302]

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292. *Id.* at 6.
293. *Id.*
294. *Id.*
295. *Id.*
296. *Id.*
297. *Id.* at 8.
298. *Id.*
299. *Id.* at 43.
300. Benvenisti, *supra* note 118, at 384. Each State has a competing interest in the aquifer. *Id.*
301. Joseph W. Dellapenna, *Recent Books on International Law*, 97 AM. J. INT'L L. 233, 234 (2003) (reviewing STEPHEN C. MCCAFFREY, THE LAW OF INTERNATIONAL WATERCOURSES: NON-NAVIGATIOANAL USES (2001)) [hereinafter *Recent Books*].
302. *Id.*

Historically, international water law did not address groundwater resources.[303] Water management discussion often excluded groundwater resources because of uncertain distribution, geophysical characteristics, and the difficulties in determining rights.[304] Consequently, treaties and transboundary dispute resolutions did not begin to address groundwater resources until the beginning of the twentieth century.[305] Even then, rising awareness of the importance of groundwater resources existed, but agreements addressed them as secondary issues.[306] However, after governments and policy makers gained a better understanding of the science of water, international agreements directly addressed the interrelationship between surface and ground waters.[307] Nevertheless, international law concerning aquifers remains relatively undeveloped compared to other areas of water law.[308]

Although international aquifer law is in its infancy,[309] there is enough of a foundation to facilitate cooperation and negotiation among States.[310] With regard to international law, there are four main sources of rules applicable to transboundary aquifers: 1) international customs, 2) international conventions, 3) regional treaties and agreements, and 4) publications of highly qualified experts.[311]

A. *Customary Law*

Customary law is the most basic form of international water law. There are two criteria for creating customary international law: (1) a widespread, consistent, and general practice of States, and (2) acceptance from a sense of legal obligation.[312] To put it another way, customary law is State practice undertaken out of a sense of legal obligation by a large number of States.[313] This type of law develops through a process of claims and counterclaims

303. *Hydrogeological Approach*, *supra* note 66, at 222.
304. Gaines, *supra* note 71, at 143.
305. *Hydrogeological Approach*, *supra* note 66, at 224-25.
306. *Id.*
307. *Id.* at 225.
308. *Id.* at 222.
309. Veronica Brieno Rankin, Project, International Law and Transboundary Groundwater: An Evaluation of the Legal Strategies Promoting Sustainability in a Changing Climate 10 (2004) (unpublished manuscript, on file with author).
310. KERSTIN MECHLEM, FOOD & AGRIC. ORG. DEV. L. SERVICE, WATER AS A VEHICLE FOR INTER-STATE COOPERATION: A LEGAL PERSPECTIVE 3 (Food & Agric. Org. of the United Nations, Legal Papers Online No. 32, Aug. 2003), *at* http://www.fao.org/Legal/prs-ol/lpo32.pdf.
311. Kemper et al., *supra* note 53, at 195.
312. Upadhye, *supra* note 20, at 68.
313. *Id.*

between States.[314] Customary law can include multilateral decisions, decisions by international courts or arbitrators, or unilateral actions of States.[315]

Notably, there is no designated enforcement mechanism for customary law, and as such, customary law alone cannot solve transboundary water disputes.[316] Even today, there is still not a distinct and generally accepted plan of conflict resolution and cooperation over water resources.[317] This lack of consistency results from conflicting interpretations of the general principles of customary law.[318] Despite these inconsistencies, customary law provides needed guidelines for treaties, agreements, and conventions.[319]

There are three overriding principles of customary international water law: (1) the principle of equitable utilization, (2) the obligation not to cause significant harm, and (3) the duty to cooperate.[320] Because of these principles, collaboration and cooperation are the norm in interstate water relations despite States' competing interests in the management of shared water resources.[321] Accordingly, these core principles often serve as the foundation for most contemporary agreements drafted to develop, utilize, protect, and manage transboundary water resources.[322]

1. Equitable Utilization

Equitable utilization is the "heart" of international water law.[323] Under this principle, the sovereign equality of the States tends to limit the use of shared water resources.[324] One State cannot use the water in a manner that is likely to have a negative effect on the legitimate entitlements of other States.[325] Therefore, maximum use and optimal use do not equate.[326] This principle seeks to allow each State to attain the maximum possible benefits while minimizing

314. Joseph W. Dellapenna, *Treaties as Instruments for Managing Internationally-Shared Water Resources: Restricted Sovereignty vs. Community of Property*, 26 CASE W. RES. J. INT'L L. 27, 34 (1994) [hereinafter Treaties at Instruments].

315. *Id.*

316. *Id.* at 34-35.

317. Shlomi Dinar & Ariel Dinar, *Recent Developments in the Literature on Conflict Negotiation and Cooperation over Shared Int'l Fresh Waters*, 43 NAT. RESOURCES J. 1217, 1223 (2003).

318. *See* MECHLEM, *supra* note 310, at 4.

319. Kemper et al., *supra* note 53, at 196.

320. MECHLEM, *supra* note 310, at 3.

321. *Id.*

322. MECHLEM, *supra* note 310, at 3.

323. *Id.* at 9.

324. *Id.*

325. CAPONERA, *supra* note 2, at 191. Entitlements are based on rights rather than shares of water resources. MECHLEM, *supra* note 310, at 9.

326. MECHLEM, *supra* note 310, at 9.

the detrimental effects to itself and other States.[327] The principle of sustainable use incorporates the equitable use principle because countries cannot benefit from a depleted water source.[328]

There are numerous factors used to determine whether an actual or potential use is equitable, including social and economic needs, the population depending on the watercourse, the effects of the use, existing and potential uses, conservation and protection needs, and the availability of alternatives to an existing or potential use.[329] These factors reflect the complexity of the equitable use principle and the need for flexibility.[330] Because of changing circumstances and uses, maintaining quality among the users requires ongoing adaptations.[331]

Delegates first adopted equitable use under The Helsinki Rules on the Uses of the Waters of International Rivers ("Helsinki Rules").[332] As adopted under the Helsinki Rules, equitable utilization provides incentives for a State to initially develop an untapped water resource because "[a]n existing reasonable use may continue in operation unless the factors justifying its continuance are outweighed by other factors leading to the conclusion that it be modified or terminated so as to accommodate a competing incompatible use."[333] Although the Helsinki Rules marked significant evolution in international water policy, they are not binding.[334] To ensure that countries abide by these rules, they are often expressly included in treaties.[335] For example, the Ganges Treaty of 1996 allocates water use on the basis of historical water flows, while provisions to alter the flow of water during dry periods are based on fairness and reduction of harmful effects.[336]

On the other hand, adherence to the principle of equitable utilization is subjective.[337] An upstream State can exercise full dominion over a

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327. *Id.* at 9-10. There are two viewpoints of the principle of equitable use that apply to international aquifers: (1) use of the aquifer, and (2) apportionment of benefits. Barberis, *supra* note 58, at 176. Both must be reasonable and equitable to satisfy equitable use. *Id.*

328. Dr. Patricia Wouters et al., The Legal Response to the World's Water Crisis: What Legacy fro, The Hague? What Future in Kyoto?, 4 U. DENV. WATER L. REV. 418, 423 (2001) [hereinafter Legal Response].

329. MECHLEM, *supra* note 310, at 10.

330. *Id.*

331. *Id.*

332. *Helsinki Rules on the Uses of the Waters of International Rivers* (1967), http://www.internationalwater law.org/IntlDocs/Helsinki_Rules.htm [hereinafter *Helsinki Rules*]. "Each basin State is entitled, within its territory, to a reasonable and equitable share in the beneficial uses of the waters of an international drainage basin." *Id.* at art. IV.

333. *Helsinki Rules*, *supra* note 332, at art. VIII.

334. Upadhye, *supra* note 20, at 73.

335. MECHLEM, *supra* note 310, at 10-11.

336. A. NISHAT AND M. F. K. PASHA, A REVIEW OF THE GANGES TREATY OF 1996, (AWRA/IWLRI-UNIV. OF DUNDEE INT'L SPECIALTY CONFERENCE), Aug. 6-8, 2001, http://www.awra.org/proceedings/dundee01/ Documents/Pashafinal.pdf.

337. Upadhye, *supra* note 20, at 72-3. "[W]hat is perfectly reasonable to one [State] may be wholly unreasonable to another." *Id.*

transboundary water resource and consider such actions equitable and reasonable; the affected downstream State, however, could find them wholly unjustifiable.[338] For example, tensions ran high between Slovakia and Hungary when Slovakia unilaterally diverted the Danube River.[339] The States' conception of the application of equitable utilization differed greatly.[340] While the Slovaks valued expert opinions and development, the Hungarians viewed the project from an environmental perspective.[341] The parties could not reach an agreement on their own and, consequently, submitted the dispute to the International Court of Justice (ICJ) for resolution.[342]

2. *Obligation Not to Cause Significant Harm*[343]

The obligation not to cause significant harm overlaps with the principle of equitable utilization.[344] This obligation is subject to a balancing test under the equitable use principle because any use of a shared water resource could be potentially detrimental to another State.[345] Article Seven of the United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses ("Non-Navigation Uses Convention") states that if significant harm does occur, the offending State must "take all appropriate measures . . . to eliminate or mitigate such harm and, where appropriate, to discuss the question of compensation."[346] Under this principle, a State cannot act in any way that will cause harm to the quantity, quality, or geological structure of an aquifer.[347] However, the same problem of subjectivity still arises in that "it is left 'up to the state planning a measure to determine whether another watercourse state will experience significant harm.'"[348]

Even still, several treaties and agreements expressly state the obligation not to cause significant harm.[349] For example, during the 1970s, extensive

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338. *Id.* at 73.

339. Bukhosi Fuyane & Ferenc Madai, The Centre for Energy, Petroleum and Mineral L. & Pol'y, *The Hungary-Slovakia Danube River Dispute: Implications for Sustainable Development and Equitable Utilization of Natural Resources in International Law*, 1 INT'L J. GLOBAL ENVTL. ISSUES 329, 332 (2001), http://www.internationalwaterlaw.org/Bibliography/IJGEI/06ijgenvl2001v1n34fuyane.pdf.

340. *Id.* at 333.

341. *Id.*

342. *Id.* at 332.

343. "[S]*ic utero tuo ut alienum non laedas* – so use your own as not to harm that of another" MECHLEM, *supra* note 310, at 12.

344. *Id.*

345. *Id.* at 13.

346. *Non-Navigational Convention*, *supra* note 76, at Art. 7.

347. Barberis, *supra* note 58, at 169.

348. Jordan C. Kahn, Water: II. 1997 United Nations Convention on the Law of Non-Navigational Uses of International Watercourses, 1997 COLO. J. INT'L ENVTL. L. Y.B. 178, 181 (1997) (quoting Ann Milne Roberts, Water Wars or Water Law, FIN. TIMES BUS. REP., Aug. 28, 1997).

349. MECHLEM, *supra* note 310, at 13.

irrigation in the United States caused deterioration in the water quality of the Colorado River.[350] To remedy the problem, the United States and Mexico negotiated an agreement, Minute 242, which placed a cap on the level of salinity in order to ensure Mexico a potable water supply.[351] Further, some agreements create special inter-state commissions to fulfill their obligation not to cause significant harm.[352] For instance, the Franco-Swiss agreement regarding the Genevese Aquifer created a joint commission to ensure the protection of the aquifer.[353]

3. *Duty of Cooperation*

The final principle obligates States with shared water resources to cooperate in order to attain optimal utilization and adequate protection of such resources.[354] Article 8 of the Non-Navigational Convention states, for example, that "[w]atercourse States shall cooperate on the basis of sovereign equality, territorial integrity, mutual benefit and good faith . . . ."[355] This duty encompasses the obligations to provide prior notice, to negotiate,[356] and to exchange data.[357] Before a State can engage in a water project, such as groundwater withdrawals, it must notify affected States.[358] Prior notification allows affected States to assess their likely harm from the project.[359] Such notification procedures facilitate the negotiation process.[360] If a dispute arises after the affected State is notified of the intended project, each State has a duty to negotiate in good faith to resolve the dispute.[361] To facilitate cooperation, States are obligated to regularly exchange data on the condition of the shared resource.[362] This exchange of information is generally the foundation of many international water resource treaties.[363]

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350. *Id.* at 14.

351. *Id.*

352. *Id.*

353. Rankin, *supra* note 309, at 21.

354. Barberis, *supra* note 58, at 180.

355. *Non-Navigational Convention*, *supra* note 76, at Art. 8. The Non-Navigational Convention encourages the use of joint commissions to facilitate cooperation. *Id.*

356. Barberis, *supra* note 58, at 178-79.

357. MECHLEM, *supra* note 310, at 15.

358. *Principle 21 of the Stockholm Declaration of the United Nations Conference on the Human Environment, Report of the U.N. Conference on the Human Environment*, U.N. Doc. A/CONF.48/14/Rev. 1 (1972), *reprinted in* 11 I.L.M. 1416 [hereinafter Stockholm Declaration]. "[W]hen major water resource activities are contemplated that may have a significant environmental effect on another country, the other country should be notified well in advance of the activity envisaged." *Id.*

359. Barberis, *supra* note 58, at 180.

360. *Id.*

361. *Id.* at 181.

362. MECHLEM, *supra* note 310, at 15-16.

363. *Id.* at 16.

B. Conventions

States can also adopt conventions to create rules of conduct and binding obligations for shared water resources.[364] Although no convention focuses directly on groundwater resources, those conventions that deal with water resources in a comprehensive manner provide a foundation for the law governing transboundary aquifers.[365]

The 1996 United Nations Convention on the Protection and Use of Transboundary Watercourses and International Lakes ("Convention on Protection and Use") marked a significant step forward in the pursuit to preserve international groundwater resources.[366] Under the Convention on Protection and Use, countries have the duty "to prevent, control and reduce any transboundary impact."[367] This convention requires countries to enter into "bilateral or multilateral agreements . . . to define their mutual relations and conduct regarding the prevention, control and reduction of transboundary impact."[368]

Following the Convention on Protection and Use, the 1997 U.N. General Assembly adopted the Non-Navigational Convention, marking the "[m]ost notable . . . development of international law applicable to groundwater"[369] because it is the first international convention to include certain groundwater resources within its scope.[370] The Non-Navigational Convention defined a "watercourse" as "a system of surface waters and *groundwaters* constituting by virtue of their physical relationship a unitary whole and normally flowing into a

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364. Kemper et al., *supra* note 53, at 196.

365. *Id.* at 195.

366. *Id.* at 196. The Convention on Protection and Use is especially relevant to the Guarani Aquifer because there is already substantial pollution of shallow groundwater resources in Argentina and Brazil. *Id.* at 189.

367. United Nations, *Convention on the Protection and Use of Transboundary Watercourses and International Lakes*, 31 I.L.M. 1312 (1992) [hereinafter *Convention on Protection and Use*].

> The Parties shall, in particular, take all appropriate measures:
> (a) To prevent, control and reduce pollution of waters causing or likely to cause transboundary impact;
> (b) To ensure that transboundary waters are used with the aim of ecologically sound and rational water management, conservation of water resources and environmental protection;
> (c) To ensure that transboundary waters are used in a reasonable and equitable way, taking into particular account their transboundary character, in the case of activities which cause or are likely to cause transboundary impact;
> (d) To ensure conservation and, where necessary, restoration of ecosystems.

Id. at art. 2 ¶ 2.

368. *Id.*

369. Yoram Eckstein, Groundwater Resources and Int'l. Law in the Middle East Peace Process, 22 WATER INT'L. 154, 158 (June 2003) [hereinafter Middle East].

370. *Id.* at 159. Due to the explicit definition of a watercourse, confined aquifers are not regulated by the Non-Navigational Convention. Rankin, *supra* note 309, at 17.

common terminus."[371] The Non-Navigational Convention provided measures for the "protection, preservation, and management" of such water courses.[372] It did not apply retroactively to the rights or obligations of previous agreements, rather it simply laid out the requirements for future watercourse agreements.[373] These requirements included the core principles of international water law: an obligation to negotiate in good faith, a responsibility not to cause significant harm to other States' interests, and a duty to "cooperate on the basis of sovereign equality, territorial integrity, mutual benefit, and good faith."[374] However, the Non-Navigational Convention is only binding on the countries that have ratified it.[375] Since Argentina and Paraguay abstained, their future agreements do not have to comply with the Non-Navigational Convention.[376]

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371. *Non-Navigational Convention*, *supra* note 76, at Art. 2 (emphasis added).

372. *Id.* at Art. 1.

373. *Id.* at Art. 3.

> 1. In the absence of an agreement to the contrary, nothing in the present Convention shall affect the rights or obligations of a watercourse State arising from agreements in force for it on the date on which it became a party to the present Convention.
> 2. Notwithstanding the provisions of paragraph 1, parties to agreements referred to in paragraph 1 may, where necessary, consider harmonizing such agreements with the basic principles of the present Convention.
> 3. Watercourse States may enter into one or more agreements, hereinafter referred to as "watercourse agreements", which apply and adjust the provisions of the present Convention to the characteristics and uses of a particular international watercourse or part thereof.
> 4. Where a watercourse agreement is concluded between two or more watercourse States, it shall define the waters to which it applies. Such an agreement may be entered into with respect to an entire international watercourse or any part thereof or a particular project, programme or use except insofar as the agreement adversely affects, to a significant extent, the use by one or more other watercourse States of the waters of the watercourse, without their express consent.
> 5. Where a watercourse State considers that adjustment and application of the provisions of the present Convention is required because of the characteristics and uses of a particular international watercourse, watercourse States shall consult with a view to negotiating in good faith for the purpose of concluding a watercourse agreement or agreements.
> 6. Where some but not all watercourse States to a particular international watercourse are parties to an agreement, nothing in such agreement shall affect the rights or obligations under the present Convention of watercourse States that are not parties to such an agreement.

Id.

374. *Non-Navigational Convention*, *supra* note 76, at Art. 8.

375. Aaron Schwabach, *The United Nations Convention on the Law of Non-navigational Uses of Int'l. Watercourses, Customary Int'l. L. and the Interests of Developing Upper Riparians*, 33 TEX. INT'L. L.J. 257, 278-79 (1998).

376. *See generally* Dr. Patricia Wouters, *The Legal Response to International Water Scarcity and Water Conflicts: The UN Watercourses Convention and Beyond*, at http://www.thewaterpage.com/pat_wouters 1.htm (2000) [hereinafter *Legal Response*].

C. *Regional Treaties/Agreements*

Only one-fourth of existing treaties related to transboundary freshwater mention groundwater.[377] This section briefly addresses two of them: the Franco-Swiss Genevese Aquifer management agreement, and the Israel-Palestinian Coastal and Mountain Aquifer Systems. These agreements illustrate how political factors can affect treaties.[378]

The Franco-Swiss agreement, based on the principle of cooperation, formed a joint commission to manage the Genevese Aquifer, which underlies France and Switzerland.[379] A twenty-year span of over-appropriation substantially depleted the Genevese Aquifer.[380] Overall, excessive use reduced the aquifer's size by a third.[381] Clearly, the Genevese Aquifer needed a new water management plan. After extensive negotiations, the countries passed the "Arrangement on the Protection, Utilization, and Recharge of the Franco-Swiss Genevese Aquifer"[382] ("Franco-Swiss Agreement"). The agreement formed a commission of French and Swiss authorities to manage the annual extraction rates and recharge sources of the aquifer.[383]

In contrast, ongoing conflicts between Israel and Palestine overshadow the Israeli-Palestinian agreements concerning shared aquifer systems.[384] Because water scarcity is one of the most serious problems in the region, it is not surprising that two countries with a history of violent disputes are struggling to reach a final arrangement for the Coastal Aquifer and Mountain Aquifer Systems.[385] Both sides support their claims to the aquifers on the basis of "historical use, territorial possession, and basic human needs."[386] To further complicate matters, these aquifers are outside the scope of the Non-Navigational Convention because their hydrogeological cycles do not meet the definition of a "watercourse" under the Convention.[387] To facilitate cooperation, the existing interim agreements provide for both an Israeli-Palestinian Economic Cooperation Committee and a joint water council to promote "equitable utilization of joint water resources" and establish water resource management.[388] Although negotiations have temporarily ceased, in 2001 both sides released official statements pledging their commitment to cooperation.[389]

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377. Rankin, *supra* note 309, at 19.
378. *Id.*
379. *Id.*
380. *Id.* at 19-20.
381. *Id.*
382. *Id.* at 21.
383. *Id.*
384. *Id.* at 23.
385. *Middle East*, *supra* note 369, at 154.
386. *Id.* at 157.
387. Rankin, *supra* note 309, at 28.
388. *Id.* at 26.
389. *Id.*

In spite of the conflicts, water resource development is progressing because of third-party involvement.[390] The U.S. Agency for International Development has developed initiatives that resulted in research and expansion of water networks and wastewater treatment.[391] The tempestuous relationship between the two States necessitates tribunal or third-party review for specific disputes concerning international water law principles.[392]

D. Experts

Highly respected professional organizations are a growing source of international water law despite the fact that their findings and recommendations are not binding.[393] For example, the International Law Association (ILA) is a private non-governmental organization that has developed many of the international water law norms.[394] Several ILA documents, including the Helsinki Rules of 1966 and the Seoul Rules of 1986, have marked significant advancements in international water law.[395] The Helsinki Rules were the first attempt to codify international water law norms.[396] In addition, the Helsinki Rules were among the first documents to address the relationship between groundwater and surface water.[397] The Seoul Rules went a step further and actually defined an "international aquifer" as "waters of an aquifer that is intersected by the boundary between two or more States . . . if such an aquifer with its waters forms an international basin or part thereof."[398] Notably, the Seoul Rules were the first regulatory document to address confined aquifers under the principle of equitable utilization.[399]

A division of the United Nations, the International Law Commission (ILC), is another influential organization that shapes international water law.[400] The ILC issued the Resolution on Confined Transboundary Groundwater (RCTG) to supplement the Non-Navigational Convention, which applied only to aquifers hydrologically connected to surface water.[401] The RCTG simply

390. *Id.* at 29.
391. *Id.*
392. *See Middle East*, *supra* note 369, at 160.
393. Kemper et al., *supra* note 53, at 195.
394. *Id.* at 197.
395. Rankin, *supra* note 309, at 11-12
396. *Id.* at 12.
397. *Id.*
398. *The Seoul Rules on International Groundwaters* (1986) (describing when international standards consider an aquifer international ground water), http://www.internationalwaterlaw.org/IntlDocs/Seoul _Rules.htm.
399. Rankin, *supra* note 309, at 15.
400. Kemper et al., *supra* note 53, at 197.
401. Int'l L. Comm, *Resolution on Confined Transboundary Groundwater*, 2 Y.B. Int'l L. Comm'n 135 (1994).

recommends that States also apply the principles of the Non-Navigational Convention to confined aquifers.[402]

In addition to the ILA and ILC, other organizations have drafted model documents that have had a substantial impact on international water law. For instance, the Bellagio Draft Treaty ("Bellagio Treaty") originated from the Ixtapa Draft Agreement ("Ixtapa Draft"), an aquifer management protocol for the United States and Mexico.[403] A multidisciplinary group of specialists transformed the Ixtapa Draft into a model groundwater management program.[404] The specialists drafted the Bellagio Treaty to fill gaps in international water law concerning aquifers and to provide a model treaty that countries could use to draft bilateral or multilateral agreements.[405] The Treaty's goal "is to achieve joint, optimum utilization of the available waters, facilitated by the procedures for avoidance or resolution of differences over shared groundwaters in the face of ever increasing pressures on this priceless resource."[406]

The Bellagio Treaty centers around three concepts of deference to the sovereignty of States: (1) the focus of administration on critical zones of withdrawal and contamination rather than a comprehensive administration; (2) the actual enforcement left to internal administrative agencies of each country, but subject them to the oversight of an international agency, and (3) a joint agency, of limited discretion, to instruct the commission on initiatives for problem-solving.[407] In addition, the Bellagio Treaty suggests mechanisms for sustained use and preservation and dispute resolution.[408]

Overall, international law provides numerous safeguards for shared water resources.[409] Although it may appear at first glance that privatization and international law are incompatible, this is not the case. In fact, the principles and rules set forth by customary international law reflect the social value of water and protect it for future use.[410] In addition, because customary international water law requires close cooperation, it is less likely that States will use resources in ways that harm other States.[411]

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402. *Id.*

403. Rankin, *supra* note 309, at 15.

404. Kemper et al., *supra* note 53, at 197.

405. *Id.*

406. Robert Hayton & Albert E. Utton, *Transboundary Groundwaters: The Bellagio Draft Treaty*, 29 NAT. RES. J. 663, 665 (1989), *available at* http://uttoncenter.unm.edu/pdfs/Bellagio_Draft_Treaty_E.pdf.

407. *Id.* at 664-65.

408. *Id.* at 665.

409. *See supra* notes 320-411 and accompanying text.

410. *See supra* notes 323-353 and accompanying text.

411. *See supra* notes 354-363 and accompanying text.

V. SPECULATIVE CASE STUDY OF THE GUARANI AQUIFER

The Guarani Aquifer, located beneath Brazil, Argentina, Uruguay, and Paraguay, is "one of the most important underground fresh water reservoirs in the world."[412] Until about twenty years ago, the Guarani States treated parts of the aquifer as their national entities rather than a shared water source.[413] Once the scientists and researchers discovered the interrelationships between the aquifers, it took several more years for the public and decision makers to appreciate this complex interrelationship of the aquifer.[414] In an effort to show unity, the countries renamed the hydrogeological system the Guarani Aquifer "in homage to the Guarani indigenous people who used to – and still do – live in the area."[415] Although public awareness of the Aquifer is moderate at best,[416] management of its resources is essential to minimize conflicts between the States because the Guarani aquifer is a strategic water supply for the four countries.[417]

The total surface area of the aquifer is approximately 1.2 million square kilometers,[418] equivalent to the size of England, France, and Spain combined.[419] The aquifer has a freshwater reserve volume of about 40,000 km^3, which is large enough to supply the entire population of Brazil for 3,500 years.[420] In fact, the aquifer could supply water for 360 million people at a rate of 300 liters per day[421] for each person for a hundred years and deplete a mere ten percent of the reserves.[422] In addition to these large reserves, the aquifer has an average annual recharge of 160 km^3.[423] The aquifer also has geothermal[424] potential.[425] Water naturally emerges at temperatures that are ideal for water supply, tourism, and development of alternative energy sources.[426] This

412. MARINA RUBIO, INT'L HYDROLOGICAL PROGRAMME, INTERNATIONALLY SHARED (TRANSBOUNDARY) AQUIFER RESOURCES MANAGEMENT: THEIR SIGNIFICANCE AND SUSTAINABLE MANAGEMENT 45 (Nov. 2001), http://unesdoc.unesco.org/images/0012/001243/124386e.pdf.

413. Kemper et al., *supra* note 53, at 185.

414. *Id.*

415. *Id.* at 185, 188-89.

416. *Id.* at 187.

417. *See id.* at 188.

418. WORLD BANK GROUP, *supra* note 69, at 2 (noting that the surface area in each country is 839,800 km^2 in Brazil, 225,500 km^2 in Argentina, 71,700 km^2 in Paraguay, and 45,000 km^2 in Uruguay).

419. *Id.*

420. WORLD BANK GROUP, *supra* note 69, at 2.

421. This is six times the amount each individual needs to meet the minimum quality of life. *See supra* note 39.

422. Kemper et al., *supra* note 53, at 185.

423. *Id.*

424. Geothermal Resources Council, *What is Geothermal*, *at* http://www.geothermal.org/what.html (2003). Geothermal energy is the thermal energy contained in the rock and fluid in the earth's crust. *Id.* Geothermal energy can be used to generate electric power and provide heating. *Id.*

425. Kemper et al., *supra* note 53, at 185.

426. *Id.*

aquifer presents incredible business opportunities for Brazil, Argentina, Paraguay, and Uruguay,[427] as developing water resources can be a catalyst for social progression.[428]

A. *Need for Privatization Agreement*

In the face of an impending global water crisis, cooperation among states with shared resources will become increasingly important.[429] Several characteristics of aquifers heighten the need for cooperation, including susceptibly to pollution, danger of salinization if over-exploited, uncertainty of structure, lack of understanding of the relationship to surface water, and the potential to serve as long-term storage within comprehensive management schemes.[430] In short, a State cannot manage its share of an aquifer in a sustainable manner without cooperation from other parties.[431] Fortunately, the Guarani States have recognized the need for "a coordinated shared groundwater management framework" and are developing an "integrated management framework for the Guarani Aquifer System."[432] However, in order to maximize the potential of the Guarani Aquifer, the countries should also address the economic value of the aquifer in an international privatization agreement. Such an agreement would easily fit into the currently proposed management framework.

Developing an international privatization agreement is of particular importance in the Guarani context because each of the States suffers from unmet needs and inefficiencies in existing infrastructures.[433] In Argentina, despite the success of privatization efforts, such as the concession of Buenos Aires,[434] only sixty-nine percent of the urban population have connections to a

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427. DAVID HALL ET AL., PUBLIC SERVICES INT'L. RESEARCH UNIT, MAKING WATER PRIVATISATION [SIC] ILLEGAL: NEW LAWS IN NETHERLANDS AND URUGUAY 2 (Nov. 31, 2004), http://www.psiru.org/reports/ 2004-11-W-crim.doc. In October of 2004, over sixty percent of Uruguayan voters passed a constitutional referendum to ensure that social considerations would take priority over economic considerations in water policies. *Id.* The amendment states that access to piped water and sanitation are fundamental human rights. *Id.* Water and sewage services must be exclusively provided by the government, making privatization illegal. *Id.*

428. Upadhye, *supra* note 20, at 61.

429. ERAN FEITELSON & MARWAN HADDAD, IDENTIFICATION OF JOINT MANAGEMENT STRUCTURE FOR SHARED AQUIFERS: A COOPERATIVE PALESTINIAN-ISRAELI EFFORT 1 (World Bank, Technical Paper No. 415, 1998) (on file with author). "The discrepancy between water sources, water uses, spheres of control (either at the national or sub-national level) and ownership patterns, and the extensive externalities involved can all be a basis for conflicts. . . . [O]vercoming the scarcity and temporal variance of water availability in semi arid regions, or the excess of water in temperate regions, often requires cooperation." *Id.*

430. *Id.*

431. *Id.*

432. Kemper et al., *supra* note 53, at 189.

433. Orwin, *supra* note 189.

434. *See supra* text accompanying notes 268-281.

municipal water supply.[435] Further, only seventeen percent of the rural population has any form of sewage treatment.[436] Most of the sewage that enters the system remains untreated.[437] In Brazil, while the water supply system serves over seventy percent of the population, only thirty-five percent are connected to public sewers.[438] Almost half of the population has rudimentary cesspools or no means of disposal.[439] In Paraguay, a government-owned corporation is the sole provider of water and sewage services for all urban areas with populations of over 4,000 or more.[440] Unfortunately, less than half of these people have access to water systems, and a mere thirty-five percent are connected to sewers.[441] Only seventeen percent of the rural population has access to a potable water supply.[442] In Uruguay, almost ninety percent of people have access to a safe water supply.[443] Even still, only forty-eight percent are connected to sewers, and on-site sanitation is considered inadequate.[444]

B. International Solution

Economic structures, such as international privatization agreements, are essential for the sustainable development and maximum utilization of the Guarani Aquifer. Such agreements ensure cost effective management of the aquifer, provide another source of sustainable funding,[445] promote efficiency, and allow governments flexibility to expand service. Market mechanisms are the common denominator of two economic structures: water trade and utilities.[446] The ability to trade water allocations is important because it provides States with the flexibility to accommodate changes in circumstances and cope with rapid shifts in demand without requiring a readjustment in water rights or basic allocations.[447] In addition, water markets have the capacity to reduce imbalances in supply and demand.[448] On the other hand, utilities allow for private sector involvement in the management of the aquifer and in funding programs, such as water supply and protection.[449]

435. Orwin, *supra* note 189.
436. *Id.*
437. *Id.*
438. *Id.*
439. *Id.*
440. *Id.*
441. *Id.*
442. *Id.*
443. *Id.*
444. *Id.*
445. FEITELSON & HADDAD, *supra* note 429, at 16.
446. *Id.* at 16-17.
447. *Id.* at 16.
448. WATER PRICING, *supra* note 13, at 49-50.
449. FEITELSON & HADDAD, *supra* note 429, at 17.

1. *Step One: Data Collection and Exchange*

The first step toward creating an international privatization agreement is data collection and exchange amongst the parties.[450] "[A]ll economic structures require that water be priced, or bought and sold, and unless consumption is monitored no market transaction is possible."[451] The establishment of joint monitoring structures and databases is also a confidence-building measure.[452] The exchange of information facilitates communication and fosters relationships among the States, thereby reducing the probability of a need for a third-party to resolve disputes.

The Guarani States began exchanging information in 1990s.[453] Scientists and government officials from each State and international agencies compiled and shared data concerning water use, consumers, and physical problems, such as overexploitation and pollution.[454] Representatives from each country later formed the Project Preparation Superior Council (PPSC) to assess the data in order to develop project goals and an operative plan.[455]

Although it is tempting to gloss over the first phase of development, the States' willingness to share information can determine the success of the project. For example, an Israeli-Palestinian team worked diligently for two years to identify joint management structures for the aquifers shared by the countries.[456] However, lack of information sharing coupled with the continued precarious water supply led to a loss of confidence in the project.[457] As a result, it will be much more difficult to persuade Israel and Palestine to pursue another joint management project.[458]

2. *Step Two: Definition of Water Rights and Determination of Water Allocations*

When water managers treat water as the economic good that it is, then it is possible to allow the market to govern allocations of water.[459] However, prior to the introduction of a water market, the regulatory body must determine the total number of water rights needed for allocation to existing water users.[460] Groundwater use rights are ambiguous and challenging to define because it is often difficult to determine the magnitude and availability of aquifers.[461]

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450. *Id.*
451. *Id.*
452. *Id.* at 20.
453. Kemper et al., *supra* note 53, at 190.
454. *Id.*
455. *Id.* at 191.
456. FEITELSON & HADDAD, *supra* note 429, at 20.
457. *Id.*
458. *Id.*
459. LEE, *supra* note 6, at 55.
460. *Id.*
461. INNOVATIVE APPROACHES, *supra* note 4, at 135.

Nevertheless, once established, a well-defined usage right entitles users to an extraction allocation at a specified time.[462] So long as the regulatory body clearly defines both users and their respective entitlements, water rights promote efficient use of water.[463] Clearly defined usage rights also promote trade that can enhance efficiency and provide the rights to a holder with a long-term perspective.[464] Such a rights-holder will not only consider his individual benefits from the water, but also the opportunity costs.[465]

The Guarani States face many challenges in the establishment of a water market. To begin, scientists lack baseline knowledge on characteristics and behavior of the aquifer.[466] Users must have assurance that the aquifer will be able to replenish itself and provide water for future uses, otherwise there is no incentive to use the water efficiently.[467] Also, additional data is needed concerning water uses and water users to determine supply and demand.[468] To complicate matters, there is an inadequate legal framework for groundwater management and diverging positions from national standpoints as to the core of water authority and the required levels of involvement and responsibility.[469] The Guarani States recognize these challenges and developed a plan to expand and consolidate the scientific and technological knowledge base and develop a framework for the coordinated management of the aquifer.[470]

3. *Step Three: Pricing, Enforcement, and Dispute Resolution*

The next step towards private sector engagement is the establishment of pricing and/or trading mechanisms.[471] To obtain full benefits of the international agreement, the Guarani States should agree to a single pricing scheme for the entire aquifer. Water pricing mechanisms must promote system sustainability and the efficient use and allocation of water resources.[472] When water is free, individuals use more than they would otherwise.[473] Overuse of water resources reduces the availability of water, and in turn, increases competition for water.[474]

There are two basic types of water charges: water tariffs and water fees. Water tariffs are charges that directly correlate to the use of the infrastructure.[475]

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462. *Id.*
463. *Id.*
464. *Id.*
465. *Id.* at 135-36.
466. Kemper et al., *supra* note 53, at 191.
467. INNOVATIVE APPROACHES, *supra* note 4, at 135.
468. Kemper et al., *supra* note 53, at 191.
469. *Id.*
470. *Id.* at 192.
471. FEITELSON & HADDAD, *supra* note 429, at 17.
472. WATER PRICING, *supra* note 13, at 336.
473. INNOVATIVE APPROACHES, *supra* note 4, at 137.
474. *Id.*
475. WATER PRICING, *supra* note 13, at 351.

Ideally, tariffs would cover the costs of operation, maintenance, and replacement, thereby ensuring the sustainability of the system.[476] "Water fees are government charges for the use of the nation's water resources."[477] The fees should cover the costs of water resources management, such as resource monitoring, assessments of water quantity and quality, administration of water rights, and environmental costs.[478] Water markets can establish the value of water, but this is a challenge.[479] The water markets must have a strong institutional foundation.[480] They also need to correlate to secure water rights allocation, reliable water availability, use monitoring, and low-transaction cost exchange mechanisms.[481]

Pricing mechanisms are useless without proper enforcement mechanisms and dispute resolution procedures.[482] Therefore, enforcement measures and dispute resolution procedures need to be developed simultaneously with pricing mechanisms. It is very costly for regulatory bodies to monitor the many different users involved in abstracting groundwater.[483] Incentives to comply with regulatory provisions are generally low because users know that governments do not monitor their individual behaviors.[484] Providing users with information concerning the condition of their resource is essential to enticing them to preserve the resource.[485] Information becomes increasingly more valuable with a well-defined basis of water rights and responsibilities.[486] By providing users with information, the regulatory body gives users the ability to self-regulate.

In addition, the regulatory body can initiate other enforcement mechanisms to respond to changes in circumstances. For example, the Guarani States might consider price-cap regulation immediately following privatization. Price-cap regulation encourages productivity gains, which are the largest immediately following privatization.[487] Price-cap regulation is also attractive in areas where technological changes increase competition.[488]

On the other hand, the Guarani States might consider rate-of-return regulation.[489] This can provide investors with a guaranteed fair rate-of-return.[490] Rate-of-return is especially relevant for investments with a high sunk-

476. *Id.*
477. *Id.*
478. *Id.*
479. *See id.* at 352.
480. *Id.*
481. *Id.* at 352-53.
482. FEITELSON & HADDAD, *supra* note 429, at 17.
483. INNOVATIVE APPROACHES, *supra* note 4, at 139.
484. *Id.*
485. *Id.*
486. *Id.*
487. LEE, *supra* note 6, at 188.
488. *Id.*
489. *Id.*
490. *Id.*

cost component, such as drinking water supply and sewerage.[491] Although the incentives for cost reduction are weak, this type of regulation works well in countries with general macroeconomic instability and histories of high inflation.[492]

The Guarani States have an advantage in developing dispute resolution procedures because they are already united under the Mercosur[493] trade agreement,[494] which is "an intergovernmental organization without supranational powers."[495] The organizational structure of Mercosur provides means for dispute settlement among State Parties and between private parties affected by different aspects of the process of integration.[496] The organizational framework and dispute resolution procedures of the Mercosur agreement provide an excellent framework for the creation of a multilateral privatization agreement.

4. Step Four: Constraints on Privatization and Trade Agreements

Finally, the Guarani States must establish constraints for privatization and trade agreements to prevent damage to the aquifer.[497] The PPSC,[498] or a similarly organized body, would set up trading rules and govern the structure of the privatization agreement. In other words, the PPSC would act as the single negotiating body for purchases of water from the aquifer.[499] For example, the PPSC could outlaw divesture privatization agreements to promote State ownership and regulation. The PPSC would also set the terms of privatization

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491. *Id.*

492. *Id.*

493. "Mercosur" stands for Mercado Común del Cono Sur. *Legal Response*, *supra* note 376.

494. The Mercosur trade agreement established a Common Market to further economic integration among the countries. Evelina Teubal Alhadeff, *Mercosur (Argentina, Brazil, Paraguay, and Uruguay): Protocol of Brazilia for the Settlement of Disputes*, 36 I.L.M. 691, 691 (1997) [hereinafter *Protocol of Brazilia*]; Evelina Teubal Alhadeff, *Argentina-Brasil* [sic]-*Paraguay-Uruguay: Additional Protocol to the Treaty of Asuncion on the Institutional Structure of Mercosur ("Protocol of Ouro Preto")*, 34 I.L.M. 1244, 1244 (1995) [hereinafter *Additional Protocol*].

495. *Additional Protocol*, *supra* note 494. The Institutional Organization established by the Mercosur agreement consists of "a Common Market Council, a Common Market Group and a Mercosur Trade Commission, which have powers of decision; and a Joint Parliamentary Commission, an Economic and Social Consultative Forum and the Mercosur Administrative Secretariat." *Id.*

496. Evelina T. Alhadeff, *Mercosur (Argentina-Brazil-Paraguay-Uruguay): Protocol of Buenos Aires on International Jurisdiction in Disputes Relating to Contracts*, 36 I.L.M. 1263, 1263 (1997) [hereinafter *Protocol on Buenos Aires*].

497. *See supra* notes 254-267 and accompanying text.

498. Kemper et al., *supra* note 53, at 191. The PPSC is an ideal regulatory body because it is composed of top officials from all four counties representing water, environment, and foreign affairs. *Id.*

499. *See id. See also* FEITELSON & HADDAD, *supra* note 429, at 17 (noting that "trading rules across priorities [should] be set and enforced").

agreements.[500] For instance, the PPSC might consider requiring a provision that requires the private corporation to guarantee a certain quantity of water to each customer or to make meeting unmet needs its first priority.[501] Such provisions would reflect the social value of the water.[502] In addition, it would be wise to include language that binds private operators to the international water law principles of equitable utilization, the obligation not to cause substantial harm, and the duty to cooperate.[503] Lastly, the PPSC might issue drilling and pumpage licenses to reduce the possibility of over-exploitation.[504] The desired level of cooperation between the States would determine the complexity of the privatization limitations.[505]

VI. CONCLUSION

By recognizing the economic value of water, the Guarani States allow themselves the flexibility to trade water resources and entice private sector engagement.[506] Privatization enables the States to obtain much needed funding and flexibility to meet unmet needs and promote efficiency in water use and infrastructure.[507] An international agreement is ideal because it forces the States to allocate water rights. Clearly defined usage rights lessen the subjectivity associated with the principles of international water law and promote efficiency in the water sector. Therefore, the Guarani States would greatly benefit from an international privatization agreement by increasing water availability, heightening water quality, and lowering costs associated with water management and consumption. In turn, the Guarani States' international privatization agreement would serve as a model for other developing countries.

In the face of an impending water crisis, States must develop a new approach to water resource management. International privatization agreements allow States with shared resources to tailor water management schemes to meet unmet citizen needs, generate revenue, and maximize efficiencies, while ensuring compliance with international water law principles. Privatization is an especially attractive solution for developing countries that face growing demands to expand coverage while maintaining existing infrastructures and water treatment standards.

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500. *See supra* notes 254-67 and accompanying text.

501. FEITELSON & HADDAD, *supra* note 429, at 17 (stating that in order to address the variance in water availability, a joint management commission must establish "a priority system of water allocations").

502. *See supra* notes 256-258 and accompanying text.

503. *See, e.g.*, *Helsinki Rules*, *supra* note 332 (a formal adoption of the principle of equitable use); *Non-Navigational Convention*, *supra* note 76 (convention requiring States to mitigate harm and cooperate).

504. FEITELSON & HADDAD, *supra* note 429, at 17.

505. *Id.* at 18.

506. *See supra* notes 445-449 and accompanying text.

507. *See supra* notes 123-124 and accompanying text.