

2009

Hydroelectric Dams: Transboundary Environmental Effects and International Law

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FLORIDA STATE UNIVERSITY LAW REVIEW



HYDROELECTRIC DAMS:
TRANSBOUNDARY ENVIRONMENTAL EFFECTS AND
INTERNATIONAL LAW

Karlie Shea Clemons

VOLUME 36

SPRING 2009

NUMBER 3

Recommended citation: Karlie Shea Clemons, *Hydroelectric Dams: Transboundary Environmental Effects and International Law*, 36 FLA. ST. U. L. REV. 487 (2009).

COMMENT

HYDROELECTRIC DAMS: TRANSBOUNDARY ENVIRONMENTAL EFFECTS AND INTERNATIONAL LAW

KARLIE SHEA CLEMONS*

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I. INTRODUCTION

By the year 2050, the human population is expected to increase by more than thirty-five percent.¹ At present, we are thus simultaneously facing pressure for an efficient energy increase,² while also trying to adhere to an international regime to slow climate change.

The result is an international struggle between each State's ability to provide efficient and reliable energy while also doing its part to preserve the atmosphere. The major complication to all of this is the question of how far each State will go to accomplish such efficient energy: will a State stay within the bounds of its duties presented by international environmental law and adhere to its duties for environmental and atmospheric preservation, or will it push further with no adherence to either the law or recognition of the environmental harm to its own territory or the territory of others?

This Comment will present and analyze international environmental law as it applies to the construction and use of hydroelectric dams. Overall, this Comment will show that while there are relevant laws, many times a harmed State still has no recourse. To demonstrate this conclusion, this Comment will first provide general background regarding hydroelectric dams and follow with an explanation of the resulting benefits and harms, focusing primarily on environmental concerns. Second, this Comment will identify and thoroughly analyze relevant sources of international environmental law, and it will highlight both strengths and weaknesses of these sources. Third, this Comment will offer specific examples of transboundary agree-

1. U.N. Dep't of Econ. and Soc. Aff., Population Div., *World Population Prospects: The 2006 Revision Executive Summary*, ¶ 2, U.N. Doc. ST/ESA/SER.A/261/ES [hereinafter *World Population Prospects*], available at <http://www.un.org/esa/population/publications/wpp2006/English.pdf>. Specifically, the 2006 Revision estimates that by 2050 the world population will reach 9.2 billion from the 6.7 billion estimate at the time. *Id.*

2. In addition to needing more energy as a result of increased population, almost two billion people do not have access to affordable energy services at all, particularly in developing countries. U.N. DEV. PROGRAMME ET AL., *WORLD ENERGY ASSESSMENT: OVERVIEW, 2004 UPDATE*, at 34, U.N. Sales No. E.04.111.B.6 (2004) [hereinafter *WORLD ENERGY ASSESSMENT*], available at http://www.undp.org/energy/docs/WEAOU_full.pdf; see also *World Population Prospects*, *supra* note 1. Thus, an increase in energy sources is necessary in order to alleviate significant health impacts, and such an increase may even raise the level of education, especially for women and children. *WORLD ENERGY ASSESSMENT*, *supra*. In order to cook, women and children are forced to spend long periods of time gathering firewood and water. *Id.* Because of the physical energy required, "women and children often have no opportunities for education and other productive activities, while their health suffers." *Id.*

ments or, in many situations, the lack of agreements. These examples will illustrate direct application of international laws and portray the extreme deficiencies in enforceability. Lastly, this Comment will offer a brief conclusion regarding both a specific hydroelectric dam dispute and the state of the relevant law in general.

II. BACKGROUND

Hydroelectric dams exist on international watercourses worldwide, and some States even use hydropower as their primary source of energy.³ There are approximately 45,000 large dams in the world, including both hydroelectric and nonhydroelectric dams.⁴ Between 1990 and 1997, hydropower generated approximately 18.5% of the world's electricity, and as of 2004, hydropower accounted for 16% of the world's energy production.⁵

While hydroelectric dams contribute to atmospheric preservation, they still present much concern. Whether these benefits outweigh the concerns is controversial, debatable, and a contributing factor to many international political disputes. The main problem is addressing the issues that arise between States given the applicable international environmental law. While one State may determine that the advantages of a particular hydroelectric dam outweighs the potential disadvantages, another nation, also affected by the potential dam, may not agree. The possibility for this scenario is quite likely since nearly fifty percent of Earth's land surface (not including Antarctica) and sixty percent of all fresh water are part of transboundary water

3. ROY L. NERSESIAN, ENERGY FOR THE 21ST CENTURY: A COMPREHENSIVE GUIDE TO CONVENTIONAL AND ALTERNATIVE SOURCES 290-91 (2007) (noting that sixty-five countries rely on hydropower for more than fifty percent of their electricity generation); *see also* Mustafa Balat, *Electricity from Worldwide Energy Sources*, 1 ENERGY SOURCES PART B: ECON. PLAN. & POL'Y 395, 401 (2006) (citing G. Bergkamp et al., *Dams, Ecosystem Functions, and Environmental Restoration* (2000)). Canada is the largest producer of hydroelectric power, followed by Norway and the United States. *Id.*

Hydroelectric power, also known as hydropower, refers to the process of using water's energy to create electricity. U.S. Dep't of Energy, Wind and Hydropower Technologies Program: How Hydropower Works, http://www1.eere.energy.gov/windandhydro/hydro_how.html (last visited June 1, 2009) [hereinafter *How Hydropower Works*]. While several types of hydropower plants exist, this Comment specifically pertains to hydroelectric dam use through an impoundment facility, which is the most common type of hydroelectric power facility. U.S. Dep't of Energy, Wind & Hydropower Technologies Program: Types of Hydropower Plants, http://www1.eere.energy.gov/windandhydro/hydro_plant_types.html (last visited June 1, 2009). Once a dam is built, a reservoir (an artificial man-made lake) is created on the upstream side of the dam. *See id.* When it is time to generate electricity, water is released from the reservoir, moving through a turbine creating energy. *Id.* This energy is then put onto the electrical grid and eventually used in homes, businesses, and industries. *How Hydropower Works, supra.*

4. NERSESIAN, *supra* note 3, at 290-91.

5. *Id.* at 300.

basins, meaning that the majority of Earth's water is shared water.⁶ When faced with disputes, a harmed State is ultimately left only to rely on sources of international environmental law for guidance.

III. BENEFITS OR HARMS: WHICH PREVAILS?

A. Benefits

In comparison to other existing forms of energy production, the most notable benefit of hydropower is that hydroelectric dams do not directly emit greenhouse gasses.⁷ Specifically, since water is the main component of hydropower generation, burning of coal or use of either oil or fuels is not necessary.⁸ Likewise, the water used—and thus the river as a whole—is not polluted.⁹ Additionally, although the construction of hydroelectric dams and their turbines is quite costly,¹⁰ the cost of energy generation is rather inexpensive.¹¹

In comparison to other sources of energy production, hydroelectric dams also provide power that is both predictable and reliable.¹² These dams allow the storage of water (in the reservoir) until it is needed and then allow a rapid increase in energy production (more

6. Water Encyclopedia, Transboundary Water Treaties, <http://www.waterencyclopedia.com/St-Ts/Transboundary-Water-Treaties.html> (last visited June 1, 2009) (“A transboundary waterway is defined as all territory which contributes to a stream, at least one of the tributaries of which crosses a boundary.”); *see also* LUDWIK A. TECLAFF, *THE RIVER BASIN IN HISTORY AND LAW* 42-46 (1967) (emphasizing, through multiple examples, the vast amount of trade that was facilitated because of the existence of a large number of transboundary rivers and noting that “[t]he influence of the physical unity of the basin proved stronger than political divisions”).

7. *See* U.S. Dep’t of Energy, Wind and Hydropower Technologies Program: Advantages and Disadvantages of Hydropower, http://www1.eere.energy.gov/windandhydro/hydro_ad.html (last visited June 1, 2009); *see also* Thomas Moran, *The Environmental and Socio-Economic Impacts of Hydroelectric Dams in Turkish Kurdistan* 24-25 (June 10, 2004) (unpublished thesis, Roskilde University), available at <http://rudar.ruc.dk/handle/1800/403>.

8. *See* WILLIAM WHIPPLE, JR., *WATER RESOURCES: A NEW ERA FOR COORDINATION* 64-65 (1998); *see also* U.S. Dep’t of Energy, *supra* note 7.

9. *See* NERSESIAN, *supra* note 3, at 291.

10. *Id.*; *see, e.g.,* NASA Satellites Watch as China Constructs Giant Dam, SCIENCE DAILY, June 13, 2007, <http://www.sciencedaily.com/releases/2007/06/070612134358.htm> (stating that the total construction cost of the Three Gorges Dam on the Yangtze River in China, which is now the largest hydroelectric dam in the world, was at least \$625 billion).

11. NERSESIAN, *supra* note 3, at 291 (noting that “hydropower has no fuel cost and a low operating cost”); *see also* 25x’25, Why Renewables: Hydroelectric and Tidal Power, http://www.25x25.org/index.php?option=com_content&task=view&id=19&Itemid=48 (last visited June 1, 2009). “25x’25” is an alliance originally created by a group of farm leaders who had a goal of obtaining twenty-five percent of America’s energy from renewable sources—such as wind, solar, and biofuels—by 2025. About 25x’25, http://www.25x25.org/index.php?option=com_content&task=view&id=12&Itemid=41 (last visited June 1, 2009).

Additionally, hydroelectric power can be highly automated. *See* U.S. Dep’t of Energy, *supra* note 7 (noting that engineers can control the amount of water flowing through the turbines to “produce electricity on demand”).

12. 25x’25, *supra* note 11.

quickly than power plants using fossil fuel for energy production) during periods of higher demand.¹³

Similar to other types of dams, hydroelectric dams also serve as a flood control mechanism.¹⁴ Compared to a river functioning in its natural state, a dam can maintain more water in the reservoir and thus allow less water to move downstream.¹⁵ Many times, this can protect downstream communities from flooding.¹⁶

Additional indirect benefits of hydroelectric dam construction are that it “[e]nhances knowledge and improves management of valued species due to study results” and that it can sometimes create new freshwater ecosystems which are more productive.¹⁷ Immediately after floods, fish populations typically increase because the floods “enable fish to move out into floodplain^[18] wetlands to feed and reproduce.”¹⁹ Similarly, floods recharge groundwater supplies and wetlands and natural fertilize farmland.²⁰

B. Harms

Despite the undoubted benefits, many still feel that hydroelectric dams present serious environmental concerns, which should be considered in conjunction.²¹

1. Methane Gas and Carbon Dioxide Emissions

Hydroelectric dams are considered a “clean” source of renewable energy²² because they do not directly emit greenhouse gases. However, evidence that dams’ reservoirs emit methane gas may arguably

13. *Id.*

14. *Id.*

15. *See id.*

16. *Id.* *But see infra* text accompanying notes 84-86 (questioning dams’ efficacy in protecting downstream communities).

17. Moran, *supra* note 7, at 25.

18. A river’s floodplain is an important part of the river system. Institute for Ecological Health, Floodplain Management, http://www.instituteforecologicalhealth.org/floodplain_management.html (last visited June 1, 2009). In a river’s natural state, “a dynamic river will move its course to and fro over a long time frame . . . Riparian vegetation and wetlands associated with streams and rivers are essential habitats for a great number of animal and plant species.” *Id.*

19. Misty Herrin, The Nature Conservancy, China: Minimizing Dam Impact on the Yangtze River, <http://www.nature.org/wherework/asiapacific/china/features/yangtzedams.html> (last visited June 1, 2009) (interview with Qiaoyu Gou, Project Manager, The Nature Conservancy’s China Program).

20. *Id.*

21. *See* NERSESIAN, *supra* note 3, at 291.

22. Environmental Literacy Council, Hydroelectric Power, <http://www.enviroliteracy.org/article.php/59.html> (last visited June 1, 2009) [hereinafter ELC, Hydroelectric Power]. The Environmental Literacy Council is an independent, non-profit organization providing general environmental science information for educators and the public. Environmental Literacy Council, About Us, <http://www.enviroliteracy.org/subcategory.php?id=1> (last visited June 1, 2009).

refute the claim that these dams are environmentally friendly.²³ Essentially, “man-made reservoirs convert carbon dioxide in the atmosphere into methane.”²⁴ According to critics, in tropical areas of Brazil where large dams produce more than ninety percent of electricity, the dams’ reservoirs emit such a high amount of methane gas that the dams’ contribution to climate change is even greater than that of equivalent fossil fuel power plants.²⁵ For example, estimates show that the Balbina Dam in Brazil produces between twenty and forty times more carbon dioxide than power plants using coal.²⁶ According to the estimates of Philip Fearnside of Brazil’s National Institute for Research in the Amazon in Manaus, such high emission rates are from carbon that is “tied up in trees and other plants [which is] released when the reservoir is initially flooded and the plants rot.”²⁷ After the initial decay, plant parts then settle on the floor of the reservoir and continue to decompose, which results in an increase of dissolved methane because the plants are decomposing with no oxygen.²⁸ When water passes through the turbine, this dissolved methane is released into the air.²⁹ Fernando Ramos, lead scientist for the National Space Research Institute (INPE) in Brazil, stated that “[i]t’s like opening a bottle of soda. A large part of the methane is dissolved in the water bubbles, and it’s released to the atmosphere.”³⁰

While great uncertainty exists as to how much methane hydroelectric dams actually emit into the atmosphere,³¹ INPE scientists estimate that large dams may be responsible for worldwide annual emissions of 800 million tons of carbon dioxide, whereas the United Kingdom’s *total* greenhouse gas emissions in 2006 was around 660 million tons.³²

23. See Duncan Graham-Rowe, *Hydroelectric Power’s Dirty Secret Revealed*, NEWSIDENTIST, Feb. 24, 2005, <http://www.newscientist.com/article.ns?id=dn7046>; Tim Hirsch, *Project Aims to Extract Dam Methane*, BBC NEWS, May 10, 2007, <http://news.bbc.co.uk/1/hi/sci/tech/6638705.stm>.

24. Graham-Rowe, *supra* note 23.

25. *Id.*

26. International Rivers, *Frequently Asked Questions About Dams*, <http://www.internationalrivers.org/en/node/480> (last visited June 1, 2009) [hereinafter *Frequently Asked Questions About Dams*].

27. Graham-Rowe, *supra* note 23.

28. *Id.*

29. *Id.*

30. Hirsch, *supra* note 23.

31. See *id.* Each dam may emit different levels of methane gas. *Id.* The amount of methane gas emitted depends on, among other things, the amount of vegetation in the water, the water’s temperature, and the reservoir’s shape. *Id.*

32. *Id.* Although not within the scope of this Comment, it is relevant to note that the INPE scientists have proposed that “with relatively simple technology, this unwanted by-product of hydro-electric power generation could be turned into an extra source of clean, renewable electricity.” See *id.* (providing a brief note on and a detailed chart regarding such technology).

2. River Flow and Affected Ecosystems

Freshwater ecosystems provide many things that humans depend on, such as “food and fiber, water purification,” and “fish and wildlife.”³³ But in order to provide these things, freshwater ecosystems are dependent upon the “cycling of water and on functioning ecological processes and species assemblages.”³⁴ In order to maintain the health of these ecosystems, the water must maintain a particular level of both quality and quantity.³⁵ Thousands of species and activities depend upon freshwater ecosystems.³⁶ Specifically, approximately forty percent of fish are of a freshwater species and approximately 200 new freshwater species are identified yearly.³⁷ And, of the 10,000 freshwater species that have already been identified, approximately 2,000 are already endangered, vulnerable, or extinct.³⁸ Given the large number of species relying on these ecosystems and the number of these species that are endangered and vulnerable, maintaining the ecosystems is of grave importance.³⁹

The most significant environmental impact of hydroelectric dams is, arguably, the alteration of the affected river’s flow.⁴⁰ When river flows are altered, it is not merely the visible appearance of the river that is changed. Rather, it is a cycle that has much deeper impacts—even beyond the river itself.⁴¹

(a) Natural Flooding

While flood control is undoubtedly beneficial to some extent, especially for those who would otherwise lose their communities and businesses, arguably “[t]he elimination of the benefits provided by

33. Karin M. Krchnak, The Nature Conservancy, “Greening” Hydropower: Integrating Environmental Flow Considerations 2 (2006), http://www.nature.org/initiatives/freshwater/files/hydropower_2006_krchnak_paper_final.pdf.

34. *Id.*

35. *Id.*

36. *Id.*

37. *Id.*

38. *Id.*

39. *See id.*

40. International Rivers, Environmental Impacts of Dams, <http://internationalrivers.org/en/node/1545> (last visited June 1, 2009) [hereinafter Environmental Impacts of Dams]. Note that this impact is caused by other types of large dams as well. *Id.* Also note that hydroelectric dams impact groundwater and wetlands. *See* Krchnak, *supra* note 33, at 2. Other than general references, however, these issues are outside the scope of this Comment.

41. *See infra* Part III.B.2 (focusing on the harms to a river’s flow and surrounding ecosystem caused by hydroelectric dam construction and use).

natural flooding may be the single most ecologically damaging impact of a dam.⁴²

Biologists generally recognize dams as the most damaging of the sources that contribute to the disappearance of riverine species.⁴³ The loss of natural flooding affects river and floodplain ecosystems overall. Such ecosystems “are closely adapted to a river’s flooding cycle. The native plants and animals depend on its variations for reproduction, hatching, migration, and other important lifecycle stages. Annual floods deposit nutrients on the land, flush out backwater channels, and replenish wetlands.”⁴⁴

(b) *Ecosystem Fragmentation*

Damming a river fragments the riverine ecosystem by isolating the upstream and downstream ecosystems and cutting off species’ migration habits;⁴⁵ this causes serious changes to species’ historical spawning habits.⁴⁶ For example, in the current construction of the Brazilian Madeira River hydroelectric dams,⁴⁷ catfish have become “the main symbol of the controversy.”⁴⁸ These fish have an intricate 2,000-mile migration to the “mouth of the Amazon,” and, according to experts, the dams will disrupt this migration.⁴⁹ River ecosystem fragmentation has resulted in a serious reduction in watershed species.⁵⁰ For example, in the Northwest United States, as a result of hydroelectric dam construction (among other reasons, such as over-

42. PATRICK MCCULLY, SILENCED RIVERS: THE ECOLOGY AND POLITICS OF LARGE DAMS 31 (2001).

43. Lori Pottinger, International Rivers, Environmental Impacts of Large Dams: African Examples (Oct. 1, 1996), <http://www.internationalrivers.org/en/africa/environmental-impacts-large-dams-african-examples>.

44. *Id.*

45. MCCULLY, *supra* note 42, at 31; *see also* WHIPPLE, *supra* note 8, at 65. It should be noted that certain technologies have been used on hydroelectric dams in order to alleviate some fish migration problems. *See* WHIPPLE, *supra* note 8, at 66-67 (“[T]he dams on the Columbia [River] and many other rivers have fish ladders, which are quite efficient in allowing movement of adult fish migrating upstream in order to spawn. However, the problems of moving the immature ‘fingerlings’ downstream after spawning have proved much more difficult to handle.”).

46. *See generally* D.D. Dauble et al., *Impacts of the Columbia River Hydroelectric System on Main-Stem Habitats of Fall Chinook Salmon*, 23 N. AM. J. FISHERIES MGMT. 641 (2003) (describing the changes in the spawning habits and the resulting decrease in anadromous fish run populations in the Columbia and Snake rivers as a result of hydroelectric dams).

47. *See infra* Part VI.C.

48. Larry Rohter, *Both Sides Say Project Is Pivotal Issue for Brazil*, N.Y. TIMES ONLINE, June 11, 2007, <http://www.nytimes.com/2007/06/11/world/americas/11amazon.html>.

49. *Id.*

50. MCCULLY, *supra* note 42, at 31. It is noteworthy, however, that species isolation may be beneficial for some species, because dams provide a reservoir that allows for the creation of habitat for lake fish. *Id.* Additionally, the increase in the amount of cool water—released as a result of creation of the reservoir—may allow some fish to thrive that could not have done so when the water was warm. *Id.*

fishing) on the Columbia River, anadromous fish populations have decreased from an average of 10 to 16 million fish per year at the beginning of the twentieth century to an annual run size of only 2.5 million.⁵¹

Currently, the exact global extent of river ecosystem fragmentation caused by dams has not been determined.⁵² However, Swedish ecologists, Mats Dynesius and Christer Nilsson, from the University of Umeå,

estimated the degree of damage to river systems in the US, Canada, Europe and the former USSR. . . . [and] found that fully 77 per cent of the total water discharge of the 139 largest river systems in these countries is 'strongly or moderately affected by fragmentation of the river channels by dams and by water regulation resulting from reservoir operation, interbasin diversion and irrigation'.⁵³

Dynesius and Nilsson also concluded that " '[a]s a result of habitat destruction and obstruction to organism dispersal,' . . . 'many riverine species may have become extinct over vast areas, whereas populations of others have become fragmented and run the risk of future extinction.' "⁵⁴

(c) *Sediment Displacement*

Sedimentary deposits, to both river channels and banks, are pertinent: "too much sediment can aggrade channels and cause flooding problems, whereas erosion of sediment can degrade habitat."⁵⁵ While natural sediment levels vary between regions of the world (and thus sedimentation affects areas differently) according to the World Commission on Dams, assuming that no controls are implemented to control sedimentation, in the next twenty-five to fifty years, reservoir

51. Dauble et al., *supra* note 46, at 641 ("Although the exact amount of fish lost to hydropower development is uncertain, salmonid habitats in the main-stem Columbia and Snake rivers have changed dramatically during the past 60 years. For example, many areas where salmonids spawned are now a series of low-velocity impoundments, and access to other habitats is blocked by impassable barriers."). For a more recent example of a major reduction in freshwater species resulting from dam construction, see *infra* notes 334-37 and accompanying text, which discuss a recent "mass killing" of fish during the initial construction phases of the Santo Antonio dam in Brazil.

52. MCCULLY, *supra* note 42, at 31; *accord, e.g.*, Dauble et al., *supra* note 46, at 641.

53. MCCULLY, *supra* note 42, at 31.

54. *Id.*

55. MICHAEL COLLIER ET AL., U.S. DEPT. OF THE INTERIOR, CIRCULAR NO. 1126, DAMS AND RIVERS: A PRIMER ON THE DOWNSTREAM EFFECTS OF DAMS, U.S. GEOLOGICAL SURVEY 3 (2d rev. ed. 2000).

sedimentation will eliminate twenty-five percent of the world's storage capacity for fresh water.⁵⁶

In a river's normal state, sediments allow natural replenishment of the downstream ecosystems by moving sediments downstream and depositing them along the riverbeds and river banks; this essentially serves as a natural fertilizer.⁵⁷ A dam, however, captures these natural sediments and prevents them from moving downstream, thus depriving the downstream portion of the river.⁵⁸ When a river is deprived of normal sediment placement, the river seeks to nourish itself by eroding the river's bank and downstream riverbed.⁵⁹ This can even undermine bridges and structures built along the riverbank.⁶⁰ Within a decade of a dam's initial operation, downstream riverbeds may be eroded by several meters, and damage may even be felt hundreds of kilometers downstream of the dam.⁶¹

Sediment reduction also affects the fish and wildlife relying on the natural sediment process.⁶² For example, because sediment reduction causes the water to become clearer, many fish and wildlife species will be at greater risk of danger because they are less camouflaged.⁶³

A river's loss of natural sediments also affects the upstream portion of the river.⁶⁴ Just as the downstream portion of the river is deprived of these valuable sediments, a dam's reservoir can be damaged by an accumulation and buildup of these same sediments.⁶⁵ Because sediments and nutrients are trapped behind the dam, the lack of water flow is then likely to cause growth and spread of algae and other aquatic weeds.⁶⁶ Further, due to lack of movement, water in the reservoir becomes stagnant, resulting in loss of oxygen.⁶⁷ Ultimately, this cycle can reduce the number of organisms living in the reservoir.⁶⁸ In extreme cases, sediment buildup can put additional pressure on the dam itself, which can actually weaken the dam.⁶⁹

56. Moran, *supra* note 7, at 22-23 (noting that "the WCD predicts that most of the global loss of fresh water storage capacity will occur in the developing countries as well as those with higher sedimentation rates").

57. Environmental Impacts of Dams, *supra* note 40.

58. *Id.*; see, e.g., *infra* note 322 and accompanying text (describing study of the expected effects of Brazil's Madeira River dam projects with regard to sedimentation).

59. Environmental Impacts of Dams, *supra* note 40.

60. *Id.*

61. *Id.*

62. See Moran, *supra* note 7, at 23.

63. *Id.* at 24.

64. See *id.* at 23-24.

65. *Id.* at 22.

66. ELC, Hydroelectric Power, *supra* note 22.

67. Moran, *supra* note 7, at 23.

68. *Id.*

69. *Id.* at 22.

Groundwater pollution may also result from sediment deprivation.⁷⁰ Specifically, farmers downstream who rely on the water as a source of fertilizer are then forced to use substitute types of fertilizer, which may ultimately pollute both the river and the related groundwater.⁷¹

3. *Cultural, Historical, and Health Concerns*

The human effect is one of the most significant harms of hydroelectric dams.⁷² The initial construction itself results in mass numbers of individuals losing their homes, villages, communities, and ways of life.⁷³ Consider the Three Gorges Dam on the Yangtze River in China, for example.⁷⁴ It was anticipated that the rising waters of the expansive reservoir could submerge over 140 towns, 326 townships, and 1,351 villages, causing over one million people to be moved from the general area.⁷⁵

The World Commission on Dams estimated that between forty and eighty million people have been physically displaced,⁷⁶ but this may be a conservative estimate. The World Bank estimates that approximately four million people are displaced annually from “approximately 300 large dams (above 15m high) that on average enter construction phase annually.”⁷⁷ This number, however, does not account for those whose livelihoods are affected by dams.⁷⁸ For example, a city’s unemployment may ultimately rise as a result of dam construc-

70. *Id.*

71. *Id.*

72. While the social and economic impacts of hydroelectric dams are important and relevant to a State’s construction decision, they are outside the scope of this Comment.

73. See Matthew Coon Come, *Survival in the Context of Mega-Resource Development: Experiences of the James Bay Crees and the First Nations of Canada*, in *IN THE WAY OF DEVELOPMENT: INDIGENOUS PEOPLES, LIFE PROJECTS AND GLOBALIZATION* 153, 155 (Mario Baser et al. eds., 2004). Matthew Come described the effects of development on indigenous communities in Northern Canada in the early 1970s:

In 1972 I was a young student . . . , and I read in the newspaper one day about Quebec’s ‘hydroelectric project of the century’. [sic] I looked at a map and saw that my community’s lands at Mistissini were to be submerged because they were going to use Lake Mistissini as a reservoir. It was then that our people realized that the plans of Hydro-Quebec to dam and divert more than a dozen rivers in our territory would spell an end to our way of life.

Id.; see also ELC, *Hydroelectric Power*, *supra* note 22.

74. See *infra* Part III.C.

75. DAI QING, *THE RIVER DRAGON HAS COME!: THE THREE GORGES DAM AND THE FATE OF CHINA’S YANGTZE RIVER AND ITS PEOPLE* 41, 52 (John G. Thibodeau & Philip B. Williams eds., Yi Ming Trans., 1998).

76. THAYER SCUDDER, *THE FUTURE OF LARGE DAMS: DEALING WITH SOCIAL, ENVIRONMENTAL, INSTITUTIONAL AND POLITICAL COSTS* 22 (2005); *WORLD COMM’N ON DAMS, DAMS AND DEVELOPMENT: A NEW FRAMEWORK FOR DECISION-MAKING* 104 (2000), available at <http://www.dams.org/docs/report/wcdreport.pdf>.

77. SCUDDER, *supra* note 76, at 22.

78. *Id.*

tion because farmers are displaced as a result of their land being flooded for the creation of the reservoir.⁷⁹

Even if river dwellers are not physically displaced by dam construction, they are still impacted. Where dam construction blocks migration and ultimately causes complete or partial diminishment of a species, river dwellers relying on those species also suffer.⁸⁰ For example, in the case of the Madeira River construction in Brazil,⁸¹ fish species likely to be negatively affected (which some claim could become extinct) serve as the main protein source of those living along the Madeira and Amazon.⁸² Additionally, since these fish provide economically for people living along the rivers,⁸³ elimination of the species in the area would, presumably, further contribute to the large number of indigent people in the area.

Another problem is overreliance on dams as flood protection.⁸⁴ Often times, this reliance may prove to be a “false sense of security” during large floods, when dams are not sufficient to hold back all of the water.⁸⁵ Specifically, reliance has led people to increase development in floodplains, and thus during large floods the resulting damage may be even greater than it otherwise would have been without the dam.⁸⁶

C. *Three Gorges Dam: Yangtze River, China*

The Three Gorges Dam project on the Yangtze River in China demonstrates the difficulty of striking a balance between the benefits and harms of hydroelectric dams. The dam was structurally completed in May 2006 and is the world’s largest reinforced concrete hydroelectric dam.⁸⁷ In late 2008, the final generating unit was installed, and on March 3, 2009, the project announced that, like the other twenty-five generating units, the final generating unit had suc-

79. Moran, *supra* note 7, at 7.

80. See, e.g., Glenn Switkes, The Americas Program, Brazilian Government Moves to Dam Principal Amazon Tributary 2 (2007), <http://americas.irc-online.org/pdf/reports/0706amazon-eng.pdf>.

81. *Id.*; see also *infra* Part VI.C.

82. Switkes, *supra* note 80, at 2. For a recent “mass killing” of these fish along the Madeira River, see *infra* notes 334-37 and accompanying text.

83. *Id.*

84. See Institute for Ecological Health, *supra* note 18.

85. *Id.*

86. See Bob Schildgen, *Unnatural Disasters*, SIERRA MAG, May-June 1999, available at <http://www.sierraclub.org/sierra/199905/floods.asp>.

87. *Three Gorges Dam Wall Completed*, BBC NEWS, May 20, 2006, <http://news.bbc.co.uk/2/hi/asia-pacific/5000092.stm>. Proposals for dam construction on the Yangtze River date back to around 1918, but such a project was not actually accepted until 1992 and not actually begun until 1994. See China Three Gorges Project, History, http://www.ctgpc.com/history/history_a.php (last visited June 1, 2009).

cessfully operated for its first 100 days.⁸⁸ The completed reservoir spans 401 square miles.⁸⁹

Construction of the Three Gorges Dam has always been, and remains, controversial—especially between scientists who claim that the dam will cause extreme environmental harm and the political proponents within the Chinese government.⁹⁰ The Chinese government supported the dam for two main reasons—energy generation and flood control.⁹¹ Regarding energy generation, in comparison to coal-fired power stations with electricity generation, the plant will decrease carbon dioxide emissions by 100 million tons and will help prevent acid rain and the greenhouse effect.⁹² And, with regard to flood control, the Yangtze River is known to have devastating floods; for example, a flood in 1998 affected 300 million people.⁹³ Previous estimates predicted that upon completion, the flood control standard would be upgraded from preventing floods categorized as less than 10-year floods to preventing 100-year floods.⁹⁴ Estimates show that this upgrade will relieve approximately 15 million people and 1.5 million hectares of farmland from flooding.⁹⁵

In addition to these main goals, the Chinese government intended the dam to increase navigability, which would extend the travel route into China's mainland.⁹⁶ The ultimate hope for this navigability

88. China Three Gorges Project, All 26 Generating Units in Smooth Operation for First 100 Days, <http://www.ctgpc.com/news/news1.php?NewsId=32399> (last visited June 1, 2009).

89. *NASA Satellites Watch as China Constructs Giant Dam*, *supra* note 10.

90. See generally Jim Yardley, *Chinese Dam Projects Criticized for Their Human Costs*, N.Y. TIMES, Nov. 19, 2007, available at <http://www.nytimes.com/2007/11/19/world/asia/19dam.html>.

91. Samuel Robert Fishleigh Allin, *An Examination of China's Three Gorges Dam Project Based on the Framework Presented in the Report of the World Commission on Dams 16-17* (Nov. 30, 2004) (unpublished Master's thesis, Virginia Polytechnic Institute and State University), available at http://scholar.lib.vt.edu/theses/available/etd-12142004-125131/unrestricted/SAllin_010304.pdf. Chinese Government documents,

especially those released by the Ministry of Water Resources, commonly note that overall ecosystem enhancement will occur because of the [Three Gorges Dam]. This will include the establishment of new ecosystems supported by the [Three Gorges Dam] reservoir and better, more controlled conditions in the areas downstream of the dam. Based on the literature and findings of the WCD, this statement should be questioned. There are a few recognized ecosystem benefits that occur from the construction of large dams, however the net environmental effect is almost always negative.

Id. at 22-23.

92. China Three Gorges Project, Environment, http://www.ctgpc.com/environmental/environmental_a.php (last visited June 1, 2009).

93. Allin, *supra* note 91, at 16 (citations omitted).

94. China Three Gorges Project, Biggest Flood Control Benefit in the World, http://www.ctgpc.com/benefits/benefits_a.php (last visited June 1, 2009).

95. *Id.*

96. Allin, *supra* note 91, at 17.

increase was to “cause the emergence of new markets, job creation, and economic vitality.”⁹⁷ Earlier estimates provided that when complete, as it now is, the annual one-way navigation capacity of the Yangtze River at the dam would increase from ten million to fifty million tons.⁹⁸ Yet another goal of the Chinese Government was accessibility to fresh water.⁹⁹ The dam was projected to increase fresh water access for both agriculture and consumption purposes.¹⁰⁰

While many economic benefits are (or at least are expected to be) derived from construction and operation of the Three Gorges Dam, the environmental concerns may arguably undermine these benefits.¹⁰¹ Currently, obvious problems caused by the dam include drastic changes to the river’s water temperature, silt levels, and seasonal fluctuations in the river’s flow.¹⁰² Additionally, significant amounts of reservoir greenhouse gas emissions will result from vegetation breakdown, silt, and other organics, which decompose at the bottom of the reservoir.¹⁰³ Thus, the alleged “clean energy” theory for the Three Gorges Dam is undermined because of these reservoir greenhouse gas emissions.¹⁰⁴ Furthermore, silting may eventually cause an increase in flooding because of silt buildup in the dam’s reservoir.¹⁰⁵ Even more extreme is that this silt buildup may “reduce the effectiveness of power generation schemes, while upstream siltation may impact navigability.”¹⁰⁶

The downstream portion of the river is also affected by this silt buildup in the reservoir. This buildup results in less silt flowing downstream, thus compromising the river’s ability to naturally replenish itself.¹⁰⁷ Loss of nutrients then reduces “fertility” of the agricultural lands downstream,¹⁰⁸ and the “[d]isruption of the natural distribution and timing of streamflow disrupt[s] aquatic ecosystems.”¹⁰⁹

After supporting the Three Gorges Dam project for over a decade, on September 26, 2007, China’s Communist Party gave a firm warning that unless preventative measures were quickly taken, an environmental disaster was approaching for the areas surrounding the

97. *Id.*

98. China Three Gorges Project, Remarkable Navigation Benefit, http://www.ctgpc.com/benefifs/benefifs_a_3.php (last visited June 1, 2009).

99. Allin, *supra* note 91, at 17.

100. *Id.*

101. NERSESIAN, *supra* note 3, at 301.

102. Allin, *supra* note 91, at 20.

103. *Id.* at 19.

104. *Id.*

105. *Id.* at 20.

106. *Id.*

107. *Id.* at 20-21.

108. *Id.* at 20.

109. *Id.*

dam and that the same areas were paying a serious and possibly catastrophic environmental cost.¹¹⁰ Further, Wang Xiaofeng, the director of the administrative office that built the dam, noted that “it was time to face up to the environmental consequences of a project hailed as an achievement to rival the Great Wall.”¹¹¹ Specifically, Xiaofeng stated: “We absolutely cannot relax our guard against ecological and environmental security problems sparked by the Three Gorges project. We cannot win passing economic prosperity at the cost of the environment.”¹¹²

Overall, while there are nonenvironmental benefits resulting from the Three Gorges Dam and hydroelectric dams in general, there are many negative environmental impacts, which a State should thoroughly analyze when deciding whether to construct such a dam. The previous discussion of the Three Gorges Dam demonstrates the seriousness of dams’ potential environmental harm and shows one State’s realization that further analysis of the benefits and harms was necessary: “It was hailed as one of the engineering feats of the 20th century. Now the Three Gorges Dam across China’s mighty Yangtze River threatens to become an environmental catastrophe.”¹¹³

IV. INTERNATIONAL ENVIRONMENTAL LAW

Beyond the actual environmental impacts on a State, an additional concern is that dam construction may also cause harm to the *other* States that have rights to the same transboundary watercourse. Thus, the focus of this Comment now turns to the relevant sources of international environmental law in an attempt to address States’ legal duties in the construction and use of hydroelectric dams.

International environmental law, while not as well established or readily enforceable as many States’ domestic law, essentially operates through customary international law and treaties.¹¹⁴ Customary

110. Jane Macartney, *Three Gorges Dam Is a Disaster in the Making, China Admits*, TIMES ONLINE, Sept. 27, 2007, <http://www.timesonline.co.uk/tol/news/world/article2537279.ece>.

111. *Id.*

112. *Id.* For a further look at the events surrounding these comments by the Chinese government, see generally Yardley, *supra* note 90, and Jim Yardley, *China Says Three Gorges Dam Is Not Responsible for Landslides*, N.Y. TIMES, Nov. 28, 2007, available at <http://www.nytimes.com/2007/11/28/world/asia/28gorges.html>.

113. Macartney, *supra* note 110.

114. Customary International Law consists of principles that have become standard either in a particular region or internationally; such practices are “undertaken out of a sense of legal obligation (the *opinio juris*).” 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, 33 (1994) (citation omitted). “Practices that crystallize as customary international law can include multilateral decisions reflected in votes in international assemblies, decisions by international courts or international arbitrators, or apparently unilateral actions of states. Even treaties or other international agreements can express customary rules of international law.” *Id.* at 34 (citations omitted).

international law is binding on all States, and a particular treaty is binding on those States that have signed on.¹¹⁵

For clarity purposes, this Section is organized by first detailing those broad themes of international environmental law that, among many other issues, are relevant to transboundary watercourses. Next, this Section will present several sources of international environmental law specifically applicable to transboundary watercourses and thus applicable to hydroelectric dam construction and use on such waters. Finally, this Section will focus on recurring themes presented in these sources, highlight strengths and weaknesses, and discuss the enforceability of these sources.

A. *Broad Sources of International Environmental Law*

1. *Relevant Sources*

Both the Declaration of the United Nations Conference on the Human Environment (“Stockholm Declaration”),¹¹⁶ adopted in 1972, and the Rio Declaration on Environment and Development (“Rio Declaration”),¹¹⁷ adopted in 1992, present general principles of international law that are applicable to, among other issues, transboundary watercourses and hydroelectric dams.¹¹⁸ While neither the Stockholm Declaration¹¹⁹ nor the Rio Declaration were originally binding,¹²⁰

Customary international law, however, is not sufficient to deal with all global environmental problems; “even on the most optimistic view, customary international law can hardly be said to have sufficient scope or content to prevent damage and provide sufficient sanctions to be directed against the perpetrators of the damage when it occurs.” INTERNATIONAL ENVIRONMENTAL LAW ANTHOLOGY 14 (Anthony D’Amato & Kirsten Engel eds., 1996).

115. See generally INTERNATIONAL ENVIRONMENTAL LAW ANTHOLOGY, *supra* note 114, at 109.

116. United Nations Conference on the Human Environment, Stockholm, Swed., June 5-16, 1972, *Declaration of the United Nations Conference on the Human Environment*, U.N. Doc. A/CONF.48/14 (June 16, 1972), revised by U.N. Doc. A/CONF.48/14/Corr.1 (1972), reprinted in 11 I.L.M. 1416 (1972) [hereinafter Stockholm Declaration]. The Stockholm Declaration was adopted after the United Nations Conference on the Human Environment met in Stockholm from June 5 through June 16, 1972. *Id.* The Conference adopted this declaration after it “considered the need for a co[m]mon outlook and for common principles to inspire and guide the peoples of the world in the preservation and enhancement of the human environment.” *Id.*

117. Twenty years after the Stockholm Declaration was created, the Rio Declaration on Environment and Development was adopted following the United Nations Conference on Environment and Development in Rio de Janeiro, Brazil from June 3 through June 14, 1992. United Nations Conference on Environment and Development, Rio de Janeiro, Braz., June 3-14, 1992, *Rio Declaration on Environment and Development*, U.N. Doc. A/CONF.151/5/Rev. 1 (June 13, 1992), reprinted in 31 I.L.M. 874 (1992) [hereinafter Rio Declaration]. Endorsed by 172 nations, the declaration reaffirms the Stockholm Declaration and builds on it, “[w]ith the goal of establishing a new and equitable global partnership through the creation of new levels of cooperation among States.” *Id.*

118. See *id.*; see also Stockholm Declaration, *supra* note 116.

119. See Stockholm Declaration, *supra* note 116 (describing itself as “common principles to inspire and guide the peoples of the world in the preservation and enhancement of the human environment,” as opposed to requiring such actions); see also INTERNATIONAL

even on those States that signed on to the Declarations, each offers much to the field of international environmental law.¹²¹ The Stockholm Declaration, in particular, has proven especially influential in the field of international environmental law,¹²² as it was the first “widely accepted effort to set forth basic concepts and principles,” and certain Stockholm principles are indeed considered customary international law.¹²³ At present, the Rio Declaration has not received such widespread acceptance; however, certain Rio principles *are* accepted as customary international law and are therefore binding.¹²⁴

2. *Relevant Themes*

(a) *Development and Resource Exploitation*

The well-established Principle 21 of the Stockholm Declaration,¹²⁵ which is widely considered customary international law,¹²⁶ provides that States have “the sovereign right to exploit their own resources pursuant to their own environmental policies.”¹²⁷ Important, howev-

ENVIRONMENTAL LAW ANTHOLOGY, *supra* note 114, at 17 (“The view prevailed that the [Stockholm] Declaration should merely outline ‘broad goals and objectives’”).

120. JOHN O’BRIEN, INTERNATIONAL LAW 555-56 (2001); *see also* Rio Declaration, *supra* note 117 (providing that its “goal” was to “establish[] a new and equitable global partnership through the creation of new levels of cooperation among States,” but not mentioning any *requirement* of such cooperation).

121. *See* DAVID HUNTER ET AL., INTERNATIONAL ENVIRONMENTAL LAW AND POLICY 464-66 (3d ed. 2007).

122. *See* Said Mahmoudi, *Introduction* to CTR. FOR OCEANS LAW & POLICY, THE STOCKHOLM DECLARATION AND LAW OF THE MARINE ENVIRONMENT 3, 3-4 (Myron H. Nordquist et al., eds. 2003) (“The Stockholm Conference and the declaration that the participating States adopted at the end of the conference are generally considered as the starting point for what constitutes today the modern international law and policy for the environment.”); *id.* at 3 (“The significance of the Stockholm Declaration lies in the fact that despite all the obstacles and lack of genuine political will on the part of a great number of States, it succeeded in laying down a number of general principles that since then have constituted a framework and a source of reference whenever a step has been taken for the international protection of the environment.”); *id.* at 4 (“Repeated references to the Stockholm Declaration in almost all major international environmental agreements show that the Declaration is indeed a milestone and the starting point for the body of laws and policies that today apply to the protection of the environment at the international level.”).

123. Alexandre Kiss, *The Destiny of the Principles of the Stockholm Declaration*, in THE STOCKHOLM DECLARATION AND LAW OF THE MARINE ENVIRONMENT, *supra* note 122, at 53, 59 (noting that Stockholm Principles 1 and 21 “have been developed into customary rules”).

124. *Id.*; *see, e.g., infra* text accompanying notes 137-39.

125. The Rio Declaration adopted this same concept in Rio Principle 2. *See* Rio Declaration, *supra* note 117, princ. 2. The only change made, in comparison to Stockholm Principle 21, was the addition of the words “and developmental” to then read, in relevant part, “the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies.” *Id.* (emphasis added). This was added presumably because of the overall theme of development focused on by the Conference.

126. HUNTER ET AL., *supra* note 121, at 465.

127. Stockholm Declaration, *supra* note 116, princ. 21; *see also* INTERNATIONAL ENVIRONMENTAL LAW ANTHOLOGY, *supra* note 114, at 19.

er, is that this right to exploit comes with a major exception.¹²⁸ Principle 21 requires that States “ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.”¹²⁹ Principle 14 of the Stockholm Declaration provides guidance by stating that to “reconcil[e] any conflict between the needs of development and the need to protect and improve the environment,”¹³⁰ States must use the “essential tool” of “[r]ational planning.”¹³¹ According to Stockholm Principle 13, to “ensure that development is compatible with the need to protect and improve the human environment for the benefit of [a State’s] population,” “States should adopt an integrated and coordinated approach to [its] development planning.”¹³²

The *Corfu Channel*¹³³ case also demonstrates the general notion that States are not entitled to use their territories in ways that will ultimately harm other States.¹³⁴ Specifically, the case provides that States may not use their territory in ways that they *know* will damage other States.¹³⁵ If States do act with such knowledge, they must compensate the harmed State for the damage caused.¹³⁶

(b) *Environmental Preservation*

The Precautionary Principle or Approach also receives widespread usage in international law, and it may be considered international environmental law.¹³⁷ Since at least the 1960s, the Precautionary Principle has been used in international issues, but at least since the 1980s, it has been frequently used in international *environmental* law—through both multilateral and bilateral treaties.¹³⁸ While the usage of the Precautionary Approach as an international rule has not been without challenge, “[a]t a minimum . . . there is sufficient evidence of state practice to justify the conclusion that the principle, as elaborated in the Rio Declaration, reflects a broadly accepted basis

128. See Stockholm Declaration, *supra* note 116, princ. 21.

129. *Id.*

130. Presumably, this language addresses the environment of a State’s *own* territory as well as the territory of other States.

131. Stockholm Declaration, *supra* note 116, princ. 14.

132. *Id.* princ. 13.

133. The Corfu Channel Case (U.K. v. Alb.), 1949 I.C.J. 4 (Apr. 9).

134. INTERNATIONAL ENVIRONMENTAL LAW ANTHOLOGY, *supra* note 114, at 13.

135. *Id.*

136. *Id.* Note that few international cases have addressed the issue of damages owed to a State that has been harmed. *Id.* at 20.

137. *Id.* at 21.

138. *Id.* at 20-21; see also Int’l Law Ass’n (ILA), Berlin Conference: Water Resources Law, art. 23 cmt. (2004) [hereinafter Berlin Rules], available at http://www.internationalwaterlaw.org/documents/intldocs/ILA_Berlin_Rules-2004.pdf (“[T]he precautionary principle appears in almost all international environmental instruments adopted since 1990.”).

for international action.”¹³⁹ In the Rio Declaration, the inclusion of a precautionary approach was “unanimously endorsed.”¹⁴⁰

Quite generally, the Precautionary Principle is the concept that States have a duty to protect the environment by considering the effects that development will cause.¹⁴¹ The Precautionary Principle, however, does not serve to completely halt and forbid all action that will harm the environment.¹⁴² Although the Precautionary Principle “indeed may impose a ‘no-go’ or a ‘go-slow’ on certain directions of innovation and scientific progress . . . , [it] is not based on ‘zero risks’ but aims to achieve lower or more acceptable risks or hazards.”¹⁴³

Many people fear that such a precautionary approach “may stifle innovation or hamper scientific progress.”¹⁴⁴ In reality, however, an increase in the use of the Precautionary Principle “can help stimulate both innovation and science, replacing [outdated] technologies . . . with the clean technologies and systems science of a new industrial revolution.”¹⁴⁵ The result is likely to be an effective balance between innovation and the associated harm.¹⁴⁶

Further, Rio Principle 15 also states that “[w]here there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”¹⁴⁷ The International Court of Justice (ICJ) recognized this duty in the 1997

139. INTERNATIONAL ENVIRONMENTAL LAW ANTHOLOGY, *supra* note 114, at 22. For a critique of whether the Precautionary Principle is indeed customary international law, see Jutta Brunnée, *The Stockholm Declaration and the Structure and Processes of International Environmental Law*, in THE STOCKHOLM DECLARATION AND LAW OF THE MARINE ENVIRONMENT, *supra* note 122, at 67, 77, which notes that “doubts linger” as to whether the Precautionary Principle is truly customary international law and noting that while “an increasing number of observers conclude that the principle is binding custom,” some are skeptical and some states claim that there is no legally binding effect to the Precautionary Principle.

140. INTERNATIONAL ENVIRONMENTAL LAW ANTHOLOGY, *supra* note 114, at 21.

141. *See* Rio Declaration, *supra* note 117, princ. 15.

142. *See id.*

143. WORLD COMM’N ON THE ETHICS OF SCIENTIFIC KNOWLEDGE AND TECH., THE PRECAUTIONARY PRINCIPLE 16 (2005), available at <http://unesdoc.unesco.org/images/0013/001395/139578e.pdf>. The precautionary approach differs from the traditional view of “scientific findings” in that the traditional view may have ultimately resulted in the abandonment of a project where it was not *certain* that the project would not result in environmental harm. *See* INTERNATIONAL ENVIRONMENTAL LAW ANTHOLOGY, *supra* note 114, at 21.

144. WORLD COMM’N ON THE ETHICS OF SCIENTIFIC KNOWLEDGE AND TECH., *supra* note 143, at 15.

145. *Id.* at 15-16.

146. *See id.* (“While the [Precautionary Principle] indeed may impose a ‘no-go’ or a ‘go-slow’ on certain directions of innovation and scientific progress, the [Precautionary Principle] at the same time acts as a stimulant for other innovations and clean technological progress.”).

147. Rio Declaration, *supra* note 117, princ. 15.

Gabčíkovo-Nagymaros Project Case.¹⁴⁸ Though the ICJ shows great respect for the environment,¹⁴⁹ at the same time it held that a State must fulfill its obligations where there is no *proof* that such activity will cause significant harm.¹⁵⁰

The Precautionary Principle does take into consideration the different economic circumstances of States, and thus its application is not static.¹⁵¹ Specifically, Rio Principle 15¹⁵² provides that “[i]n order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities.”¹⁵³ This attempts to prevent exploitation of the developing States because they are not held to the same standards as thriving developed States.¹⁵⁴

The Principle of Sustainable Development¹⁵⁵ is also an important international environmental law concept.¹⁵⁶ Generally, this principle stands for the proposition that States have an obligation to develop in a way so as to preserve resources for future generations.¹⁵⁷ Specifically, Rio Principle 3 provides that “[t]he right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.”¹⁵⁸ Rio Principle 4 details how to fulfill this obligation by stating that “to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation

148. Case Concerning the Gabčíkovo-Nagymaros Project (Hung. v. Slov.), 1997 I.C.J. 7, 42 (Sept. 25).

149. *Id.* at 41 (emphasizing “the great significance that [the ICJ] attaches to respect for the environment, not only for States but also for the whole of mankind”).

150. *See id.* at 42 (noting that to fulfill its obligations, Hungary must have “at least proven that a real, ‘grave’ and ‘imminent’ ‘peril’ existed . . . and that the measures taken by Hungary were the only possible response to it”).

151. *See* Rio Declaration, *supra* note 117, princ. 15.

152. Although the themes of the Rio Declaration are quite similar to the themes previously addressed by the Stockholm Declaration, the Stockholm Declaration did *not* address the Precautionary Principle.

153. Rio Declaration, *supra* note 117, princ. 15.

154. While many sources of international environmental law account for the inability of developing countries to comply with certain standards to the same extent of developed countries, these are not within the scope of this Comment.

155. Rio Declaration, *supra* note 117, princ. 4.

156. *See* HUNTER ET AL., *supra* note 121, at 200 (noting that since the Rio Declaration, the Principle of Sustainable Development “has received nearly universal acceptance . . . among every sector of international society” and that the concept has been included in many international environmental declarations and treaties).

157. *See id.*

158. Rio Declaration, *supra* note 117, princ. 3.

from it.”¹⁵⁹ This principle does not prevent development; rather it requires that each State approach development in a certain way.¹⁶⁰

Conjunctively, the Precautionary Principle and Principle of Sustainable Development show that States have an obligation to use environmental effects as a *consideration*, not as a determinative factor, in whether to move forward with construction and development projects (including hydroelectric dam projects, among others). Where a State has knowledge that extreme environmental consequences are *certain* to result from a considered development, then both principles would likely say to not move forward.

Yet, where such environmental consequences are not certain to result—even if only because the scientific evidence is not determinative or complete—the Precautionary Principle advises to continue but at a slower, more careful pace. This slowed continuation would also be in conformance with the Principle of Sustainable Development because moving at a slower rate would contribute to preservation of environmental resources for future generations. Because of this relationship, when a State formulates its development approach in compliance with the Precautionary Principle, it is much more likely to also comply with the requirements of the Principle of Sustainable Development.¹⁶¹

Neither the Precautionary Principle nor the Principle of Sustainable Development gives mention to territorial boundaries.¹⁶² Thus, arguably, the two principles obligate a State to consider the effect of projects generally, including the impacts on other States, as opposed to only the impact on its *own* current environment.¹⁶³ Likewise, neither the Precautionary Principle nor the Principle of Sustainable Development applies solely to one resource or issue within the context of international environmental law,¹⁶⁴ and thus both principles are applicable to a State’s construction and use of hydroelectric dams.

159. *Id.* princ. 4. The Rio Declaration also recognized that developing and developed countries should not be held to the same standards, stating that “[t]he developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command.” *Id.* princ. 7.

160. *See id.* princ. 3.

161. Another view of the relationship between these principles is that the Principle of Sustainable Development is a balance between the well-established Right to Develop and the Precautionary Principle. Brian Trevor Hodges, *Where the Grass Is Always Greener: Foreign Investor Actions Against Environmental Regulations Under NAFTA’s Chapter 11*, S.D. Myers, Inc. v. Canada, 14 GEO. INT’L ENVTL. L. REV. 367, 393-94 (2002).

162. *See, e.g.*, Rio Declaration, *supra* note 117, princs. 3, 4, 15.

163. *See generally id.*

164. *See id.* princs. 3, 15.

(c) *States' Duty to Cooperate*

General sources of international environmental law also provide that States have a duty to cooperate with each other; such cooperation is paramount to the adherence to other broad themes of international environmental law.¹⁶⁵ This duty is considered customary international law.¹⁶⁶ Principle 25 of the Rio Declaration provides a clear and concise statement of this duty. Specifically, the principle provides that “[p]eace, development and environmental protection are interdependent and indivisible.”¹⁶⁷ Without peace between States, there can be no successful movement toward environmental preservation; peace itself cannot result unless States are willing to cooperate. For example, Stockholm Principle 24 provides that “[i]nternational matters concerning the protection and improvement of the environment should be handled in a co-operative spirit by *all* countries, big or small, on an equal footing.”¹⁶⁸

Rio Principle 12 further provides that States should make all efforts to achieve international consensus for environmental concerns by stating that “[u]nilateral actions to deal with environmental challenges outside the jurisdiction of the importing country should be avoided. Environmental measures addressing transboundary or global environmental problems should, as far as possible, be based on an international consensus.”¹⁶⁹ Less abstract, and more direct, is Stockholm Principle 24, which stresses the duty of governments to cooperate “through multilateral or bilateral arrangements, or other appropriate means” for the purpose of controlling, reducing, or otherwise eliminating adverse environmental effects.¹⁷⁰

In 1957, even before the Stockholm Declaration set forth this principle, the *Lake Lanoux* Arbitration stressed notice.¹⁷¹ The panel in *Lake Lanoux* “held that as a matter of customary international law, a State that is engaging in behavior likely to significantly im-

165. See, e.g., *id.* princ. 25; see also Kiss, *supra* note 123, at 55 (noting that the Stockholm Declaration’s philosophy is expressed in large part in Principles 24 and 25, “inviting States to cooperate in international matters concerning the protection and improvement of the environment”).

166. See PHILIPPE SANDS, PRINCIPLES OF INTERNATIONAL ENVIRONMENTAL LAW 461 (2d. ed. 2003).

167. Rio Declaration, *supra* note 117, princ. 25. Likewise, Rio Principle 26 holds that “environmental disputes” should be handled “peacefully and by appropriate means in accordance with the Charter of the United Nations.” *Id.* princ. 26.

168. Stockholm Declaration, *supra* note 116, princ. 24 (emphasis added).

169. Rio Declaration, *supra* note 117, princ. 12. Rio Principle 12 further ties in the Principle of Sustainable Development by stating the following: “States should cooperate to promote a supportive and open international economic system that would lead to economic growth and sustainable development in all countries, to better address the problems of environmental degradation.” *Id.*

170. Stockholm Declaration, *supra* note 116, princ. 24.

171. See generally *Lake Lanoux* Arbitration, 12 INT’L ARB. AWARDS 281, 315-16 (1957).

fact the environment of another State is obliged to involve the affected State in discussions regarding these activities.”¹⁷²

B. Sources of Transboundary Water Law

Sources of international law specifically addressing transboundary watercourses did not appear until approximately the 1950s.¹⁷³ Prior to that, some sources did exist, such as nongovernmental resolutions, and sources specific to particular regions had not yet received international application.¹⁷⁴ Multiple theories addressing the relationship between riparian States with regard to transboundary water rights have prevailed, depending on the particular time period.¹⁷⁵ However, after a brief overview of the relevant sources of law, this Section will focus primarily on the equitable utilization theory, as it has become the “cornerstone” of international water law. The available sources of international law, at least in part, adhere to this theory.¹⁷⁶

1. Relevant Sources

The Helsinki Rules on the Uses of the Waters of International Rivers were adopted by the International Law Association (ILA) in 1967 after the ILA’s fifty-second conference, which was held in Helsinki, Finland in 1966.¹⁷⁷ While these rules provide valuable information specifically applicable to international rivers, one major downfall

172. Hodges, *supra* note 161, at 393-94 (citation omitted).

173. Surya P. Subedi, *Regulation of Shared Water Resources in International Law: The Challenge of Balancing Competing Demands*, in INTERNATIONAL WATERCOURSES LAW FOR THE 21ST CENTURY: THE CASE OF THE RIVER GANGES BASIN 7, 8 (Surya P. Subedi ed., 2005).

174. *Id.* at 8-9.

175. *See id.* at 9.

176. *See, e.g.*, Convention on the Law of the Non-navigational Uses of International Watercourses (1997) [hereinafter UN Convention], available at http://untreaty.un.org/ilc/texts/instruments/english/conventions/8_3_1997.pdf (adopted by General Assembly Resolution Convention on the Law of Non-navigational Uses of International Watercourses, G.A. Res. 51/229, art. 5, U.N. GAOR, 51st Sess., 99th plen. mtg., U.N. Doc. A/RES/51/229 (May 21, 1997)).

177. Int’l Law Ass’n [ILA], Fifty-Second Conference, Helsinki Fin., Aug. 14-20, 1966, *The Helsinki Rules on the Uses of the Waters of International Rivers* (Aug. 1966) [hereinafter Helsinki Rules], available at http://www.internationalwaterlaw.org/documents/intldocs/helsinki_rules.html. After the Helsinki Rules were adopted in 1966, the ILA then drafted multiple sets of rules to different water-related activities that were not specifically addressed in the Helsinki Rules. Joseph W. Dellapenna, *The Berlin Rules on Water Resources: The New Paradigm for International Water Law*, in WORLD ENVIRONMENTAL AND WATER RESOURCES CONGRESS 2006: EXAMINING THE CONFLUENCE OF ENVIRONMENTAL AND WATER CONCERNS (American Society of Civil Engineers CD-ROM) (Randall Graham ed., 2006) [hereinafter Dellapenna, *The Berlin Rules*], available at [http://www.ualg.pt/5cigpa/comunicacoes/Berlin Rules Summary.doc](http://www.ualg.pt/5cigpa/comunicacoes/Berlin%20Rules%20Summary.doc). These included: “flood control (1972), pollution (1972, 1982), navigability (1974), the protection of water installations during armed conflicts (1976), joint administration (1976, 1986), flowage regulation (1980), general environmental management concerns (1980), groundwater (1986), cross-media pollution (1996), and remedies (1996).” *Id.* at 4.

is that these rules were not endorsed by the United Nations—the ILA is a nongovernmental body that is not affiliated with the UN.¹⁷⁸ Also important is that while the Helsinki Rules are relevant to the issue of hydroelectric dams, they were not created as a multilateral treaty, and thus the rules are not binding on any States.¹⁷⁹

In 1997, the International Law Commission (ILC) of the United Nations incorporated themes from the Helsinki Rules into its Convention on the Law of the Non-navigational Uses of International Watercourses.¹⁸⁰ The UN Convention was approved by 103 States at the Convention, but has still not come into force.¹⁸¹ Article 36 of the UN Convention requires that thirty-five States ratify, accept, approve, or accede, and when the thirty-fifth instrument does this, the UN Convention will come into force.¹⁸² As of May 2009, only sixteen States had become signatories and seventeen states had ratified, accepted, approved, or acceded.¹⁸³ While the allotted time for ratification expired in May 2000, some States that did accede did so after the May 2000 deadline;¹⁸⁴ States are thus still presumably permitted to accede.¹⁸⁵ Therefore, the UN Convention may at some point come into force.¹⁸⁶

Before the UN Convention's adoption in 1997, "the international community did not have at its disposal a set of written rules and principles endorsed by a political arena. Up until this time, the Helsinki Rules . . . were the only set of written rules to be referred to,"¹⁸⁷

178. Laurence Boisson de Chazournes, *The UN Convention on International Watercourses: Prospects for an Unfinished Agenda for Co-Management*, <http://gurukul.ucc.american.edu/maksoud/water98/present7.htm#Chazournes> (last visited June 1, 2009). Although not affiliated with the United Nations, the ILA is well known for "the articulation of cogent and compelling statements of the customary international law relating to fresh water resources." Berlin Rules, *supra* note 138, at 2 ("Working over a span of nearly 50 years, the Association has produced a series of rules addressing various topics relating to the overall field of international water law.")

179. *See generally* Helsinki Rules, *supra* note 177.

180. UN Convention, *supra* note 176.

181. STEPHEN C. MCCAFFREY, *THE LAW OF INTERNATIONAL WATERCOURSES: NON-NAVIGATIONAL USES* 315 (2001); Press Release, United Nations, General Assembly Adopts Convention on Law of Non-Navigational Uses of International Watercourses, GA/9248 (May 21, 1997), available at <http://www.un.org/News/Press/docs/1997/19970521.ga9248.html>.

182. UN Convention, *supra* note 176, art. 36.

183. United Nations, *Multilateral Treaties Deposited with the Secretary-General, Status as of 13 May 2009, Convention on the Law of the Non-Navigational Uses of International Watercourses*, [http://treaties.un.org/doc/Publication/MTDSG/Volume II/Chapter XXVII/XXVII-12.en.pdf](http://treaties.un.org/doc/Publication/MTDSG/Volume%II/Chapter%XXVII/XXVII-12.en.pdf) (last visited June 1, 2009) [hereinafter *Multilateral Treaties Deposited with the Secretary-General*]. Ratifying, accepting, acceding, and approving States include: Finland, Germany, Hungary, Iraq, Jordan, Lebanon, Libyan Arab Jamahiriya, Namibia, Netherlands, Norway, Portugal, Qatar, South Africa, Sweden, Syrian Arab Republic, Tunisia, and Uzbekistan. *Id.*

184. *Id.*

185. *See id.*

186. *See id.*; *see also* MCCAFFREY, *supra* note 181, at 315.

187. de Chazournes, *supra* note 178.

and it was debatable as to whether the Helsinki Rules actually “constituted customary law.”¹⁸⁸ Note, however, that the Helsinki Rules seem to, overall, be considered customary international law.¹⁸⁹ In 1997, the very same year in which the UN Convention was adopted, the International Court of Justice in the *Gabčíkovo-Nagymaros Project Case*¹⁹⁰ referred to the Convention “as expressing, at least in part, contemporary customary international law governing internationally shared waters.”¹⁹¹ Even though the UN Convention has not been ratified, one argument is that “the success of the Convention does not depend on whether it enters into force. Its influence is more likely to derive from its status as the most authoritative statement of general principles and rules governing the non-navigational uses of international watercourses.”¹⁹² Further, the UN Convention is likely to “remain highly influential and persuasive as a statement of current customary and general international law on watercourses as it is the culmination of over 20 years of in-depth research by the International Law Commission into the state of international watercourse law and practice.”¹⁹³

Recognition is also due to the Berlin Rules, the ILA’s 2004 revision of the Helsinki Rules.¹⁹⁴ Arguably, “[t]he *Berlin Rules* set forth a clear, cogent, and coherent summary of the relevant customary international law, incorporating the experience of the nearly four decades since the *Helsinki Rules* were adopted.”¹⁹⁵

There are a couple of important differences in the scope of the Berlin Rules in comparison to both the Helsinki Rules and the UN Convention. One significant difference is that the Berlin Rules do not

188. *Id.* Widely accepted, however, is the claim that the Helsinki Rules are customary international law. See, e.g., Dellapenna, *The Berlin Rules*, *supra* note 177, at 1 (arguing that “[t]he *Helsinki Rules* quickly came to be seen as the authoritative summary of the customary international law on transboundary or internationally shared waters”). But see Lisa M. Jacobs, *Sharing the Gifts of the Nile: Establishment of a Legal Régime for Nile Waters Management*, 7 TEMP. INT’L & COMP. L.J. 95, 101 (1993) (“The Helsinki Rules are not an international convention. Nor are they a treaty, since they do not represent particular states’ agreement among themselves to the principles expressed. The Helsinki Rules are not customary law. Insufficient state practice exists to show the Rules’ widespread acceptance, and no evidence indicates that states feel bound to follow these Rules.”).

189. Joseph W. Dellapenna, *International Law’s Lessons for the Law of the Lakes*, 40 U. MICH. J.L. REFORM 747, 762 (2007).

190. See Case Concerning the Gabčíkovo-Nagymaros Project (Hung. v. Slov.), 1997 I.C.J. 7, 42 (Sept. 25).

191. Berlin Rules, *supra* note 138, at 3.

192. Stephen McCaffrey, *The Contribution of the UN Convention on the Law of the Non-Navigational Uses of International Watercourses*, 1 INT’L J. GLOBAL ENVTL. ISSUES 250, 250 (2001).

193. Owen McIntyre, *The Role of Customary Rules and Principles of International Environmental Law in the Protection of Shared International Freshwater Resources*, 46 NAT. RESOURCES J. 157, 160 n.2 (2006).

194. See generally Berlin Rules, *supra* note 138.

195. Dellapenna, *The Berlin Rules*, *supra* note 177, at 6.

solely focus on international waters.¹⁹⁶ Instead, their focus includes national waters “to the extent that customary international law speaks to those waters.”¹⁹⁷ Likewise, the Berlin Rules focus on ground waters in addition to surface waters.¹⁹⁸ Rapporteur for the Berlin Rules, Joseph W. Dellapenna, stated in reference to these rules that the inclusion of these matters within this single set of rules allows

a lawyer, a jurist, a water manager, a water policy maker, or anyone else concerned by the rules of customary international [law] pertaining to water [to], for the first time, find all the relevant rules in one place, with attention to the interrelationships of the rules as well as to their clear statement.¹⁹⁹

The next subsection will emphasize discrepancies between the Helsinki Rules, the UN Convention, and the Berlin Rules. Additionally, this Section will occasionally offer the author’s opinion regarding the language and importance of the contents of each of these sources.

2. *Relevant Themes*

(a) *Equitable Utilization*

Currently, the theory of equitable utilization is at the “cornerstone” of international law regarding transboundary watercourses,²⁰⁰ and “[t]here is little contention that equitable utilisation is a well-established principle of customary international water law.”²⁰¹

Equitable utilization²⁰² can be viewed as an integration and compromise between two previous theories, the doctrine of absolute sovereignty and the doctrine of territorial integrity.²⁰³ Briefly, the doctrine of absolute sovereignty would allow an upper riparian State to do as it wishes with the transboundary watercourse flowing through its country regardless of the harm caused to the lower riparian

196. *See id.*

197. *Id.*

198. *Id.* at 5-6.

199. *Id.* at 6-7.

200. Subedi, *supra* note 173, at 9.

201. Simon Nicholson, *Water Scarcity, Conflict, and International Water Law: An Examination of the Regime Established by the UN Convention on International Watercourses*, 5 N.Z. J. ENVTL. L. 91, 113 (2001).

202. “Equitability has been understood . . . to mean not division into equal portions, but the equality of right to use the water for beneficial purposes.” Sharif S. Elmusa, *Harmonizing Equitable Utilization and Significant Harm: Comments on the 1997 ILC Convention*, Conference on “Water, Dispute Prevention and Development: South Perspectives,” Presented at the Center for the Global South, American Univ. (Oct. 12-13, 1998), <http://gurukul.ucc.american.edu/maksoud/water98/present7.htm#El-Musa>.

203. *See* Dellapenna, *The Berlin Rules*, *supra* note 177, at 3.

State.²⁰⁴ Conversely, the doctrine of territorial integrity may be used by a lower riparian State to claim that it has a right to a “fair share” of the water within the transboundary watercourse to “meet its existing and potential use.”²⁰⁵

The Helsinki Rules “crystallized and codified” the well-established use of equitable utilization, albeit by using slightly different phraseology.²⁰⁶ Specifically, Article IV of the Helsinki Rules states that “[e]ach 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.”²⁰⁷

The UN Convention addresses equitable utilization in Articles 5 and 6.²⁰⁸ Importantly, notice that compared to the Helsinki Rules, the UN Convention’s language is substantially longer and includes a new focus. In particular, Article 5.2 includes for the first time (other than individual treaties created between States) the idea of *participation* in achieving equitable and reasonable use:

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

2. Watercourse States shall participate in the use, development and protection of an international watercourse in an equitable and reasonable manner. Such participation includes both the right to utilize the watercourse and the duty to cooperate in the protection and development thereof, as provided in the present Convention.²⁰⁹

Both the Helsinki Rules Article V and the UN Convention Article 6 provide ways to determine what is meant by equitable and reasonable use.²¹⁰ Each of these sections includes a list of factors and provides that States must consider all relevant sources equally and “on the basis of the whole.”²¹¹ While this flexibility is beneficial in the sense that it leaves room to account for States’ particular circumstances and the uniqueness of particular regions and watercourses, it may, for practical purposes, prove to be quite a complication. In practice, an analyst applying these factors may find this flexibility burdensome and lacking of sufficient guidance to determine whether a

204. *Id.*; see also Subedi, *supra* note 173, at 9.

205. Subedi, *supra* note 173, at 9 (citation omitted).

206. Dellapenna, *The Berlin Rules*, *supra* note 177, at 3.

207. Helsinki Rules, *supra* note 177, art. IV (emphasis added).

208. UN Convention, *supra* note 176, arts. 5, 6.

209. *Id.* art. 5.

210. UN Convention, *supra* note 176, art. 6; Helsinki Rules, *supra* note 177, art. V.

211. UN Convention, *supra* note 176, art. 6; Helsinki Rules, *supra* note 177, art. V.

use, such as hydroelectric dam construction, is actually an equitable and reasonable use of a particular transboundary watercourse.²¹² Article 9 offers some help to analysts through its requirement that States provide each other, on a regular basis, with relevant information.²¹³ This requirement at least ensures that States have current, relevant information on hand when making a determination.²¹⁴

Recognizing the necessity for *overall* protection of the watercourse, Article 8 provides that “[w]atercourse States shall cooperate on the basis of sovereign equality, territorial integrity, mutual benefit and good faith in order to attain optimal utilization and adequate protection of an international watercourse.”²¹⁵ Arguably, the use of the word “optimal” combined with the specification of “watercourse” makes clear that an equitable and reasonable use is based on what is equitable and reasonable for the watercourse as a *whole* rather than simply a State’s equitable and reasonable use of that portion of the watercourse flowing through its territory.

(i) *UN Convention Article 5 and General Principles of International Environmental Law*

Article 5 of the UN Convention can be viewed as incorporating several important customary international law principles. Similar to Stockholm Principle 21, a State is permitted to use transboundary watercourses within its territories, but is precluded from doing so in a way that harms another State.²¹⁶

Additionally, “to be equitable and reasonable, the use must also be consistent with adequate *protection* of the watercourse.”²¹⁷ This can be viewed as representing the broad themes of both the Precautionary Principle and Principle of Sustainable Development. Specifically, in order to protect the watercourse, a precautionary approach will be necessary. For example, a State would not know for certain that it is adhering to this protection requirement unless it moves more slowly in order to further investigate the effects of the dam, thereby adhering to a precautionary approach. Further, by taking such a precautionary approach, the State is much more likely to be in compliance with the overall Principle of Sustainable Development, as such protection will preserve the watercourse for future generations.

212. Elmusa, *supra* note 202 (claiming that such an analyst will face difficulties “for two reasons: one is that individual factors lack specificity as to meaning and, the second, is that multiplicity of the factors and lack of assigning weights to each diminish their value as a practical tool”).

213. McCaffrey, *supra* note 192, at 253.

214. *Id.*

215. UN Convention, *supra* note 176, art. 8 (emphasis added).

216. *See id.* art. 5.

217. McCaffrey, *supra* note 192, at 253.

(b) *No Significant Harm*

It is well established in international law and specifically set forth in Stockholm Principle 21 (and Rio Principle 2) that States may not exploit their own resources to such a point so as to cause damage to other States.²¹⁸ This concept is included in the doctrine of no significant harm.²¹⁹ While the Helsinki Rules principally focused on equitable utilization with no focus on the idea of no significant harm, the UN Convention focuses on both.²²⁰ The concept of no significant harm is codified in Article 7 of the UN Convention:

1. Watercourse States shall, in utilizing an international watercourse in their territories, take all appropriate measures to prevent the causing of significant harm to other watercourse States.
2. Where significant harm nevertheless is caused to another watercourse State, the States whose use causes such harm shall, in the absence of agreement to such use, take all appropriate measures, having due regard for the provisions of articles 5 and 6, in consultation with the affected State, to eliminate or mitigate such harm and, where appropriate, to discuss the question of compensation.²²¹

(c) *Competing Doctrines Within the UN Convention?: Equitable Utilization Versus No Significant Harm*

A major difficulty with the UN Convention is the “clash” between equitable utilization (Article 5) and no significant harm (Article 7).²²² This clash resulted in debate both during and after drafting regarding whether equitable utilization or no significant harm holds precedence.²²³ This determination is crucial because, on one hand, if “equitable utilization” is deemed to take precedence, then so long as an upstream riparian State’s actions are equitable and reasonable, significant harm may eventually still be caused to the downstream riparian State.²²⁴ On the other hand, if “no significant harm” is deemed to take precedence, then an upstream riparian State is not permitted to even an equitable and reasonable use of the transboundary watercourse, if that will cause significant harm to the downstream riparian State.²²⁵ For these reasons, upstream riparian States

218. See Stockholm Declaration, *supra* note 116, princ. 21.

219. See UN Convention, *supra* note 176, art. 7.

220. See *id.* arts. 5, 7.

221. *Id.* art. 7.

222. Nicholson, *supra* note 201, at 116-17.

223. *Id.*

224. *Id.* at 117.

225. *Id.*

are in favor of the equitable utilization principle and downstream riparian owners are in favor of the no significant harm principle.²²⁶

Negotiations during drafting eventually resulted in a compromise; however, “the balance reached between articles 5 and 7 can best be described as ‘tantalisingly obscure.’”²²⁷ Unfortunately, the adopted draft, even after extensive negotiations, still presents problems between whether equitable utilization or no significant harm prevails.²²⁸

Although some may view the issue as unresolved by the UN Convention, careful inspection of the phrasing of the UN Convention strongly suggests that equitable utilization is favored over no substantial harm. Article 7 addresses a State’s responsibility to cause no significant harm to another State.²²⁹ However, Article 7.1 includes the language “take all appropriate measures,” and 7.2 includes the statement “having due regard for the provisions of articles 5 and 6,” which are the very articles addressing equal utilization.²³⁰ Furthermore, Article 10 provides that “[i]n the event of a conflict,” the conflict “shall be resolved with reference to articles 5 to 7.”²³¹ Based on these statements, one can easily conclude that no significant harm certainly does not prevail over equitable utilization. Supporting this conclusion is a relevant example used by McCaffrey regarding the inclusion of these statements:

This would presumably mean that if State A’s hydroelectric use conflicts with State B’s agricultural use, the conflict is not to be resolved solely by applying the ‘no-harm’ rule of Article 7, but rather through reference to the ‘package’ of articles setting forth the principles of both equitable utilisation and ‘no-harm.’²³²

The Berlin Rules attempt to eliminate controversy between equitable utilization and no significant harm by adopting the following language in Article 12:

1. Basin States shall in their respective territories manage the waters of an international drainage basin in an equitable and reasonable manner having due regard for the obligation not to cause significant harm to other basin States.
2. In particular, basin States shall develop and use the waters of the basin in order to attain the optimal and sustainable use thereof and benefits therefrom, taking into account the interests

226. *Id.* at 116-17.

227. *Id.* at 117 (citation omitted).

228. *See id.*

229. UN Convention, *supra* note 176, art. 7.

230. *Id.*

231. *Id.* art. 10.

232. McCaffrey, *supra* note 192, at 255.

of other basin States, consistent with adequate protection of the waters.²³³

This phrasing “emphasizes that the right to an equitable and reasonable share of the waters of an international drainage basin carries with it certain duties in the use of those waters.”²³⁴ Similar to both the Helsinki Rules and the UN Convention, the Berlin Rules include factors to determine whether a use, such as the construction and use of a hydroelectric dam, is an equitable and reasonable use of a transboundary watercourse.²³⁵ However, the Berlin Rules emphasize sustainability and prevention of environmental harm by adding two additional factors.²³⁶

(d) *States’ Duty to Cooperate*

It is widely recognized that “[t]he duty of cooperation is the most basic principle underlying international water law.”²³⁷ Without State cooperation, it would ultimately prove impossible for States to fulfill obligations prescribed to them through the many sources of international law.²³⁸ Article 6 of the UN Convention provides that “watercourse States concerned shall, when the need arises, enter into consultations in a spirit of cooperation.”²³⁹

Article 8 further provides that in States’ determinations regarding the manner of cooperation, “watercourse States may consider the establishment of joint mechanisms or commissions.”²⁴⁰ While this is merely a suggestion, as it uses the word “consider,” many scholars deem this ideal.²⁴¹ This proposition is the best approach because use of a joint mechanism will assist when two riparian states disagree as to what activities will provide “‘optimal utilisation and adequate protection.’”²⁴² Such a joint mechanism will allow individuals from

233. Berlin Rules, *supra* note 138, art. 12.

234. *Id.* art. 12 cmt.

235. *See id.* art. 13.

236. *Id.* (adding “[t]he sustainability of proposed or existing uses” and “[t]he minimization of environmental harm” to its list of factors).

237. *Id.* art. 11 cmts. (noting that in addition to the Berlin Rules, the Helsinki Rules and other international environmental law documents recognize this rule).

238. *See id.*

239. UN Convention, *supra* note 176, art. 6. The UN Convention furthers its emphasis on participation by including this statement within the same article (Article 5) in which it lists the elements. *Id.* art. 5.

240. *Id.* art. 8. Indeed, a paragraph was added to Article 8 of the UN Convention regarding the use of joint mechanisms or commissions because “delegations negotiating the Convention attached such a significance to cooperation *through joint mechanisms*.” McCaffrey, *supra* note 192, at 253; *see, e.g., infra* Part VI.A. (explaining the creation of the International Joint Commission between the United States and Canada).

241. *See, e.g.,* McCaffrey, *supra* note 192, at 253.

242. *Id.* (quoting UN Convention, *supra* note 176, art. 8).

each State to mutually determine whether the States should permit certain uses of the transboundary watercourse.

Article 9 also states that “watercourse States shall on a regular basis exchange readily available data and information on the condition of the watercourse.”²⁴³ This contributes to the requirement for State cooperation because without cooperation, it would be impossible to provide each other with this required information. Additionally, Article 10’s statement that “no use of an international watercourse enjoys inherent priority over other uses,” except where agreement or custom specifies otherwise, also shows that States must work *together* to determine the equitable and reasonable uses of a watercourse, rather than one State assuming and declaring that its use has priority.²⁴⁴

(e) *Dispute Avoidance and Settlement*

The Helsinki Rules, the UN Convention, and the Berlin Rules all provide information regarding prevention of disputes, and since disputes are many times inevitable, these sources also provide dispute resolution information for use when disputes actually occur.²⁴⁵ Because all three sources provide relatively similar provisions, dispute resolution information is not a main focus of this Comment. It should be noted, however, that the inclusion of this information in agreements regarding transboundary watercourses and hydroelectric dams is especially important as it ensures that a harmed party will have a mechanism for legal enforcement.

243. UN Convention, *supra* note 176, art. 9.

244. *Id.* art. 10.

245. *See generally* UN Convention, *supra* note 176, arts. 11-19, 30, 33, annex arts. 1-14; Berlin Rules, *supra* note 138, arts. 56-73; Helsinki Rules, *supra* note 177, arts. XXVI-XXXVII. UN Convention Part III, entitled Planned Measures, sets forth a framework for avoiding and handling disputes between watercourse States. *See* UN Convention, *supra* note 176, arts. 11-18, 33. Article 12, requiring notice, provides that before implementing “planned measures which may have a significant adverse effect upon other watercourse States,” the State is required to give those States “timely notification.” *Id.* art. 12. This notification should include technical data and results from environmental impact statements. *Id.* This information should be given “in order to enable the notified States to evaluate the possible effects of the planned measures.” *Id.* The UN Convention Article 13 then specifies a time period for reply to notification, obligations of the notifying state during the reply period, information regarding the reply to the notification, and information regarding an absence of reply to notification. *Id.* art. 13. Article 17 addresses consultations and negotiations, further showing the importance of State cooperation. *See id.* art. 17.

For those situations in which one State fails to give notice to another affected State, Article 18 provides procedures for the absence of notification. *Id.* art. 18. It states that where one “watercourse State has reasonable grounds to believe that another watercourse State is planning measures that may have a significant adverse effect upon it,” the affected State may request the planning State to comply with Article 12, by giving such notification of harm. *Id.* Article 33 specifically addresses settlement of inevitable disputes. *See id.* art. 33.

(f) *Additional Relevant Articles of the UN Convention*(i) *Ecosystems and Marine Environment*

As discussed previously, the effects of hydroelectric dam construction can affect rivers and the supported ecosystems immensely. The UN Convention includes specific language addressing ecosystems that is directly relevant to hydroelectric dams.²⁴⁶ Article 20 provides that “[w]atercourse States shall, individually and, where appropriate, jointly, protect and preserve the ecosystems of international watercourses.”²⁴⁷ Likewise, Article 23 of the UN Convention specifically addresses the duty of watercourse States to “take all measures with respect to an international watercourse that are necessary to protect and preserve the marine environment, including estuaries, taking into account generally accepted international rules and standards.”²⁴⁸ In a sense, these UN Convention articles enhance the widely accepted Principle of Sustainable Development but on a more focused issue directly applicable to transboundary watercourses.

(ii) *Hydraulic Works*

The UN Convention also incorporated language specifically applicable to “regulation” of the natural flows of transboundary watercourses by stating in Article 25 that “[w]atercourse States shall cooperate, where appropriate, to respond to needs or opportunities for regulation” and that “[u]nless otherwise agreed, watercourse States shall participate on an equitable basis in the construction and maintenance or defrayal of the costs of such regulation works.”²⁴⁹

In addition to general consultation requirements set forth for transboundary watercourses in Article 24,²⁵⁰ Article 26 includes consultations directly applying to one State being harmed by the installations of another State. Article 26.2 provides the following:

Watercourse States shall, at the request of any of them which has reasonable grounds to believe that it may suffer significant adverse effects, enter into consultations with regard to:

246. See UN Convention, *supra* note 176, art. 20.

247. *Id.*

248. *Id.* art. 23.

249. *Id.* art. 25. Article 25 defines “regulation” as “the use of hydraulic works or any other continuing measure to alter, vary or otherwise control the flow of the waters of an international watercourse.” *Id.*

250. *Id.* art. 24. Article 24.1 provides that “[w]atercourse States shall, at the request of any of them, enter into consultations concerning the management of an international watercourse, which may include the establishment of a joint management mechanism.” *Id.* Article 24.2 further provides that “‘management’ refers, in particular, to: (a) Planning the sustainable development of an international watercourse and providing for the implementation of any plans adopted; and (b) Otherwise promoting the rational and optimal utilization, protection and control of the watercourse.” *Id.*

- (a) The safe operation and maintenance of installations, facilities or other works related to an international watercourse; and
- (b) The protection of installations, facilities or other works from wilful or negligent acts or the forces of nature.²⁵¹

V. ENFORCEMENT AND ITS COMPLICATIONS

A. *Legal Enforcement*

While various mechanisms exist to address problems and disputes, a major impediment is enforcement.²⁵² This Section will focus on several enforcement deficiencies with regard to the sources of international environmental law relevant to the construction and use of hydroelectric dams.

1. *Relevant Law Is Nonbinding*

One common enforcement problem is that often the relevant international law is simply not binding, and where the law is nonbinding, a harmed State has no mechanism to force the harming State to comply.²⁵³ This may arise either because the relevant international law is a nonbinding source that is not considered to be customary international law and thus binding on *no* States or because the relevant binding sources are not binding on the *particular* State causing the harm.²⁵⁴

While the Helsinki Rules and the UN Convention provide enforcement provisions specifically relevant to disputes resulting from hydroelectric dam construction and use,²⁵⁵ these sources are not necessarily binding. The Helsinki Rules are likely widely considered customary international law, in which case they are binding.²⁵⁶ However, the UN Convention, while continuously gaining acceptance and

251. *Id.* art. 26.

252. *See, e.g.*, INTERNATIONAL ENVIRONMENTAL LAW ANTHOLOGY, *supra* note 114, at 14.

253. *See id.* at 14-15.

254. *See id.*

255. *See supra* Part IV.B.1.

256. *See supra* notes 188-89 and accompanying text. Article XXX of the Helsinki Rules provides that "[i]n case of a dispute between States as to their legal rights or other interests," negotiation should be sought. Helsinki Rules, *supra* note 177, art. XXX. If both states consider the problem to be "incapable of resolution," then Article XXXII "recommend[s] that they seek the good offices, or jointly request the mediation of a third State, of a qualified international organization or of a qualified person." *Id.* art. XXXII. One such example is the creation of the International Joint Commission by the United States and Canada to handle such disputes. *See infra* Part VI.A. Further, where such states are still unsuccessful at resolving their problems, then Article XXXIII "recommend[s] that they form a commission of inquiry or an ad hoc conciliation commission," which will try to "find a solution, likely to be accepted by the States concerned, of any dispute as to their legal rights." Helsinki Rules, *supra* note 177, art. XXXIII. As a last resort, Article XXXIV "recommend[s] that the States concerned agree to submit their legal disputes to an ad hoc arbitral tribunal, to a permanent arbitral tribunal or to the International Court of Justice." *Id.* art. XXXIV.

having the UN's endorsement, has not come into force and is not yet considered customary international law and thus binds no State to its framework of enforcement mechanisms.²⁵⁷

Should the UN Convention eventually come into force, assuming it would not yet be widely accepted as customary international law, it will only bind those States that ratify it.²⁵⁸ Additionally, the UN Convention is meant to solely be a *framework*—used as a starting point for States with such transboundary watercourse issues to build upon when generating their own agreements.²⁵⁹

2. *No Attached Enforcement Mechanism*

A second major impediment to enforcement—presuming that relevant international law is binding upon the harming State—is that there is not always an enforcement mechanism attached to the applicable law, and if there is, there is not always a way to force the harming party to submit to that mechanism. This is the classic problem with customary international law principles, as they do not typically define “required behavior.”²⁶⁰ Instead,

these rules state international duties that are too vague to provide any guidance about what behavior is acceptable or to facilitate ready application of these rules to specific disputes. When publicists endow these abstract duties with substantive content and attempt to generate determinate outcomes for future disputes, they inevitably privilege the interests of some states over others.²⁶¹

Further, many States, especially developing nations, “refuse to consider themselves bound by rules of customary international law, however determinate the rules may be.”²⁶² Thus, while Stockholm Principle 21,²⁶³ the duty of States to cooperate,²⁶⁴ and likely the Precautionary Principle²⁶⁵ are customary international law and are therefore binding, a harmed State may have no authority to force the harming State to a particular, or any, enforcement mechanism.

Even the International Court of Justice does not have the power to force a State to submit to its jurisdiction.²⁶⁶ Thus, in order to es-

257. See *supra* notes 181-86 and accompanying text.

258. Scott Barrett, *International Cooperation and the International Commons*, 10 DUKE ENVTL. L. & POL'Y F. 131, 139 (“A country only needs to comply with a treaty to which it is a party.”).

259. See generally UN Convention, *supra* note 176.

260. INTERNATIONAL ENVIRONMENTAL LAW ANTHOLOGY, *supra* note 114, at 15.

261. *Id.*

262. *Id.*

263. See *supra* notes 125-32 and accompanying text.

264. See *supra* notes 165-66 and accompanying text.

265. See *supra* notes 137-39 and accompanying text.

266. See Aloysius P. Llamzon, *Jurisdiction and Compliance in Recent Decisions of the International Court of Justice*, 18 EUR. J. INT'L L. 815, 815 (2007).

tablish ICJ jurisdiction over a State, the State must either have voluntarily submitted to the ICJ's compulsory jurisdiction or have agreed in a treaty that in the event of dispute the parties would submit the case to the ICJ.²⁶⁷

To minimize the problem of no available mechanism to force a harming State to submit to a particular mechanism, many treaties, both multilateral and bilateral, provide enforcement mechanisms that are binding on the party States.²⁶⁸ Ideally, transboundary States will choose to create treaties for transboundary waters and, more specifically, when a hydroelectric dam project is proposed for that river. These treaties prove beneficial, when drafted properly, because they can incorporate—and essentially codify—general principles, such as the Precautionary Principle, and relevant international watercourse law, such as the UN Convention. Use of such incorporation to address the construction and use of hydroelectric dams will ideally include enforcement mechanisms. When these enforcement mechanisms are incorporated into a treaty, in times of dispute, party States are then required to submit to that mechanism and consider the rendered decision binding.

3. *Rendered Decision May Not Mean that the Problem Is Solved*

A third enforcement problem is that even when States adhere to their duties of cooperation during a dispute and thus submit their case to the mechanism they previously designated through agreement, the eventual rendered decision may not always resolve the dispute.²⁶⁹

B. *Nonlegal Forms of Enforcement*

Realistically, because of these enforcement deficiencies, many times a harming State may halt or change its activities not based on the enforcement of an international environmental law, but through other nonlegal mechanisms. One general principle is the idea of reciprocity.²⁷⁰ A harming State may determine that although a certain action would be a good economic decision for the State, taking such an action will then leave open the door, and in a sense encourage, other States to take the same action.²⁷¹ Thus, a State may determine

267. See *id.* at 844; see also *infra* Part VI.C. (demonstrating the difficulty of enforcement when a State is in noncompliance with customary international law).

268. See, e.g., *infra* Part VI.A.

269. See, e.g., *infra* Part VI.B (discussing an ICJ decision that did not resolve Hungary and Slovakia's dispute regarding a set of locks on the Danube River).

270. Barrett, *supra* note 258, at 133 n.6 (stating that “[c]ooperation may be sustained . . . by using a strategy of reciprocity”).

271. See *id.* at 132-35.

that although a project would *currently* benefit the State, when other neighboring States take the same action, the State will be harmed.²⁷²

Additionally, a harming State may be forced into compliance with the applicable laws or forced to abort or alter a harmful project not because of international environmental law itself, but because of international pressure.²⁷³ International groups and leaders are likely to contact the State to show disfavor and lack of support. Additionally, a harming State is likely to receive hostile opinion and disruption from both its own citizens and the affected citizens of other States, and, possibly, even citizens internationally.

Damage to a State's reputation from noncompliance is injurious; such noncompliance may deter other States from entering into future agreements with the deviant State. A State's deviation from the law is problematic because "even a single deviation carries the risk of precipitating general erosion in law abidance, to the detriment of all states."²⁷⁴

VI. APPLICATION TO HYDROELECTRIC DAMS

Even though many States attempt to maintain good relations and exert effort to manage transboundary watercourses, ultimately, in times of need, each State will presumably still act according to what is best for its own State. Thus, many times when one upstream State envisions an economic benefit from the construction of a hydroelectric dam, that State may simply choose to take action regardless of the expense and harm the project will cause to other States which have rights to the same transboundary watercourse. Therefore, a sad reality is that many times States are harmed, and although there are relevant international environmental laws, the harmed State may still not be able to receive justice.

As noted, many multilateral and bilateral treaties contain specific enforcement mechanisms that the parties agree to follow in the event of later dispute, which do help avoid the problem of relying solely on the other State to abide by customary international law.²⁷⁵ As Principle 24 of the Stockholm Declaration provides, many times such bilateral agreements should be and are created specifically to deal with the watercourse issues that the neighboring States may be facing.²⁷⁶ Such bilateral agreements for actions like hydroelectric dam con-

272. *See id.*

273. *See, e.g., infra* notes 338-44 and accompanying text (discussing a letter to the Brazilian government signed by multiple organizations and individuals to show disapproval of the government's actions).

274. Barrett, *supra* note 258, at 139.

275. For an example of a bilateral treaty containing specific enforcement mechanisms, see Part VI.A.

276. *See* Stockholm Declaration, *supra* note 116, princ. 24.

struction and management will not necessarily prevent disputes from arising, but will ideally contain, with detail, enforcement mechanisms that the parties will use in case of dispute as well as contain an agreement to treat such decisions as binding.

Several relevant agreements (and lack of agreements) regarding hydroelectric dams and transboundary watercourses are identified in the following discussion. These situations exemplify the importance of bilateral agreements, yet show the enforcement deficiencies of relevant international environmental law—even when bilateral agreements exist.

A. *United States and Canada*

The United States and Canada have recognized for many years the necessity for joint specifications and a specific joint body to address transboundary water issues.²⁷⁷ The Boundary Waters Treaty was created in 1909 to “prevent disputes regarding the use of boundary waters and to settle all questions which [were then] pending between the United States and . . . Canada.”²⁷⁸

In Article II of the Boundary Waters Treaty, the United States and Canada agreed that while either State has “the exclusive jurisdiction and control over the use and diversion, whether temporary or permanent, of all waters on its own side of the line which in their natural channels would flow across the boundary or into boundary waters,” any such diversion “resulting in any injury on the other side of the boundary . . . shall give rise to the same rights and entitle the injured parties to the same legal remedies as if such injury took place in the Country where such diversion or interference occurs.”²⁷⁹ This recognition shows the States’ regard for Principle 21, the basic customary international law principle of the right of a State to develop and exploit its own resources, but only to the extent that it does not harm other States.

The Boundary Waters Treaty additionally creates the requirement in Article IV that neither party will create “any remedial or protective works or any dams or other obstructions in waters flowing from boundary waters” where it results in raising the waters on one side of the boundary “unless the construction or maintenance thereof is approved by the . . . International Joint Commission.”²⁸⁰ This ar-

277. See generally Treaty Between the United States and Great Britain Relating to Boundary Waters Between the United States and Canada, U.S.-Gr. Brit., Jan. 11, 1909, 36 Stat. 2448 [hereinafter Boundary Waters Treaty].

278. *Id.* When the treaty was initially created in 1909, the parties were the United States and “His Majesty the King of the United Kingdom of Great Britain and Ireland and of the British Dominions beyond the Seas, [and the] Emperor of India.” *Id.*

279. *Id.* art. II.

280. *Id.* art. IV.

ticle creates a legally binding formulation of the general principle of cooperation; without this “codification,” the duty to cooperate may otherwise be unenforceable.²⁸¹ Additionally, harming States are obligated to consult with those States which are negatively impacted; this concept was later codified in relevant sources of law.²⁸²

The International Joint Commission (IJC) was created in Article VII of the treaty.²⁸³ Through its creation, both the United States and Canada recognized that each State’s action regarding the “lake and river systems along the border” affect the other.²⁸⁴ Through the IJC, “[t]he two countries cooperate to manage these waters wisely and to protect them for the benefit of today’s citizens and future generations.”²⁸⁵ While the Boundary Waters Treaty was created long before the creation of either the Helsinki Rules or the UN Convention, the treaty’s creation of the IJC shows a valuable concept, which was codified and emphasized in these later sources.²⁸⁶

The Columbia River Treaty, also between the United States and Canada, specifically addresses the Columbia River basin rather than all transboundary waterways between the two States as did the Boundary Waters Treaty.²⁸⁷ The existence of the Columbia River Treaty itself helps prove the overall effectiveness of the Boundary Waters Treaty, and specifically the IJC:

Canada and the United States, in the years since the [Boundary Waters Treaty], often with the assistance of the International Joint Commission created by the [Treaty], have concluded several river agreements, the most important of which is the 1964 Columbia River Treaty. This accord resolved one of the most acrimonious boundary water conflicts between the two countries.²⁸⁸

281. See *supra* Part IV.A.2(c).

282. See UN Convention, *supra* note 176, arts. 7-8; Berlin Rules, *supra* note 138, art. 11; Helsinki Rules, *supra* note 177, art. XXIX.

283. Boundary Waters Treaty, *supra* note 277, art. VII.

284. International Joint Commission, Who We Are, http://www.ijc.org/en/background/ijc_cmi_nature.htm (last visited June 1, 2009).

285. *Id.* Note, however, that while many of the same themes were agreed to through the creation of these treaties, neither the United States nor Canada ratified the UN Convention. See Multilateral Treaties Deposited with the Secretary-General, *supra* note 183.

286. The creation of the IJC shows yet another application of including general principles in a bilateral treaty, which ultimately makes those otherwise unenforceable principles legally binding. Specifically, the IJC clearly recognizes the overall themes of the Precautionary Principle and the Principle of Sustainable Development. This is clear based on the Treaty’s focus on the States working together to preserve the water for today’s use (presumably by doing careful analyses of impacts on the environment of each State) and by doing this in such a way so as to preserve for future generations. See *generally* Boundary Waters Treaty, *supra* note 277.

287. See *generally* Treaty Relating to Cooperative Development of the Water Resources of the Columbia River Basin, U.S.-Can., Jan. 17, 1961, 15 U.S.T. 1555 [hereinafter Columbia River Treaty].

288. Patricia Wouters, *Foreword* to INTERNATIONAL WATER LAW: SELECTED WRITINGS OF PROFESSOR CHARLES B. BOURNE, at xv (Patricia Wouters ed., 1997) (citations omitted).

The Columbia River Treaty specifically sets out development requirements for both the United States and Canada and arrangements for implementation.²⁸⁹ Article XV establishes a Permanent Engineering Board that, among other things, ensures that the Treaty's objectives are being met.²⁹⁰ Article XVI then specifies that those differences arising under the Treaty that cannot be resolved may be referred to the IJC by either State.²⁹¹ If the IJC does not make a determination within three months, either party may then "submit the difference to arbitration by written notice to the other."²⁹² The Treaty then provides details about the arbitral tribunal.²⁹³

Although these treaties and the creation of the IJC have not completely prevented disagreement between the United States and Canada,²⁹⁴ they provide procedures and mechanisms that, overall, have assisted the States in working through their differences and ultimately reach agreements regarding shared water basins.²⁹⁵ Additionally, the very existence of the IJC is an important attribute, as many States have no joint mechanism to deal with transboundary water-course decisions and disputes.²⁹⁶

289. Columbia River Treaty, *supra* note 287, art. II (development by Canada); *id.* art. III (development by United States); *id.* art. XIV (arrangements for implementation).

290. *Id.* art. XV, § 2. The Permanent Engineering Board is also required to "assemble records" of the river flows of the boundary between the United States and Canada, report to the countries when there is "substantial deviation from the hydroelectric and flood control operating plans," "assist in reconciling differences" between the countries regarding "technical or operational matters," periodically inspect to "ensur[e] that the objectives of the Treaty are being met," report to the United States and Canada "at least once a year of the results being achieved under the Treaty," and "investigate and report" on other matters that arise "within the scope of the Treaty" when either country requests. *Id.*

291. *Id.* art. XVI, § 1.

292. *Id.* art. XVI, § 2.

293. *Id.* art. XVI, § 3.

294. Specifically, the existence of the Boundary Waters Treaty did not prevent dispute regarding the Columbia River; thus the Columbia River Treaty was created. *See supra* note 287 and accompanying text. Likewise, the Columbia River Treaty did not completely deter dispute. For example, "when the term of the sale of downstream benefits under [the Columbia River Treaty] expired, a new agreement . . . was reached only after *considerable controversy and disagreement.*" Wouters, *supra* note 288, at xv (emphasis added).

295. INST. FOR U.S. POLICY RESEARCH, UNIV. OF CALGARY, CONFERENCE REPORT, TRANSBOUNDARY WATER POLICY ISSUES: THE WESTERN NORTH AMERICAN REGION 1 (2007) (noting that while transboundary water "is very much under dispute, . . . Canada and the United States have been relatively successful in negotiating transboundary water where others have been less successful"); Stephen J. Randall, *Executive Summary*, in 2 INST. FOR U.S. POLICY RESEARCH, TRANS-BOUNDARY WATER POLICY ISSUES: THE WESTERN NORTH AMERICAN REGION, OCCASIONAL PAPER SERIES SPECIAL ED. 1, 1 (2008) ("[I]n spite of the cross border disputes that have arisen between Canada and the United States the two countries actually have an enviable record in resolving disputes, as for instance in the case of the Columbia Basin Treaty and the longstanding work of the International Joint Commission (IJC)."); *see also* text accompanying *supra* note 288.

296. *See* INST. FOR U.S. POLICY RESEARCH, *supra* note 295, at 1; Randall, *supra* note 295, at 1 (emphasizing that much of the successful negotiating between the United States and Canada is a result of the IJC's effectiveness, and that fifty-five of the fifty-six disputes submitted to the IJC were resolved unanimously).

B. Hungary and Slovakia

An examination of the highly publicized dispute between Hungary and Slovakia demonstrates that even when a final decision of the ICJ is rendered, the dispute may still not be resolved.²⁹⁷ Hungary and Slovakia signed a bilateral treaty in September 16, 1977, which entered into force on June 30, 1978, regarding construction and operation of the Gabčíkovo-Nagymaros System of Locks in the Danube River, which included a hydroelectric power plant.²⁹⁸ The 1977 Treaty also set forth specific procedures for dispute resolution.²⁹⁹

Hungary never began part of the construction that the agreement mandated.³⁰⁰ Hungary claimed that there was not “adequate knowledge of the consequences of environmental risks” and that more studies were necessary.³⁰¹ In response, Slovakia diverted the Danube River and implemented a “provisional solution,” aiming to provide the benefits that it had anticipated receiving from the system of locks.³⁰²

Hungary and Slovakia each claimed that the other violated the 1977 Treaty, based on different theories of violation.³⁰³ All attempts to use the designated enforcement procedures set forth in the 1977 Treaty failed, and eventually the case was submitted to the ICJ, which had been agreed upon in the 1977 Treaty as the court of last resort.³⁰⁴ The ICJ held that both parties had violated international law but, ultimately, without giving specific instructions on what each State was then to do, said that the Treaty as agreed upon was still in force.³⁰⁵ The ICJ provided that Hungary and Slovakia had a duty to negotiate and, while doing so, to take into account the principles of environmental law.³⁰⁶

Ultimately, although the ICJ rendered a decision, the dispute was not completely resolved.³⁰⁷ There has been at least one appeal to the ICJ for an additional judgment,³⁰⁸ and there have been multiple negotiation attempts between Hungary and Slovakia.³⁰⁹ Specifically, after the ICJ's decision, Hungary and Slovakia entered into negotiations,

297. Case Concerning the Gabčíkovo-Nagymaros Project (Hung. v. Slov.), 1997 I.C.J. 7, 42 (Sept. 25).

298. *Id.* at 14, 20.

299. *Id.* at 23.

300. *Id.* at 31-33.

301. *Id.*

302. Wouters, *supra* note 288, at xviii.

303. *Gabčíkovo-Nagymaros Project*, 1997 I.C.J. 7 at 15-16, 35-38; Wouters, *supra* note 288, at xviii.

304. *Gabčíkovo-Nagymaros Project*, 1997 I.C.J. 7 at 11.

305. *Id.* at 54-56; *see also* Llamzon, *supra* note 266, at 833.

306. Llamzon, *supra* note 266, at 833.

307. *See id.* at 833-34.

308. *Id.* at 833.

309. *Id.*

which “broke down” in 1998.³¹⁰ After negotiations failed, Slovakia requested the ICJ give another judgment because of Hungary’s alleged unwillingness to negotiate in good faith.³¹¹ In 2002 and 2003, there was “some talk” that Slovakia would return to the ICJ.³¹² In 2004, following a two-year period of no negotiation, Hungary and Slovakia each announced that they were willing to continue negotiations for implementation of the original ICJ decision.³¹³ These negotiations, however, apparently accomplished very little.³¹⁴

C. *Brazil and Bolivia*

Yet another unfortunate example of the difficulty of enforcement is the present dispute between Brazil and Bolivia. “The eternal tension between Brazil’s need for economic growth and the damage that [it] can cause to the environment are nowhere more visible than here in this corner of the western Amazon region.”³¹⁵ This dispute not only demonstrates a State’s internal struggle between its need for efficient energy and its efforts toward environmental preservation, but it also shows the direct application, or rather the lack thereof, of international environmental laws and their enforcement.

Brazil, one of the world’s leading dam-building nations,³¹⁶ is currently demonstrating the extent of international dispute resulting from a State’s lack of regard for the environment, transboundary States, and the relevant law. In 2007, the Brazilian government approved other hydroelectric dam projects, including the Santo Antonio and Jirau dams, which will be constructed on the Madeira River.³¹⁷ According to Glenn Switkes, Director of International Rivers Network’s Latin America office, these projects “[will] dam the Amazon’s principal tributary, causing dramatic changes to the riverine ecology and affect[] thousands of families who depend on the river for income, nutrition, and agriculture.”³¹⁸

Before the project’s approval, and even since its approval, the project has stirred ongoing controversy both within Brazil and internationally, based largely on the environmental impacts on neighbor-

310. *Id.*

311. *Id.*

312. *Id.*

313. *Id.* at 834.

314. *Id.*

315. Rohter, *supra* note 48.

316. Press Release, World Commission on Dams, Brazil: A Major Hydro Power (Aug. 11, 1999), http://www.dams.org/news_events/press309.htm (“Brazil is one of the [countries] most dependent on hydroelectricity, with 96.9 per cent of power generated coming from its 600 dams.”).

317. Gary Duffy, *Brazil Gives Amazon Dams Go-Ahead*, BBC NEWS, July 10, 2007, <http://news.bbc.co.uk/2/hi/americas/6286804.stm>; Switkes, *supra* note 80.

318. Switkes, *supra* note 80, at 1.

ing Bolivia.³¹⁹ Proponents of the Santo Antonio and Jirau dams claim that without the dams, serious blackouts will result in Brazil, and they assert that construction of the dams will create many new jobs.³²⁰ However, “[a]s environmentalists see it, the dams, one of which is to be barely 20 miles from Brazil’s border with Bolivia, will not only add to the strains on the Amazon, but also generate tensions within the country and between Brazil and its neighbors.”³²¹

Independent studies prepared by the state public attorney’s office in R ndonia, Brazil and by IBAMA, the Brazilian government’s environmental agency (under the previous executive board),

confirm what environmentalists and social movements have feared—that the Madeira project would cause enormous impacts. These would be felt over thousands of kilometers, from the mouth of the mighty Amazon and up the Madeira into neighboring Bolivia and Peru. A principal factor is the Madeira’s extremely high sediment load—the river carries millions of tons of clay, sand, and silt from the Andean slopes where it is born to the Amazon River, where it accounts for half of all the sediments along the lower Amazon. Studies have shown that when the dams begin operation, the upstream Jirau reservoir would fill up with sediments, extending the flooded area into rainforests in neighboring Bolivia. The retention of these sediments behind the walls of the dams would also rob downstream floodplains of the precious nutrients that fertilize agricultural lands and help sustain the Madeira’s incredible biodiversity³²²

Additionally, critics claim that the dams will put thirty-three endangered mammal species at risk of extinction, including the spotted jaguar, giant anteater, giant armadillo, and giant otter.³²³

319. *See generally id.*

320. Rohter, *supra* note 48.

321. *Id.* “[T]he dispute . . . appears to have more to do with politics and economics than science and nature.” *Id.* The political debate regarding the hydroelectric dams is further complicated by the countries’ animosity regarding other current issues. Ivo Cassol, governor of the Brazilian state of R ndonia stated that “ ‘Bolivia has no reason to meddle in this matter,’ [t]hey’ve already given us enough problems.” *Id.*

322. Switkes, *supra* note 80, at 2; *see also* Michael Kepp, *Brazil-Bolivia Joint Work Group to Study Environment Impacts of Amazon Dam*, INT’L ENV’T DAILY, Dec. 28, 2006. In November 2006, Rondonia’s own public prosecutor who was personally concerned about the

thoroughness of the [environmental impact study] and its supplementary studies, asked an independent group of researchers to do its own studies on the dams, which it passed on to IBAMA in December [2006] The researchers’ studies showed that, because of the Madeira River’s high sediment load, the dams could block sediment passage, thus denying the organic material to the downstream food chain in the dam’s reservoirs and that the dams could block the migration of spawning fish.

Id.

323. Int’l Rivers Network, *The Amazon Under Threat: Damming the Madeira 1-2*, <http://www.internationalrivers.org/files/MadeiraFact.pdf> (last visited June 1, 2009).

On July 9, 2007, IBAMA granted the preliminary license for the construction of the project.³²⁴ IBAMA eventually released the final report in November 2007.³²⁵ It took IBAMA approximately two years to approve the project, and even with passage, IBAMA included thirty-three conditions with which the winning consortium must comply.³²⁶

On December 10, 2007, despite the ongoing controversy, the Brazilian government auctioned off the construction contract for the Santo Antonio dam.³²⁷ A few days earlier, on December 6, 2007, Friends of the Earth-Brazilian Amazon filed an injunction to suspend the December 10th auction and argued that “the IBAMA technical team recommended through its impact assessment that neither Madeira River dam should receive a preliminary environmental license.”³²⁸ On the morning of the auction, dissatisfied Brazilian groups delayed the start of the auction and disrupted the bidding process, claiming that the project would “displace thousands and harm the environment”; protesters were ultimately forced to stop by Brazilian police officers.³²⁹

In August 2008, the Brazilian government officially granted the consortium a license for the Santo Antonio Dam project.³³⁰ Additionally, Brazil sent eviction notices to 3,000 indigenous people living in the area of the dam construction, requiring that they “abandon their lands” by August 30, 2008.³³¹ Construction on the Santo Antonio dam

324. FRIENDS OF THE EARTH BRAZIL ET AL., THE AMAZON RIVER'S LARGEST TRIBUTARY IS UNDER THREAT 11 (2007); see also Duffy, *supra* note 317.

325. Bank Info. Ctr., Environmentalists Go to Court to Suspend the Auction of Rio Madeira Dam Project (Dec. 6, 2007), <http://www.bicusa.org/en/Article.10602.aspx>.

326. Duffy, *supra* note 317.

327. Alan Clendenning, Brazilian Consortium to Build Amazon Dam (Dec. 10, 2007), <http://www.internationalrivers.org/en/latin-america/brazilian-dams/brazilian-consortium-build-amazon-dam>.

328. Michael Kepp, *Brazil Auctions Madeira Dam Concession Despite Protests over Environmental Issues*, INT'L ENV'T DAILY, Dec. 11, 2007.

“Our injunction request was based on IBAMA ignoring its own in-house technical team’s recommendation not to license the dams, firing the head of its licensing department, and hiring outside consultants who gave the dam complex a more favorable recommendation, one which allowed IBAMA in July to give both dams the preliminary licenses needed to auction them,” [Gustavo Pimentel, Friends of the Earth-Brazilian Amazon’s eco-finance manager] told BNA.

Id.

329. Clendenning, *supra* note 327.

330. Press Release, Glenn Switkes, Gustavo Pimentel & Iremar Ferreira, Environmentalists Blast Construction License for Amazon Dam (Aug. 14, 2008), <http://www.internationalrivers.org/en/node/3226>.

331. Intercontinental Cry, *Indigenous Bolivians Declare Emergency over Brazil Dams*, July 14, 2008, <http://intercontinentalcry.org/indigenous-bolivians-declare-emergency-over-brazil-dams>.

began in September 2008,³³² and the dam is expected to be functioning in 2012.³³³ Most recently, on December 23, 2008, IBAMA fined the consortium constructing the Santo Antonio dam the equivalent of over \$3 million for killing eleven tons of fish, including catfish, during the dam's initial construction phases.³³⁴ Also in December 2008, the Brazilian National Development Bank (BNDES) announced that it would fund sixty percent of the project, an amount less than it had initially promised.³³⁵ This decrease was "apparently because even BNDES is scared about the project's risks and wants to share them with other investors."³³⁶ The "mass killing" of fish³³⁷ along with the decrease in funding demonstrates that critics' concerns about the dam project are likely very accurate.

Glenn Switkes commented in 2007 that "[a]round the world, people are appalled by the cynical and dishonest manner in which the Brazilian government has side-stepped due process and pushed through the Madeira Dams, despite evidence that they will have massive impacts on the Amazon Basin ecology."³³⁸

Global dissatisfaction is apparent through a September 21, 2007, Coalition letter written to Brazilian Foreign Relations Minister Celso Amorim and Brazilian Presidential Chief-of-Staff Dilma Rousseff.³³⁹ Although it is not apparent (or at least not yet) in this particular controversy, this letter shows how a State may be pressured into complying with international environmental laws even where it is initially willing to violate.³⁴⁰ The Coalition letter contains an extensive list of individuals and organizations that support "the formation of binational working groups [between Brazil and Bolivia] to assess the potential impacts on Bolivia of the Santo Antonio and Jirau dams on the Madeira River, the Amazon's principal tributary."³⁴¹

332. Dead Catfish May Be the Least of Lula's Worries (Dec. 23, 2008), <http://www.internationalrivers.org/en/blog/aviva-imhof/dead-catfish-may-be-least-lulas-worries>.

333. Clendenning, *supra* note 327.

334. *Brazilian Agency Fines Dam Consortium for Fish Kill*, 32 INTL. ENV'T REP. 30 (2009).

335. Dead Catfish May Be the Least of Lula's Worries, *supra* note 332.

336. *Id.* (reporting that the riskiness of the project seems to be the culmination of concerns about both environmental risks and the "global financial implosion").

337. *Id.*

338. Press Release, International Rivers, Auctioning off the Amazon: Brazil's Madeira River Auction Sparks Anger, Protests, Lawsuits (Dec. 10, 2007), <http://www.internationalrivers.org/node/2347>. At the international level, to show opposition "activists barraged Brazilian embassies and consulates in the United States, Argentina, Holland, Belgium, and other countries with phone calls, and faxes, and e-mailed President Lula." *Id.*

339. Letter from Associação Terra Laranjeiras et al., to Celso Amorim, Braz. Foreign Relations Minister, and Dilma Rousseff, Braz. Presidential Chief-of-Staff (Sept. 21, 2007), http://www.amazonwatch.org/newsroom/view_news.php?id=1464 [hereinafter Coalition Letter]; see also Press Release, Switkes, Pimentel & Ferreira, *supra* note 330.

340. Coalition Letter, *supra* note 339.

341. *Id.*

The letter addresses the relevant harm by stating that “[o]fficial project studies and independent expert opinions indicate that there is a distinct probability that Bolivia could suffer flooding of territories . . . ; loss of fish species and serious impacts on some of the most important fish currently populating the upper Madeira; and health impacts.”³⁴²

Further, the coalition addresses Brazil’s legal duty by stating that

[t]he need for prior assessment of the possibility of negative impacts of this significance using the “precautionary principle” is affirmed in international treaties, including the Montreal Protocol (1987) and the Rio de Janeiro Declaration on Environment and Development (1992). The Convention on Biological Diversity (1992), which both Bolivia and Brazil have subscribed to, holds that sovereign states have “the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.”³⁴³

The letter concludes by emphasizing that the Coalition “trust[s] that representatives of civil society organizations (CSOs) and independent technical experts will be guaranteed participation in [the] process, and that the working group meetings will be conducted in a transparent manner.”³⁴⁴

Although Brazilian supporters have circumvented this necessity and moved forward with the preparation and actual construction of these dams, by law, Brazil is obligated to consider the potential impact to the entire river basin.³⁴⁵ Thus, in its determination to construct the Santo Antonio and Jirau dams, Brazil should have considered (and should continue to consider) the effects to Peru and Bolivia, both of which are in the same river basin.³⁴⁶

342. *Id.*

343. *Id.* This letter specifically shows how although the listed treaties are not binding on every country worldwide, in this instance, the Convention on Biological Diversity, is binding on both Bolivia and Brazil because they have each signed the treaty. Thus, Brazil is legally obligated to ensure that its activities do not damage Bolivia’s environment. While the Convention on Biological Diversity is outside the scope of this Comment, because Brazil is legally bound to its enforcement mechanisms, it may be an enforcement route by which Bolivia could take action.

344. *Id.*

345. Rohter, *supra* note 48.

346. *See id.* As an aside, note that in December 2006, Brazil and Bolivia did actually agree to establish a bilateral work group after Bolivia “expressed concerns about the environmental impact” of Brazil’s planned dam construction. Kepp, *supra* note 322. In requesting this joint work group, Bolivia cited to a 2002 agreement between the two countries which required a “rational use” of hydro resources along their common border.” *Id.* Unfortunately, however, the work group “ha[d] no power to effect the project or its licensing,” and based on Brazil’s actions since early 2007, it appears that Bolivia was unsuccessful with any attempts to prevent Brazil from moving forward. *Id.*

VII. CONCLUSION

A. *Regarding Environmental Harm*

While on the surface each State seems interested in preserving international watercourses, it can be presumed that, naturally, each State's ultimate concern is the effect on its own territory. Assuming this is true, each State is only secondarily concerned with the eventual effects of its actions on other States.

While there is much opposition regarding hydroelectric dams, most of these opponents "do not believe that [any] dam should ever be constructed."³⁴⁷ Rather, they simply believe that development projects, including dams, "should only be built after all relevant project information has been made public; the claims of project promoters of the economic, environmental, and social benefits and costs of projects are verified by independent experts; and when affected people agree that the project should be built."³⁴⁸

This position is justified. Hydroelectric dam construction should not be eliminated, as there indeed are advantages to these dams, especially as a source of reliable energy production. But each State clearly has an obligation, and should fulfill that obligation, to thoroughly plan and analyze the likely effects of a proposed hydroelectric dam before construction begins, even where a State considers the construction to be hugely profitable and a necessity for energy purposes. This would ensure compliance with such concepts as equitable utilization, by ensuring that the construction is truly the optimal equitable and reasonable use of the watercourse itself, rather than simply *an* equitable and reasonable use for the particular State. A State's concern regarding the condition of its environment would also be in line with general principles of international law, namely the Precautionary Principle and Principle of Sustainable Development.

B. *Regarding Brazil and Bolivia Specifically*

Because customary international law is binding on all States, with regard to Brazil and Bolivia, Stockholm Principle 21 is definitely binding,³⁴⁹ the duty to cooperate is definitely binding,³⁵⁰ and the Precautionary Principle is likely binding (depending upon which argument prevails regarding whether the principle truly is customary international law).³⁵¹ Further, while the Principle of Sustainable Development is not clearly customary international law, it still receives

347. Frequently Asked Questions About Dams, *supra* note 26.

348. *Id.*

349. *See supra* note 126 and accompanying text.

350. *See supra* notes 166, 171-72 and accompanying text.

351. *See supra* notes 137-39 and accompanying text.

widespread use throughout the international community,³⁵² and thus it would not be unreasonable for one of those countries to presume that the other should adhere to the principle. Unfortunately, however, these principles lack any definite enforcement mechanisms and thus it is in essence impossible for Bolivia to *force* Brazil to comply based on these principles alone.

Additionally, even assuming that the Helsinki Rules are customary international law, there still are no definite enforcement mechanisms within, but rather there is a framework as to how bilateral agreements should be arranged. Likewise, even if the UN Convention were actually in force, neither Brazil nor Bolivia has ratified it. Further, even if both parties *had* ratified it, because it is also a framework convention, without a bilateral treaty specifying enforcement mechanisms, Bolivia may still have no route for enforcement.

One hope for Bolivia, however, flows from the fact that both Brazil and Bolivia are parties to the Convention on Biological Diversity.³⁵³ Because both are parties, it is binding on each country, and thus Bolivia may be entitled to proceed upon any specified enforcement procedures in the treaty.

C. *Regarding Transboundary Water Law*

An ideal situation would be one where a straightforward and well-established set of laws and an intact precedent—similar to that of domestic law of the United States and many other countries—currently existed on the international level. It would further be ideal if when ambiguities or enforcement problems arise, like those that exist as a result of the increased use of hydroelectric dams, a legislative body could mandate rules and compliance by a simple enactment of a relevant statute. While international environmental law sources relevant to hydroelectric dams, both general and international water law specific, do exist, an obvious deficiency is that these are not mandatory; realistically, no such international body has authority to force every State worldwide to comply.

Although there is no mandatory body, and thus no binding procedure specifically addressing how and when a State may construct and maintain a hydroelectric dam on a transboundary watercourse, the sources we *do* have on the international level, namely the Helsinki Rules and the UN Convention, are a definite start. The Helsinki Rules, in existence since 1966, while never binding, eventually and for the most part, became customary international law.³⁵⁴

352. *See supra* notes 155-56.

353. *See supra* note 343 and accompanying text.

354. *See supra* note 179 and accompanying text.

Over thirty years later, in 1997, the United Nations finally adopted the UN Convention to address and expand upon those themes that the ILA had addressed in the Helsinki Rules. As noted by the UN Convention itself, it is a framework, intended to be expanded upon by States, with consideration to those States' particular situations and the transboundary watercourses affected. Although the UN Convention has not come into force, and although it is not widely considered customary international law at least at this point, it is a step toward uniformity in State treatment of international fresh water issues, namely hydroelectric dams and the effect on other States. Additionally, the ILA's adoption of the Berlin Rules in 2004 further demonstrates that this is a body of international law that is likely evolving, thus (ideally) eventually resulting in a clearer acceptance of these recurring themes.

Important, however, is that while such transboundary watercourse specific sources of law are not clearly binding, there are some general principles of international environmental law that are binding, such as Stockholm Principle 21, the overall duty to cooperate, and likely the Precautionary Principle. And, there are other principles not (at least yet) considered customary international law, such as the Principle of Sustainable Development, that are still important to international environmental law and adhered to by many States. Adherence to these recurring themes of international environmental law requires compliance efforts with an eye toward the effects on each State's *own* environment and economy, as well as an eye toward the effects on *other* States.

Although such a scenario is ideal, realistically, it is not likely that worldwide each State will immediately begin to comply with all sources of international environmental law by taking into account both the effects to its own State and to others. This is the case not only because much of the law is not binding, but also because even where the law is binding, many States will, with little consequence, refuse to comply because, particularly with customary international law, there are no mandated enforcement procedures.

On a more plausible scale, however, is a goal for greater acceptance of the use of bilateral treaties between transboundary States for hydroelectric dam projects. Such use of bilateral treaties would be consistent with relevant sources of international water law and would allow consideration to the unique characteristics of the particular States and transboundary waters involved. Additionally, these bilateral treaties would allow the parties to include provisions important to unique local and regional issues.

The creation of bilateral treaties is certainly not a final resolution to these transboundary watercourse disputes and enforcement mechanism deficiencies, as bilateral treaties certainly do not guarantee

that no future disputes will arise. However, even though not perfect, bilateral treaties do provide binding enforcement mechanisms for certain principles of customary international law, which otherwise a country would be unable to enforce.

Even more specific—and in a continued attempt to resolve disputes between States who have negotiated a bilateral treaty—is the creation of some type of commission, such as the IJC created by the United States and Canada. These commissions provide a body comprised of individuals from each country that can decide difficult questions, such as those that may evolve through construction and use of hydroelectric dams on transboundary watercourses.

Overall, in addressing hydroelectric dams, there are, in the author's opinion, two related, yet distinct, issues: (1) the actual environmental harm caused by dam construction and use; and (2) the lack of adherence to relevant international environmental law. Of the two, it is more realistic and more effective to address the deficiencies of the law itself and aim for international efforts toward both overall compliance and additional development of the law. By focusing primarily on the law, as opposed to the actual environmental harm, States will inevitably cause less harm to the environment of their own territory and the territory of other States.