Toward a More Robust International Water Law of Cooperation to Address Droughts and Ecosystem Conservation

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Abstract

The objective of international water law should be to help relieve water stress among riparian basin states and enhance states' water security. Accomplishing this objective requires fundamental cooperation on water issues among basin states. Existing studies of riparian state cooperation are deficient in this regard because they focus more on unsuccessful rather than successful examples of cooperative efforts and do not provide a workable definition of effective water cooperation.

This article first defines the terms "water stress" and "water security." Next, it draws a distinction between "input" and "output" (or "outcome") cooperation and calls for a greater focus on the latter, which produces more measurable progress toward reducing water stress and improving water security throughout water basins. The analysis then identifies the elements of international water law that discourage basin state cooperation and describes the evolving duty to engage in output cooperation. The article recognizes that cooperation is a multi-stage process and that initial cooperation initiatives can lead to outcome cooperation. Finally, the article provides three examples of successful outcome cooperation.

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I. INTRODUCTION

The objective of contemporary international water law should be to relieve water stress among states that share an international watercourse and, consequently, to enhance the water security of all riparian basin states. Greater cooperation between basin states is fundamentally necessary to achieve this objective. The legal system alone cannot compel successful cooperation, but it can be used to help states overcome geopolitical barriers to greater cooperative efforts. International water law is gradually evolving to encourage more successful cooperation on water issues. However, this evolution has been hampered by an incoherent definition of what is meant by "cooperation."

This article argues that "cooperation" in the water law context should be defined not in terms of *inputs*—moves that states make primarily based upon self-interest—but rather in terms of *outcomes*—specific actions that relieve water stress and enhance water security throughout entire water basins. Part II frames the problem by defining "water stress" and "water security" and by analyzing existing conceptions of "cooperation." Part III explores the role that customary international water law has played in encouraging or discouraging different approaches to cooperation, and critiques recent international water law decisions that sanction failures to cooperate. Part IV re-conceptualizes water cooperation as a continuum, from initial efforts to cooperate to successful outcome cooperation.

Part V offers three case studies of international water restoration efforts in the Colorado River Delta, the Great Lakes, and the Australian Murray-Darling Basin to illustrate how states may achieve more successful outcome cooperation in practice.

II. WATER STRESS, WATER SECURITY, AND THE NEED FOR GREATER RIPARIAN STATE COOPERATION

A. WATER STRESS

Two of the many worsening water management problems faced by water-stressed countries are droughts and the degradation of aquatic ecosystems that provide valuable ecosystem services.[1] The international community has adopted the concept of water stress to identify those countries most likely at risk of water shortages.[2] Climate change will exacerbate both of these stresses.[3]

Water stress is a function of three primary factors: (1) "bad hydrology"[4] and variable and unevenly distributed rainfall (a factor that climate change will likely exacerbate); (2) the growing demand and competition among nations for additional water source uses, such as irrigation, urban water supply, and energy production, as well as *in situ* uses, such as aquatic ecosystem conservation; and (3) states' relative institutional and political capacities, or lack thereof, to adapt to changed conditions. These three factors are prevalent in many countries, but serious water stress is primarily a problem for countries in Africa, Asia, and South America.[5] Developed countries, such as Australia and the United States (where, for example, Western states suffer from poor hydrology and competing demands), are often not listed as water-stressed because they have both the

1. Ecosystems provide valuable human services. Aquatic ecosystems control the timing of water runoff, help filter and decompose organic wastes, and reduce hurricane damage. *See* U.N. ENVIRONMENT PROGRAMME, MILLENNIUM ECOSYSTEM ASSESSMENT, ECOSYSTEMS AND HUMAN WELL-BEING: SYNTHESIS 40 (World Res. Inst. 2005), http://www.millenniumassessment.org/documents/document.356.aspx.pdf.

2. Some countries will escape the worst impacts of water stress as "winners," but the focus of this article is on "loser" countries and regions likely to confront more intractable water crises. Examples of relative "winners" are Canada, Norway, and Russia. *See, e.g.*, LAWRENCE C. SMITH, THE WORLD IN 2050: FOUR FORCES SHAPING CIVILIZATION'S NORTHERN FUTURE 3–4 (2010).

3. *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE [IPCC], CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY 11 (2007), https://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4_wg2_full_report.pdf; *see also* IPCC, CLIMATE CHANGE 2014 SYNTHESIS REPORT: SUMMARY FOR POLICY MAKERS 8 (2014), https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf.

4. This term was coined by Professor John Briscoe of Harvard University. John Briscoe, *Water Security: Why It Matters and What to Do about It*, 4 INNOVATIONS 3, 3 (2009).

5. *See* Veena Srinivasan et al., *The Nature and Causes of the Global Water Crisis: Syndromes from a Meta-analysis of Coupled Human-Water Studies*, 48 WATER RESOURCES RES. 10–11 (2012) (comparing underlying water crisis "syndromes" in locations across the globe).

storage capacity and the institutions to conserve and reallocate water if necessary.[6]

The increased warming of the planet alone does not cause droughts, but climate change will make droughts more frequent and severe when they occur.[7] Climate change-induced droughts will increase the stresses on both consumptive and non-consumptive uses of water, especially on flows necessary to support freshwater aquatic ecosystems, such as lakes, wetlands, and deltas.[8] Decreased flows and higher water temperatures may interfere with species reproduction and thus affect species composition and ecosystem productivity.[9] Decreased flows will also reduce the water quality and availability of food for organisms, such as invertebrates and fish, which have a high oxygen demand, as well as disrupt ecological processes and the geographic redistribution of species.[10] The root problem is that climate change will make it more difficult for countries to maintain a balance between consumptive demands and the flows necessary to sustain these natural systems.

B. WATER SECURITY

Water security has three interrelated dimensions: economic, social, and environmental.[11] The economic dimension seeks to increase water

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6. Developed countries such as Australia and the United States face water supply stresses, but when institutional capacities to adapt are factored in, these countries do not appear on the list of the most water-stressed countries. *See, e.g.*, Francis Gassert et al., *Aqueduct Country and River Basin Rankings: A Weighted Aggregation of Spatially Distinct Hydrological Indicators* 8–16, (World Res. Inst. 2013), http://www.wri.org/sites/default/files/aqueduct_coutnry_rankings_010914.pdf (ranking the world's most water-stressed countries).

7. *See* Kevin E. Trenberth et al., *Global Warming and Changes in Drought*, 4 NATURE CLIMATE CHANGE 17 (2014). For example, evidence is mounting that climate change is a major driver of California's ongoing mega-drought: "Anthropogenic warming has intensified the recent drought as part of a chronic drying trend that is becoming increasingly detectable and is projected to continue growing throughout the rest of this century . . . As anthropogenic warming continues, natural climate variability will become increasingly unable to compensate for the drying effect of warming . . . . Impacts of drought on society may be increasingly intensified due to declining availability of groundwater reserves . . . The dramatic effects of the current drought in CA, combined with the knowledge that the background warming-driven drought trend will continue to intensify amidst a high degree of natural climate variability, highlight the critical need for a long-term outlook on drought resilience, even if wet conditions soon end the current drought in CA." A. Park Williams et al., *Contribution of anthropogenic warming to California drought during 2012–2014*, 42 GEOPHYSICAL RES. LETTERS 6819, 6826 (2015).

8. *See* IPCC, CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY: SUMMARY FOR POLICYMAKERS 6 (2014), http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/ar5_wgII_spm_en.pdf (concluding with "very high confidence" that impacts of climate-related extremes such as droughts include alteration of ecosystems and disruption of food production and water supply).

9. N. LEROY POFF ET AL., AQUATIC ECOSYSTEMS AND GLOBAL CLIMATE CHANGE: POTENTIAL IMPACTS ON INLAND FRESHWATER AND COASTAL WETLAND ECOSYSTEMS IN THE UNITED STATES ii, PEW CTR. ON GLOBAL CLIMATE CHANGE (2002), http://www.c2es.org/docUploads/aquatic.pdf (summarizing findings).

10. *Id.*

11. EELCO VAN BEEK & WOUTER LINCKLAEN ARRIENS, WATER SECURITY: PUTTING THE CONCEPT INTO PRACTICE 12–13, GLOBAL WATER PARTNERSHIP [GWP] Technical Comm. (TEC) Background Paper No. 20 (2014), http://www.gwp.org/Global/ToolBox/Publications/Background%20papers/GWP_TEC20_web.pdf (framing the

productivity.[12] The social dimension seeks to ensure equitable access to water services and resources both within individual states and in the greater water basin, especially for marginalized users, and to promote resilience to extreme water stress events.[13] Finally, the environmental dimension includes the restoration of degraded ecosystem services in the basin.[14] In short, the goal of water security is to enable states or basins to pursue a sustainable water development program consistent with those of other states. Because state water security policies may conflict with other basin states, cooperation among basin (or out-of-basin) states is an essential element of this objective.[15]

To remedy water stress, donor states and the international community have adopted the aspirational goal that all countries and international basins are entitled to a minimum level of water security.[16] The Global Water Partnership ("GWP"),[17] a major water nongovernmental organization, has identified three primary measures of water security. Water use in a nation or an international river basin is considered secure when there exists: (1) sufficient, high-quality water resources for all reasonable consumptive and non-consumptive uses, including the protection of aquatic ecosystems; (2) a functioning allocation regime to define water entitlements; and (3) the ability to mitigate the risks of floods and droughts.[18]

C. THE NEED FOR AN OUTCOME MEASURE OF COOPERATION

The leitmotif running through all discussions on improving trans-basin water security and adapting to climate change is the need for greater cooperation among basin states.[19] However, the existing literature on cooperation and conflict mostly contains theoretical models and case studies[20] that primarily offer reasons for

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dimensions of water security); *see also Proceedings from the GWP Workshop: Assessing Water Security with Appropriate Indicators*, GWP (2012), http://www.gwp.org/Global/ToolBox/Publications/P763_GWP_Proceedings_Paper.pdf (synthesizing various approaches to quantifying and measuring water security).

12. van Beek & Arriens, *supra* note 11, at 12.

13. *See id.*

14. *Id.*

15. *Id.* at 13–15.

16. *See* C.W. SADOFF ET AL., SECURING WATER, SUSTAINING GROWTH: REPORT OF THE GWP/OECD TASK FORCE ON WATER SECURITY AND SUSTAINABLE GROWTH 14, GWP (2015), http://www.gwp.org/Global/About%20GWP/Publications/The%20Global%20Dialogue/SECURING%20WATER%20SUSTAINING%20GROWTH.PDF.

17. The author discloses that he was appointed to the GWP Technical Committee in 2014. *Technical Committee Members*, GWP, http://www.gwp.org/About-GWP/GWP-Technical-Committee/Technical-Committee-Members/ (last visited Feb. 28, 2016).

18. For more on the GWP's discussion of approaches to defining water security at different levels of scale, *see* van Beek & Arriens, *supra* note 11, at 18–20.

19. *See, e.g.*, U.N. Dep't of Econ. & Soc. Affairs, *International Decade for Action 'WATER FOR LIFE' 2005–2015, Water Cooperation*, http://www.un.org/waterforlifedecade/water_cooperation.shtml (last visited Feb. 28, 2016).

20. *See, e.g.*, Jeroen Warner & Neda Zawahri, *Hegemony and Asymmetry: Multiple-Chessboard Games on Transboundary Rivers*, 12 INT'L ENVTL. AGREEMENTS: POL., L. & ECON. 215, 215–16 (2012).

failed or incomplete cooperation, rather than cooperation that advances water security at the basin and national level.[21]

This article seeks to fill a gap in the study of cooperation in the water law context. Almost all discussions of such "cooperation" focus on failed efforts; most do not define the term and do not offer standards to evaluate the outcomes.[22] Analyses that focus on positive cooperation efforts adopt either a formal- or process-oriented definition of cooperation. The formal approach defines cooperation by the existence of a treaty or other agreement between two or more transboundary states. The second approach looks to the practices of riparian states, but does not systematically assess the results of riparian state cooperation.[23] Efforts to measure cooperation as a conceptual paradigm are, of course, difficult. Not only is there no single accepted definition of riparian state cooperation, but a single definition is not possible because the range of activities that can count as cooperative is large.

This article builds on previous studies to construct a more outcome-oriented model of cooperation as a process along a continuum of different stages, which range from noncooperation to outcomes with measurable benefits. It draws a distinction between "input" and "output" cooperation along this continuum, and calls for a greater focus on "outcome cooperation," which produces measurable quantitative or qualitative benefits. The article also outlines the need to develop standards to measure outcome cooperation. In short, water cooperation efforts should be assessed against their ability to lessen water stress in basins and ensure that all nations within basins receive measurable water security benefits from that cooperation.[24]

D. COOPERATION AND NONCOOPERATION

Cooperation is essential to allow all basin states to enjoy equitable and fair access to an international or transboundary watercourse.[25] As GWP studies show,

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21. *See, e.g.*, U.N. ECON. COMM'N FOR EUROPE, CONVENTION ON THE PROT. OF TRANSBOUNDARY WATERCOURSES AND INT'L LAKES, CAPACITY FOR WATER COOPERATION IN EASTERN EUROPE, CAUCASUS AND CENTRAL ASIA 39–40 (2009), http://www.unece.org/fileadmin/DAM/env/water/documents/CWC%20publication%20joint%20bodies.pdf.

22. *See* Hojjat Mianabadi et al., *Chapter 7, Trans-boundary River Basin Management: Factors Influencing the Success or Failure of International Agreements*, *in* CONFLICT RESOLUTION IN WATER RESOURCES AND ENVIRONMENTAL MANAGEMENT 133 (K.W. Hipel et al. eds. 2015).

23. *See, e.g.*, Anton Earle & Patricia Wouters, *Implementing Transboundary Water Cooperation Through Effective Institutional Mechanisms—Exploring the Legal and Institutional Design Dimensions of Selected African Joint Water Institutions: Creative Lessons for Global Problems?*, 24 J. WATER L. 100 (2015).

24. *See* F. SÖDERBAUM & J. GRANIT, THE POLITICAL ECONOMY OF REGIONALISM: THE RELEVANCE FOR INTERNATIONAL WATERS AND THE GLOBAL ENVIRONMENT FACILITY: A STAP ISSUES PAPER 9, 21, 29 (Global Env't Facility Sci. & Tech. Advisory Panel 2014), https://www.thegef.org/gef/sites/thegef.org/files/publication/Political-Economy%20of%20Regionalism-Low-Res-Compressed.pdf.

25. The International Joint Commission ("IJC") created by the Boundary Waters Treaty, for example, has recognized the role of equity in international law. *Guiding Principles*, INT'L JOINT COMM'N, http://www.ijc.org/

transboundary cooperation is one of the essential building blocks of water security.[26]

Cooperation can also produce tangible benefits for basin states. These include: (1) the reduction of the risk of unilateral state action that will prejudice other states; (2) the increased opportunity for "victim" states to influence the design and operation of major projects at the planning stage; (3) the ability to develop coordinated adaptation strategies to meet changed hydrologic conditions, including from climate change; (4) the ability to incorporate new uses such as aquatic ecosystem protection into existing allocation and management regimes; (5) the ability to negotiate mutually beneficial basin allocation and management regimes that reduce legal uncertainty for development; (6) increased access to donor project financing; (7) the ability of states to forego the expense of constructing expensive water projects in their own territory in return for a share of the financial benefits of projects in other basin states; and (8) the ability to use less-costly alternatives to meet water objectives.[27]

Despite the perceived benefits of cooperation, the reality in most basins is that many nations practice hydrogeopolitics,[28] that is, noncooperation or limited, primarily interest-driven cooperation. The long-running conflict between Egypt, Sudan, and their upstream neighbors over the use of the Nile River is a classic case of hydrogeopolitics at work.[29] Egypt and the Sudan claim almost the entire flow of the Nile based upon pre-independence agreements.[30] They have benefited from the capacity to build large, multi-purpose dams to profit from these claims at

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en_/Guiding_Principles (last visited Feb. 28, 2016). However, the contours of this principle remain unsettled. This paper equates equity with proportionality. In maritime boundary cases, the IJC has vacillated between defining proportionality as a means to adjust boundaries among states with irregular coastlines, versus as a substantive principle to allocate a scare resource. *Compare* North Sea Continental Shelf (W. Ger. v. Den.; W. Ger. v. Neth.), Judgment, 1969 I.C.J. Rep. 3 (Feb. 20); Gulf of Maine (Can. v. U.S.), Judgment, 1984 I.C.J. Rep. 246 (Oct. 12) *with* Concerning the Continental Shelf (Tunisia v. Libyan Arab Jamahiriya), Judgment, 1982 I.C.J. Rep. 116 (Feb. 24). Thomas Franck reads *Tunisia v. Libya* for the proposition that the court "has the discretion to allocate resources according to conditions of fairness." THOMAS M. FRANCK, FAIRNESS IN INTERNATIONAL LAW AND INSTITUTIONS 71 (1998). However, one of the reporters for the U.N. Convention on the Law of the Non-Navigational Uses of International Watercourses posits that equity is merely a procedural principle at best. STEPHEN C. MCCAFFREY, THE LAW OF INTERNATIONAL WATERCOURSES: NON-NAVIGATIONAL USES 345 (2001).

26. *See* van Beek & Arriens, *supra* note 11, at 12.

27. For example, Claudia Sadoff suggests that increased use of controlled groundwater pumping may be a cheaper way to provide flow augmentation in the Lower Ganges compared to the more expensive storage reservoirs used in Nepal. Claudia Sadoff et al., *Ten Fundamental Questions for Water Resources Development in the Ganges: Myths and Realities*, 15 WATER POL'Y 147, 155 (2013).

28. The literature on hydrogeopolitics is immense, particularly with respect to hydrogeopolitics in the Middle East. *See, e.g.*, MARK ZEITOUN, POWER AND WATER IN THE MIDDLE EAST: THE HIDDEN POLITICS OF THE PALESTINIAN-ISRAELI WATER CONFLICT (I.B. Tauris 2008); JOHN WATERBURY, HYDROPOLITICS OF THE NILE VALLEY (Syracuse Univ. Press 1979); Aysegul Kibaroglu & Waltina Scheumann, *Evolution of Transboundary Politics in the Euphrates-Tigris River System: New Perspectives and Political Challenges*, 19 GLOBAL GOVERNANCE 279 (2013).

29. Terje Tvedt, THE RIVER NILE IN THE AGE OF THE BRITISH: POLITICAL ECOLOGY AND THE QUEST FOR ECONOMIC POWER 267 (I.B. Tauris 2006); Waterbury, *supra* note 28.

30. Tvedt, *supra* note 29.

the expense of their slower-developing upstream neighbors.[31] Frustrated upstream states have retaliated by practicing hydrogeopolitics as well; some unilaterally reallocated the river in 2010 or, as in the case of Ethiopia, have begun to build large dams of their own.[32]

Other examples of hydrogeopolitics abound. The Lower Mekong River is an ecosystem under stress from upstream dams in China, Laos, and Cambodia, as well as from activities undertaken by Vietnam.[33] The dams diminish the river's flood pulses and the sediment that those pulses deposit, which threatens the fisheries and riverside gardens that depend on them.[34] The resulting water stress could adversely impact the diets and livelihoods of forty million people.[35] Despite recognizing the need for a common basin regime, these states continue to act primarily out of self-interest.[36] Groundwater depletion is another troubling symptom of this counterproductive dynamic. For example, Arabian Peninsula states are rapidly depleting their aquifers, which are the primary source of water for the Arabian desert region.[37]

These examples of failed or inadequate cooperation reveal how easy it is for states to practice non-cooperative hydrogeopolitics. The disincentives to cooperate include: (1) the real or imagined fear of lost development opportunities due to the notion that cooperation will disrupt the favorable status quo for the foreseeable future; (2) political and ethnic rivalry and subsequent backlash from any efforts to cooperate; (3) asymmetrical power relationships among riparian hegemons within a basin[38]; (4) the fear of claims of national sovereignty over

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31. Karen Conniff et al., *Nile Water and Agriculture: Past, Present and Future*, *in* THE NILE RIVER BASIN: WATER, AGRICULTURE, GOVERNANCE AND LIVELIHOODS 5, 18 (Seleshi Bekele Awulachew et al. eds. 2012).

32. The 2010 Agreement on the Nile River Basin Cooperative Framework replaces water quotas with a clause that permits all activities provided that they do not "significantly" impact the water security of other Nile Basin states. Agreement on the Nile River Basin Cooperative Framework, art. 5, May 14, 2010, http://www.internationalwaterlaw.org/documents/regionaldocs/Nile_River_Basin_Cooperative_Framework_2010.pdf. Five upstream countries—Ethiopia, Kenya, Uganda, Tanzania, and Rwanda—initially signed the accord, and Burundi signed it one year later. *The Cooperative Framework Agreement for the River Nile Basin: An Overview*, NILE BASIN INITIATIVE, http://www.nilebasin.org/index.php/about-us/the-nb-cooperative-framework (last visited Feb. 28, 2016).

33. Joshua Zaffos, *Life on Mekong Faces Threats As Major Dams Begin to Rise*, YALE ENVIRONMENT360 (Feb. 20, 2014), http://e360.yale.edu/feature/life_on_mekong_faces_threats_as_major_dams_begin_to_rise/2741/.

34. *Id.*

35. *Id.*

36. *See id.*

37. *See, e.g.*, Javier Blas, *Saudi Wells Running Dry—of Water—Spell End of Desert Wheat*, BLOOMBERGBUSINESS (Nov. 3, 2015), http://www.bloomberg.com/news/articles/2015-11-04/saudi-wells-running-dry-of-water-spell-end-of-desert-wheat.

38. Marwa Daoudy, *Asymmetric Power: Negotiating Water in the Euphrates and Tigris*, 14 INT'L NEGOTIATION 359, 360 (2009); *see also* GERMAN FED. FOREIGN OFF., THE RISE OF HYDRO-DIPLOMACY: STRENGTHENING FOREIGN POLICY FOR TRANSBOUNDARY WATERS 25 (2014), https://www.adelphi.de/sites/default/files/mediathek/bilder/the_rise_of_hydro-diplomacy.pdf. China, for example, is a riparian hegemon in the Mekong, Brahmaputra, and Salween basins, but is reluctant "to engage in multilateral legal instruments . . . ." Id. South Asia

waters in disputed transboundary areas[39]; (5) the lack of treaty provisions or basin institutions to manage conflicts or to distribute benefits equitably[40]; and (6) the relative inability of the international legal system to curb noncooperation. Thus, the hard question is why would states ever cooperate at all except out of an interest in financial gain or the fear that a dispute settlement process will produce a worse result?[41]

E. CLASSIC INTERNATIONAL LAW ENCOURAGES NONCOOPERATION

One answer is that the principle of territorial sovereignty has been embedded in post-World War II international water law. State sovereignty is the legal foundation of the practice of hydrogeopolitics. Sovereign nation-states became the building block of international law after the Peace of Westphalia in 1648, and state control of natural resources as a core attribute of sovereignty was reaffirmed in several major post-colonial era U.N. resolutions.[42]

International water law poses a major barrier to riparian nation cooperation because it incorporates the bedrock rule of state sovereignty over territory, including natural resources, with relatively weak limitations on those resources' exploitation.[43] The most important consequence of embedded state sovereignty over shared international river basins is that international water law encourages unilateral action and makes it hard for "victim" nations to effectively challenge such actions. It also encourages states to discourage cooperation as an infringement on their territorial sovereignty.[44]

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generally is another case in point: "None of the South Asian countries has joined the 1997 UN Watercourses Convention. India and Pakistan abstained from the vote on the Convention at the UN General Assembly, while Afghanistan, Bhutan and Sri Lanka were absent. Bangladesh, Maldives and Nepal voted in favor of the Convention, but none has ratified or acceded to the instrument. As important, India had officially noted its objections during its adoption . . . and as such, it is not surprising that it has not become a party." Kishor Uprety, *A South Asian Perspective on the UN Watercourses Convention*, INT'L WATER L. PROJECT BLOG (July 14, 2014, 6:14 AM), http://www.internationalwaterlaw.org/blog/2014/07/14/dr-kishor-uprety-a-south-asian-perspective-on-the-un-watercourses-convention/. For further background, *see* Majed Akhter, *Geopolitics of Dam Design on the Indus*, 48 ECON. & POL. WEEKLY 24 (2013); Eva Saroch, *Geopolitics of Water: From 'Security' to Sustainability*, 10 WATER NEPAL 107 (2003).

39. *See, e.g.*, ESTHER DELBOURG & ERIC STROBL, WATER CONFLICTS AND COOPERATIONS UP AND DOWN AFRICAN RIVERS, (Dep't of Econ., École Polytechnique, France 2014), http://www.estherdelbourg.com/uploads/2/3/6/5/23658330/water_conflicts_and_cooperations_up_and_down_african_rivers_.pdf.

40. Meredith Giordano and Aaron Wolf surveyed many of the major water treaties and concluded that they reveal "an overall lack of robustness. Water allocations, for example, the most conflictive issue area between co-riparian states, are seldom clearly delineated in water accords." Meredith A. Giordano & Aaron T. Wolf, *Sharing Waters: Post-Rio International Water Management*, 27 NAT. RES. F. 163, 168 (2003).

41. *See* I. Dombrowski, Conflict, Cooperation, and Institutions in International Water Management (Ph.D. Thesis, Leipzig U. 2005).

42. *See, e.g.*, G.A. Res. 1803 (XVII), Permanent Sovereignty over Natural Resources (Dec. 14, 1962).

43. *See* discussion of dams on the Mekong River, *supra* notes 33–36 and accompanying text.

44. The best example of the "drag" of sovereignty on cooperation is the Indus Waters Treaty between India and Pakistan. *See* Indus Waters Treaty 1960 between the Gov't of India, the Gov't of Pakistan and the Int'l Bank for Reconstruction and Dev., Pak.-India, Sep. 19, 1960, 419 U.N.T.S. 126. *See also* ALOYS ARTHUR MICHEL, THE

Both upstream and downstream states assert the principle to block developments in other riparian nations, limit cooperation, and practice hydrogeopolitics. For example, Turkey distinguishes between "international" and "transboundary" rivers to assert that limited sharing duties apply only to the former.[45] Such approaches place other, often less-powerful riparian states at a significant disadvantage. The territorial sovereignty principle that drives such behavior thus encourages unilateral action over cooperation and precludes fairly assessing the impacts of a state's existing or planned water uses on neighboring states. It also leads to weak or incoherent water allocation arrangements, or even one-off allocation decisions, at the expense of long-term cooperative and adaptive management. Efforts to remedy this problem are discussed in Part III.

III. THE ROLE OF INTERNATIONAL WATER LAW IN PROMOTING TRANSBOUNDARY WATER COOPERATION

International water law is an essential element of effective cooperation, but it suffers from a fundamental weakness in addition to the ones discussed in Part II. Law alone cannot compel states to cooperate. Cooperation is ultimately achieved when basin nations sufficiently trust each other to make meaningful allocation and management decisions. Trust is a combination of factors, such as the broader history of relations among nations and cultural mores. A lack of trust can exacerbate concerns that cooperation will place a nation at a relative disadvan-

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INDUS RIVERS: A STUDY OF THE EFFECTS OF PARTITION (Yale Univ. Press 1967); B.G. VERGHESE, WATERS OF HOPE: FACING NEW CHALLENGES IN HIMALAYA-GANGA COOPERATION (India Res. Press, 4th ed. 2007) (After the partition of British Imperial India into India and the new country of Pakistan, the latter found itself dependent upon a river system that originated largely outside its territory and whose headwaters were suddenly controlled by a hostile country that also controlled much of disputed Kashmir.). During the negotiation of the Colorado River Treaty between the United States and Mexico, Treaty on Utilization of the Waters of the Colorado and Tijuana Rivers and of the Rio Grande, Feb. 3, 1944, U.S.-Mex., art. 2, 59 Stat. 1219, T.S. No. 994 (effective Nov. 8, 1945), Mexico proposed that it be awarded eight percent of Lower Basin states' diversions. However, the United States, under pressure from Arizona and California, rejected this proposal because "it meant that Mexico's eyes could reach north of the border when the terms of the treaty were being administered." Charles J. Meyers & Richard L. Noble, *The Colorado River: The Treaty with Mexico*, 19 STAN. L. REV. 367 (1966). In 2013, Minute 319, discussed *infra*, notes 128–131, allowed Mexico to store water upstream in Lake Mead if it does not or cannot take its full Treaty allocation. Interim International Cooperative Measures in the Colorado River Basin through 2017 and Extension of Minute 318 Cooperative Measures to Address the Continued Effects of the April 2010 Earthquake in the Mexicali Valley, Baja California ("Minute 319") art. III, U.S.-Mex., Nov. 20, 2012.

45. Aysegül Kibaroglu, *Cooperation on Turkey's Transboundary Waters*, Status Rep. Commissioned by German Fed. Ministry for Env't., Nature Conservation & Nuclear Safety, ADELPHI RES. (Oct. 2005). Sovereignty is more pronounced in the U.N. Draft Articles on the Law of Transboundary Aquifers. *See* U.N. Draft Articles on the Law of Transboundary Aquifers, G.A. Supp. No. 10 (A/63/10), art. 3 ("Each aquifer State has sovereignty over the portion of a transboundary aquifer or aquifer system located within its territory. It shall exercise its sovereignty in accordance with international law and the present draft articles.") Other articles reaffirm the importance of international cooperation and good neighborliness, but sovereignty, not sharing, remains the bedrock principle. *See id.* In light of these provisions, the fact that nations often do not want to cooperate is understandable; cooperation requires a nation to limit its use and management of transboundary water resources for the benefit of other riparian nations, effectively forcing it to compromise its sovereignty.

tage, but access to high-quality technical information and a focus on working relationships among water professionals can help assuage such fears.[46]

At best, the legal system can provide incentives to cooperate and sanctions for the failure to do so. International water law promotes cooperation to achieve water security in five major ways: (1) by declaring that transboundary rivers should be shared among riparian nations in a way that affords each riparian state the realistic opportunity to benefit from reasonable and equitable uses of the resources;[47] (2) by permitting developing countries to bring claims that may displace existing uses to ensure that all riparian states are entitled to a share of the river; (3) by recognizing that arid states may depend upon water resources or certain allocations of those resources for their survival; (4) by imposing on states an evolving duty of ecosystem protection; and (5) by imposing procedural obligations on state water activities that may adversely impact other riparian states.

The most authoritative statement of customary international water law is The United Nations Convention on the Non-Navigation Uses of Transboundary Waters ("U.N. Watercourses Convention").[48] Other international agreements, such as the Convention on Biological Diversity,[49] the Ramsar Convention,[50] and the UNESCO World Heritage Convention,[51] augment the cooperation, sharing, and ecosystem protection duties in the U.N. Watercourses Convention.

A. THE RELATIONSHIP BETWEEN SUBSTANTIVE PRINCIPLES AND COOPERATION

The U.N. Watercourses Convention's core substantive articles are Article 5, which limits states to equitable and reasonable uses of transboundary watercourses, and Article 7, which prohibits one state from harming another's water uses. Article 6 augments Article 5 with a list of seven non-weighted factors relevant to determining what constitutes an equitable and reasonable use:

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46. *See* Thomas Bernauer, *Explaining Success and Failure in International River Management*, 64 AQUATIC SCI. 1 (2002).

47. *See* Edith Brown Weiss, *The Evolution of International Water Law*, 331 RECUEIL DES COURS 167 (2007).

48. Convention on the Non-Navigation Uses of Transboundary Waters, May 21, 1997, U.N. TREATY COLLECTION, https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-12&chapter=27&lang=en (last visited Feb. 28, 2016) [hereinafter U.N. Watercourses Convention]. For further background, *see* Salman M.A. Salman, *The United Nations Watercourses Convention Ten Years Later: Why Has Its Entry into Force Proven Difficult?*, 32 INT'L J. WATER 1, 13 (2007).

49. Convention on Biological Diversity, June 5, 1992, 1760 U.N.T.S. 79; *see also* SABINE BRELS ET AL., TRANSBOUNDARY WATER RESOURCES MANAGEMENT: THE ROLE OF INTERNATIONAL WATERCOURSE AGREEMENTS IN IMPLEMENTATION OF THE CBD, (CBD Technical Series No. 40, Secretariat of the Convention on Biological Diversity 2008), https://www.cbd.int/doc/publications/cbd-ts-40-en.pdf.

50. Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Feb. 2, 1971, 996 U.N.T.S. 245.

51. Convention Concerning the Protection of the World's Cultural and Natural Heritage, Nov. 16, 1972, 1037 U.N.T.S. 151.

a. Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character;
b. The social and economic needs of the watercourse states concerned;
c. The population dependent on the watercourse in each watercourse state;
d. The effects of the use or uses of the watercourses in one watercourse state on other watercourse states;
e. Existing and potential uses of the watercourse;
f. Conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect; and
g. The availability of alternatives, of comparable value, to a particular planned or existing use.[52]

Taken together, these factors guide the "equitable apportionment" of watercourse resources. At the base of all formulations of the principle of equitable apportionment is the norm of fundamental fairness[53]; no riparian state should be able to unilaterally preclude other states from using their fair share of an international river.

Article 6 can promote adaptation to climate-induced drought in several ways. Factors (a), (b), (c), and (f) are the most relevant to states that base their entitlement claims on poor hydrology and the need to sustain a population in a drought-prone region. Applied to drought, the reasonable and equitable use limitation on state sovereignty means that no state should be able to unilaterally exacerbate the risks or impacts of climate-induced drought on another state by using more than its fair share of an international river. Arid states argue that the factors thus favor the claims of states with poor hydrology over states with good hydrology. Between two states with poor hydrology, however, the factors are indeterminate. In addition, the principle of equitable and reasonable use allows other states to object to a dam, diversion, or discharge if they can prove significant harm.[54] Harm can range from the displacement of existing uses to preempted development opportunities.[55]

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52. U.N. Watercourses Convention, *supra* note 48, art. 6.

53. *See* FRANCK, *supra* note 25, at 71.

54. U.N. Watercourses Convention, *supra* note 48, art. 7. There is an unresolved tension between the right of a state to use a share of a river and the duty to ensure that the use does not cause harm to another state. *See* Salman M.A. Salman, *Downstream Riparian Can Also Harm Upstream Riparian: The Concept of Foreclosure of Future Uses*, 35 INT'L J. WATER 350, 350–64 (2010). *See also* S. PRT. 112-10, *Avoiding Water Wars: Water Scarcity and Central Asia's Growing Importance for Stability in Afghanistan and Pakistan* 9 (2011) (substantiating Pakistan's concerns that India is violating the Indus Waters Treaty by building dams on western rivers: "While studies show that no single dam along the waters controlled by the Indus Waters Treaty will affect Pakistan's access to water, the cumulative effect of these projects could give India the ability to store enough water to limit the supply to Pakistan at crucial moments in the growing season.").

55. It has even been suggested that a state that foregoes a project that would cause significant harm to co-riparians is entitled to compensation. *See* THE UNECE CONVENTION ON THE PROTECTION AND USE OF TRANSBOUNDARY WATERCOURSES AND INTERNATIONAL LAKES: ITS CONTRIBUTION TO INTERNATIONAL WATER COOPERATION 166 (Attila Tanzi et al. eds. 2015).

One of the biggest constraints to any climate adaptation strategy is the claim that prior uses are vested and thus cannot be limited. The U.N. Watercourses Convention provides an opening to adjust existing uses, thus putting the first state on notice that not all of its prior uses will be protected. Factor (e) makes protection of prior uses a relevant but not decisive factor. Thus, a late-developing riparian state is not barred from asserting its right to an equitable apportionment.[56] The need to ensure that all riparian nations have an equal opportunity to make future uses is as important as the protection of existing uses. Equitable apportionment as a concept is derived from U.S. Supreme Court precedent.[57] But unlike in the United States, there is no central international legal authority to mediate among and finance alternative distributions of water. Thus, weight is given to prior allocations and to a state's ability to claim its fair share.[58]

International water law has stressed aquatic ecosystems because the law has promoted the construction of dams and diversions that alter or destroy these systems.[59] There is no duty to protect aquatic ecosystems in classic customary international water law, but one is emerging.[60] International water allocation treaties routinely deal with the duty of upstream states to maintain minimum flows for the benefit of downstream states, but these flows are usually only intended to enhance power generation and consumptive uses. Customary international law imposes no *erga omnes* duty to protect aquatic ecosystems. The best that one can say is that modern formulations of customary international law recognize the need for such a duty. The duty can be derived from the international environmental law of state responsibility for transboundary harm. The duty not to cause harm has been limited to air and water pollution, but the foundational principle is that states have a duty not to allow state agencies and private parties subject to the state's regulatory jurisdiction to use their territories in a manner that causes substantial harm to other states. The U.N. Watercourses Convention extends the duty not to cause harm from a negative to a positive one. Article 20 recognizes that the shared use of international water includes ecosystem protection.[61] This duty remains undeveloped. There are, however, two important precedents that may bolster the development of such a duty.

The first precedent is the International Court of Justice ("ICJ")'s recognition that equitable apportionment, as articulated in the U.N. Watercourses Conven-

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56. *See* James C. McMurray & A. Dan Tarlock, *The Law of Later-Developing Riparian States: The Case of Afghanistan*, 12 N.Y.U. ENVTL. L.J. 711 (2005).

57. *See* Kansas v. Colorado, 185 U.S. 125, 144–43 (1902).

58. For a discussion of the available means to enforce customary and treaty-based international water law, *see* EDITH BROWN WEISS, INTERNATIONAL LAW FOR A WATER-SCARCE WORLD (Martinus Nijhoff 2013).

59. Brels et al., *supra* note 49.

60. *See* Owen McIntyre, *The Protection of Freshwater Ecosystems Revisited: Towards a Common Understanding of the 'Ecosystems Approach' to the Protection of Transboundary Water Resources*, 23 REV. OF EUROPEAN CMTY. & INT'L ENVTL. L. 88 (2014).

61. U.N. Watercourses Convention, *supra* note 48, art. 20.

tion, is a customary norm and includes ecosystem protection. In a landmark case concerning a dispute between Hungary and Slovakia,[62] the ICJ held that the former Czechoslovakia's unilateral decision to construct a lock and dam project would divert eighty to ninety percent of the river's flow, over Hungary's objections, thereby depriving Hungary of its right to an equitable and reasonable share of the use of the Danube.[63] The Court did not decree a minimum flow for Hungary, but it created the future basis for a duty on upstream states to maintain these flows.[64]

The second is a recent, pathbreaking international arbitration that has expressly articulated a duty to conserve aquatic ecosystems through the maintenance of minimum flows: the 2012-2013 Kishenganga Hydro-Electric Project Arbitration.[65] At issue was India's right to divert water for a hydroelectric project under the Indus Water Treaty.[66] A panel allowed the diversion, but held that downstream Pakistan had a right to minimum flows for hydroelectric energy and irrigation and the protection of the river's aquatic environment.[67] The Treaty, negotiated at the start of the post-World War II era of dam building in Africa and Asia, was silent on the issue of environmental protection, but the Panel grounded the new right in customary international law: "There is no doubt that States are required under contemporary customary international law to take environmental protection into consideration when planning and developing projects that may cause injury to a bordering state."[68] The decision supports the emerging vision of international water law, which posits that international watercourses are both commodities as well as heritage resources supporting a variety of consumptive and non-consumptive uses and ecosystem services, and that both purposes must be equally respected in decisions involving watercourse use and management.

B. THE PROCEDURAL RULES

Cooperation is currently viewed as a process rather than any particular substantive outcome. International water law primarily defines cooperation by compliance with a number of customary and treaty-specific procedural obligations, as well as by a general duty to cooperate.[69] The general duty is not yet either a customary rule or a rule *erga omnes*. There are too many real-world

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62. Concerning the Gabčíkovo-Nagymaros Project (Hungary v. Slovakia), 1997 I.C.J. Rep. 7. (Sept. 25).

63. *Id.* ¶ 85.

64. *See id.*

65. The Indus Waters Kishenganga Arbitration, Pakistan v. India, PCA Case No. 2011-01, Final Award, § 124 (Dec. 20, 2013).

66. Indus Waters Treaty 1960 between the Gov't of India, the Gov't of Pakistan and the Int'l Bank for Reconstruction and Dev., Pak.-India, Sep. 19, 1960, 419 U.N.T.S. 126, ¶ 15(iii).

67. *Pakistan v. India*, *supra* note 65.

68. *Id.* ¶ 449.

69. U.N. Watercourses Convention, *supra* note 48, art. 8.

examples of noncooperation or incomplete cooperation to justify characterizing such a general duty as a customary rule.

The significant existing procedural obligations, on the other hand, include prior notification of other basin states of planned measures,[70] a six-month period to allow the notified state to study and evaluate the possible effects of the planned measure,[71] and the duty of the notifying state to provide the notified state with "available" information for an "accurate evaluation."[72] The notified state must then communicate its findings to the notifying state.[73] If the notifying state determines that the project or other planned measures are inconsistent with the substantive allocation rules, it must enter into good faith consultation and negotiations "with a view to arriving at an equitable solution."[74] The U.N. Economic Commission for Europe Water Convention[75] contains more precise cooperation duties.

States most typically practice formal cooperation. The problems with this limited and often ineffective form of compliance with procedural duties, however, is illustrated by a study of Laos' compliance with the notification and stakeholder participation requirements of the Mekong River Agreement for the construction of the proposed Xayaburi hydroelectric dam project, the first dam on the Lower Mekong River. "The notification activated the Procedures for Notification, Prior Consultation and Agreement (PNPCA) Process."[76] Pressure from downstream states forced Laos to conduct an outside review of the project, which "included sections relating to fisheries, sediment management, water quality, navigation and the safety of dams."[77] However, "[s]ocial aspects such as results from stakeholder consultations were not included."[78] This demonstrates that regardless of whether consultations took place with any affected stakeholders, the results were excluded from any final decision-making process.

An environmental assessment can be a basis of cooperation, but the law does not always guarantee this. International law now recognizes a limited, customary obligation of an initiating state to prepare an environmental assessment for

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70. *Id.* art. 12. Principle 7 of the Rio Declaration also enjoins States to "cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the earth's ecosystem." Rio Declaration on Environment and Development, June 13, 1992, U.N. ENV'T PROGRAMME, http://www.unep.org/documents.multilingual/default.asp?documentid=78&articleid=1163 (last visited Feb. 28, 2016).

71. U.N. Watercourses Convention, *supra* note 48, art. 13.

72. *Id.* art. 14.

73. *Id.* art. 15.

74. *Id.* art. 17.

75. Convention on the Protection and Use of Transboundary Watercourses and International Lakes (UNECE Water Convention), Mar. 17, 1992, 1936 U.N.T.S. 269. *See also* Tanzi, *supra* note 55, pt. 7.

76. BOUNTHAVIVANH MIXAP, MEKONG RIVER, PUBLIC PARTICIPATION IN HYDROPOWER DEVELOPMENT: DOES IT MATTER? 2, (GWP 2015), http://www.gwp.org/Global/ToolBox/Case%20Studies/Americas%20and%20Caribbean/CS_463_Mekong_Hydropower_full%20case%20(3).pdf.

77. *Id.*

78. *Id.*

activities that may adversely impact transboundary waters. The 2010 ICJ decision in the *Pulp Mills* case[79] reflects the initiating state's considerable discretion to define the scope of the assessment narrowly. The Court imposed a strong threshold standard: an environmental assessment is required when the activity "may have a significant adverse impact in a transboundary context, in particular, on a shared resource."[80] However, *Pulp Mills* limited the duty by holding that the initiating state has the discretion to define the scope of the impact assessment.[81] That said, the initiating state does not have the discretion to ignore downstream or upstream impacts or otherwise overtly narrow the scope of the assessment.[82]

Pulp Mills remains the most important precedent for the duty of expanded cooperation. The Court took a major step toward expanding the duty to cooperate by recognizing that the distinction between procedural and substantive duties is artificial because procedural duties are "intended to create the conditions for successful co-operation between the parties."[83] Argentina objected to a pulp and paper mill on the Uruguay River and to the process by which Uruguay approved it. A treaty between the two countries created an international body to deal with river modifications and uses that threatened to alter water quality, but Uruguay did not make use of this body. It only provided an informal notice to Argentina that plans for the mill were going forward. In its first opinion, the Court observed that all uses of the river should allow for sustainable development, taking into account "the need to safeguard the continued conservation of the river environment and the rights of economic development of riparian states."[84]

But in the second opinion on the merits, the Court held that Uruguay's failure to use the treaty body breached both the treaty and customary international environmental law duties to notify and negotiate with the potential victim state before proceeding to approve a project that could constitute an reasonable use of the river. The Court linked substantive and procedural duties by observing that the object of procedural duties is to implement the substantive obligations of an applicable international or transboundary watercourse agreement.[85] Notification

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79. Pulp Mills on the River Uruguay (Argentina v. Uruguay), Judgment, 2010 I.C.J. Rep. 14. (Apr. 20).

80. *Id.* ¶ 204. The ICJ reaffirmed its position in Construction of a Road in Costa Rica along the San Juan River (Nicaragua v. Costa Rica) (proceedings joined with Certain Activities carried out by Nicaragua in the Border Area (Costa Rica v. Nicaragua)), Apr. 17, 2013, http://www.icj-cij.org/docket/index.php?p1=3&p2=3&case=152.

81. *Id.* ¶ 205.

82. However, assessments must be proportionate to the likely harm. In *Pakistan v. India*, discussed *supra*, notes 65-68 and accompanying text, the Permanent Court of Arbitration had to decide which of two environmental assessments was more suitable to help manage the river. *Id.* Pakistan prepared a comprehensive aquatic ecosystem assessment, while India's assessment focused only on fish habitat impacts. *Id.* The Court suggested that Pakistan's approach be used in future assessments of the environmental impacts of hydroelectric facilities. *Id.*

83. *Nicaragua v. Costa Rica*, *supra* note 79, ¶ 113.

84. Pulp Mills on the River Uruguay (Argentina v. Uruguay), Provisional Measures, Order of 13 July 2006, 2006 I.C.J. Rep. 113, ¶ 80.

85. *Pulp Mills*, 2010 I.C.J. Rep. 14, ¶ 281.

sets in motion a response procedure that ultimately allows the notified party to object to the work and that may trigger a duty to avoid damage.[86]

C. TOWARD A SUBSTANTIVE-PROCEDURAL LAW OF TRANSBASIN COOPERATION

Leading international water law expert Professor Patricia Wouters argues that:

> [read] together the UN [Watercourse Convention] provides an operation framework for the duty to cooperate in the use of international watercourses based on the substantive and procedural provisions of the instrument, and its requirement for consultations and recommendations for joint institutional mechanisms. Watercourse states undertaking an activity have a duty to cooperate on all aspects—from use-allocation, protection of the watercourse, ecosystem preservation, flood protection and pollution abatement and [have] a right to expect cooperation.[87]

States impacted by the activity have a right to expect a certain level of cooperation from the acting state.

Professor Wouters and this author have taken this argument a step further and argued that *Pulp Mills* lays the foundation for the principle that all states have an *erga omnes* duty to cooperate in the peaceful management of the world's water resources.[88] We further argue that the procedural duties to cooperate must be reinforced by two substantive rules that penalize noncooperation and push states to form the necessary permanent management institutions before undertaking substantial dams, diversions, and other projects:

1. No state has a right to develop its waters without taking into account the interests of other watercourse states; and
2. The duty to cooperate in the peaceful management of the world's water resources shall not be compromised by any state.

The first rule discourages unilateral development by erecting a presumption that the proposed activity is unreasonable and inequitable, placing the burden of proof to defend the legality of the action on the state undertaking the unilateral action. In contrast to the result in *Pulp Mills*, the second rule opens the possibility that the proper remedy for an injured state may be the removal or modification of the project. "At a minimum, the burden would be on the acting State to demonstrate that such a remedy is disproportionate to the harm suffered. The harshness of these results can be easily avoided by effective compliance with the

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86. *Id.* ¶ 115.

87. *See generally* Patricia Wouters, *'Dynamic cooperation'—The Evolution of Transboundary Water Cooperation*, *in* WATER AND THE LAW: TOWARDS SUSTAINABILITY (Edward Elgar Pub., Michael Kidd et al. eds. 2014).

88. Patricia Wouters & A. Dan Tarlock, *The Third Wave of Normativity in International Water Law*, 23 J. WATER L. 51 (2013).

duty to cooperate."[89]

IV. THE CONTINUUM OF COOPERATION

Despite the barriers, riparian states have long cooperated in various ways to share and manage transboundary rivers.[90] Some 3,600 agreements regarding transboundary water resources are currently in force.[91] But effective, long-term cooperation has not been achieved in most basins, and thus there is a gap between cooperation initiatives and institutions and the allocation and management decisions that address specific stresses. As a United Nations report observed, the existing agreements need "workable monitoring provisions, enforcement mechanisms, and specific water allocation provisions that address variations in water flow and changing needs."[92] This conclusion echoes numerous studies which have concluded that many nations practice "soft" rather than "hard" cooperation.[93] "Soft" cooperation can range from informal bilateral discussions to framework conventions that leave hard choices to the future. Hard cooperation involves concrete, discrete actions ranging from the exchange of information or environmental assessments to agreed-upon allocations and the creation of permanent shared management institutions.

This article offers the following non-exhaustive typology of the continuum of cooperation. The continuum runs from noncooperation, which is not discussed, to first steps to initiate cooperation, to more permanent river basin institutions, and to measurable outcomes that contribute to true water security. A more complete understanding of this continuum will reveal how efforts to cooperate can progressively evolve from open-ended uncertainty to measurable outcome cooperation.

A. A REQUEST TO COOPERATE

This point on the continuum is illustrated by Russia's objections to Mongolia's unilateral water diversion plans, which threaten Russia's Lake Baikal on two fronts. First, Mongolia's proposed Shuren dam will be located on the Selenga River, Lake Baikal's main source of freshwater. Second, Mongolia is proposing to divert water from the Orkhon River—another important resource for Lake

89. *Id.* at 64.

90. *See generally* CHRISTINA LEB, COOPERATION IN THE LAW OF TRANSBOUNDARY WATER RESOURCES (Cambridge U. Press 2013).

91. U.N. DEP'T OF ECON. & SOC. AFFAIRS, INTERNATIONAL DECADE FOR ACTION 'WATER FOR LIFE' 2005–2015, TRANSBOUNDARY WATERS, http://www.un.org/waterforlifedecade/transboundary_waters.shtml (last visited Feb. 28, 2016).

92. *Id.*

93. *See, e.g.*, Aaron T. Wolf, *Criteria for Equitable Allocations: The Heart of International Water Conflict*, 23 NAT. RES. F. 3 (1999); *see also* THE HYDROPOLITICS OF AFRICA: A CONTEMPORARY CHALLENGE (Marcel Kitissou et al. eds. 2007).

Baikal—through a major north-south pipeline to supply dry mines in Mongolia's Southern Gobi Desert region.[94]

In early 2015, Sergey Donskoy, Russia's Minister of Natural Resources, stated that "Russia is concerned about plans for the construction of hydropower plants on the River Selenga, which may affect the ecosystem of Lake Baikal. . . . Mongolia needs to involve competent Russian organizations to assess the impact of the project."[95] The situation is emblematic of the modern state of multi-faceted water management politics, with not just a formal request by Russia to Mongolia, but also the potential involvement of numerous other stakeholders in the environmental assessment process. State actors remain central players, but there are many other relevant potential participants and a wide array of potential legal options available to help address the conflict. For example, as discussed above, the law cannot force nations to cooperate, but there are potential consequences to noncooperation. Lake Baikal is both a UNESCO World Heritage Site[96] and a Ramsar Convention Wetland of International Importance.[97] Mongolia is relying on World Bank funding for these projects, which triggers the Ramsar Convention's Inspection Panel process—an inspection and report on a member's activity that threatens a wetland.[98] Thus a formal request to cooperate merely opens the door to the full range of potential types of cooperation.

B. AN AGREEMENT TO COOPERATE IN THE FUTURE

Making an agreement to cooperate in the future is a common practice in transboundary water negotiations. Such an agreement can either serve to "punt" or even block actual cooperation, or it can be a first step toward true cooperation. In the case of water management in China, there is reason to believe that such agreements may carry weight. China has long taken the position that its mainly upstream river development projects do not harm its downstream neighbors.[99]

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94. SISIRA S. WITHANACHCHI ET AL., (RE)CONFIGURATION OF WATER RESOURCES MANAGEMENT IN MONGOLIA: A CRITICAL GEOPOLITICAL ANALYSIS 30 (The Int'l Ctr. for Dev. & Decent Work, Paper No. 13 2014), http://www.uni-kassel.de/upress/online/OpenAccess/978-3-86219-860-3.OpenAccess.pdf.

95. Anna Liesowska, *New Threat to Baikal with Plans for New Hydroelectric Plants in Mongolia*, SIBERIAN TIMES (Feb. 17, 2015), http://siberiantimes.com/ecology/casestudy/news/n0121-new-threat-to-baikal-with-plans-for-new-hydroelectric-plants-in-mongolia/.

96. *Lake Baikal*, UNESCO WORLD HERITAGE LIST, http://whc.unesco.org/en/list/754 (last visited Feb. 28, 2016).

97. *Wetlands of Russia*, WETLANDS INT'L, http://russia.wetlands.org/Home/WetlandsofRussia/tabid/608/language/en-US/Default.aspx (last visited Feb. 28, 2016).

98. Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Feb. 2, 1971, 996 U.N.T.S. 245, art. V. Recommendation 4 of the 1990 Conference of the Parties created the advisory mission process. *See generally* PAMELA GRIFFIN, THE RAMSAR CONVENTION: A NEW WINDOW FOR ENVIRONMENTAL DIPLOMACY? (Univ. Vermont Inst. for Envtl. Diplomacy & Sec. 2012), http://www.uvm.edu/ieds/sites/default/files/Ramsar_IEDSResearchSeries.pdf.

99. The criticisms of China's refusal to cooperate in the use and management of transboundary rivers is summarized in Otto Spijkers, Xian Li & Liping Dai, *Sustainable Development in China's International and Domestic Water Law*, 24 J. WATER L. 207, nn.2–5 (2014).

But China's incremental engagement with its riparian neighors to the south is an example of this type of cooperation; it has signed a number of agreements that, for the first time, permit bilateral discussions of transboundary issues, and may be slowly aligning its transboundary water policy more consistently with international water law.[100]

C. OPEN-ENDED COOPERATION WITH NO SPECIFIC END OBJECTIVE

Open-ended cooperation encompasses the most common interactions among basin states today; cooperation is, after all, typically understood as a continuum of events. Many ongoing initiatives among basin states have no immediate or specific end objective, such as an allocation of unallocated transboundary waters, joint management of existing allocations, or efforts to adapt to changing conditions. These initiatives still necessitate concrete actions by parties and are therefore more than mere promises to cooperate in the future. Such efforts can be informal or take place within formal transboundary institutional structures. Typically, open-ended cooperation occurs when: (1) two or more basin parties agree to discuss their water needs and the needs of other neighboring riparian states; or (2) two or more basin parties agree to conduct joint studies of emerging watercourse problems. The hope is that open-ended cooperation will ultimately lead to yet more concrete steps that meet the criteria for effective outcome cooperation, as discussed below and in Part V.

The focus on climate adaptation is an example of open-ended cooperation. Many riparian states forge agreements that place climate change on the basin agenda so that its impacts on all states may be evaluated. The evaluation process typically involves several stages: (1) the recognition among all basin states of the possibility of climate-induced water stress in the basin; (2) a basin-wide study, including the exchange of relevant scientific and other information, to identify likely climate impact and water stress scenarios over a reasonable time horizon; (3) agreement among all basin states, within the bounds of agreed-upon ranges of uncertainty, on the magnitude and geographical distribution of the likely stresses; and (4) agreement on the harmonized measures that the states will need to take at both the national and international level.

Many basin states have already recognized the need to adapt to climate-induced water stress, engaged in necessary information exchange, and completed basin-wide studies of likely future impacts. The parties to both the Convention on the Protection and Use of Transboundary Watercourses as well as the International Network of Basin Organizations ("INBO") have surveyed climate adaptation measures in several basins and have extracted valuable lessons for future

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100. Patricia Wouters & Huiping Chen, *China's 'Soft-Path' to Transboundary Water Cooperation Examined in the Light of Two UN Global Water Conventions: Exploring the 'Chinese Way'*, 22 J. WATER L. 229, 232 (2013).

best practices.[101] Examples of progress achieved through these stages abound. Moldova is moving from the first to the second stage with respect to the Lower Dniester River.[102] The parties to the Sava River Convention have adopted a Framework Agreement[103] to conduct a study of climate-induced flood risks and potential flood reduction measures. The Regional Climate Change Impacts Study for the South Caucasus Region has produced a vulnerability analysis for four specific areas within the region. Furthermore, some states have progressed to the third stage and agreed upon the likely distribution and magnitude of future stresses. Belarus and Lithuania, for example, have conducted an assessment of future stream flows in the Neman River Basin.[104]

In the Danube[105] and Rhine River Basins, the parties have developed impact scenarios relevant to major uses of the rivers and adopted a basin-wide adaptation strategy.[106] The Danube River Basin is likely to experience temperature increases from 0.7 to 2.1 degrees Celsius (33 to 36 degrees Fahrenheit) from 2021 to 2050.[107] These temperature increases will be felt to a greater extent in the drier, lower Danube; the lower reaches of the basin, starting in southeastern Austria, are likely to experience decreased rainfall, with the result that "[d]roughts and low flow situations are expected to increase. Especially in the summer, and, in the southeastern parts . . . " of the Basin and these events are likely to be more frequent, intense, and long-lasting.[108] Groundwater storage also is also projected to decline in Central and Eastern Europe.[109] Thus, the whole range of the rivers' uses, from irrigation to aquatic ecosystem conservation, will be stressed.

The member states of the Danube Convention[110] recognize the need to adopt basin-wide vulnerability metrics and conduct a vulnerability assessment using previous German and Austrian studies as models. The Danube is an unallocated basin, but water scarcity will be a more pressing issue in the future and will require progressively greater degrees of basin state cooperation. For example, the

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101. WATER AND CLIMATE CHANGE ADAPTATION IN TRANSBOUNDARY BASINS: LESSONS LEARNED AND GOOD PRACTICES (U.N. Econ. Comm'n for Europe, Int'l Network of Basin Orgs. 2014), http://www.unece.org:8080/fileadmin/DAM/env/water/publications/WAT_Good_practices/ece.mp.wat.45.pdf [hereinafter *Lessons Learned*].

102. *Id.* at 17.

103. *Framework Agreement on the Sava River Basin*, INT'L SAVA RIVER BASIN COMM'N, http://www.savacommission.org/dms/docs/dokumenti/documents_publications/basic_documents/fasrb.pdf (last visited Feb. 28, 2016).

104. A. Dan Tarlock, *Promoting More Effective Cooperation Among Riparian Nations: From Principle to Practice* 32, GWP Technical Comm. (TEC) Background Paper No. 21 (2015), http://www.gwp.org/Global/ToolBox/Publications/Background%20papers/GWP_TEC21_web.pdf.

105. *Lessons Learned*, *supra* note 101, at 15.

106. *Id.* at 14.

107. ICPDR STRATEGY ON ADAPTATION TO CLIMATE CHANGE 13 (Int'l Comm'n for the Prot. of the Danube River 2013), https://www.icpdr.org/main/sites/default/files/nodes/documents/icpdr_climate-adaptation-strategy.pdf [hereinafter *ICPDR Climate Adaptation Strategy*].

108. *Id.* at 20.

109. *Id.*

110. *Id.* at 28.

Danube Commission has signaled that climate change will require the "harmonization of international basin-wide legal limits and threshold values."[111]

The management of the still-pristine Okavango River illustrates another promising open-ended cooperative regime with the potential to evolve into a comprehensive management and allocation regime. The Okavango is shared among three countries, each with markedly different visions for its use.[112] Angola, the headwaters state, emerged from decades of civil war in the 1990s and is still in the process of evaluating its use options, including hydroelectric projects. Downstream Namibia and Botswana are among the driest countries in the world, but derive great consumptive and non-consumptive benefits from the river. Namibia views the River as the only dependable source of water for the arid central part of the country where its population is concentrated. It has proposed a diversion to the head of the Eastern National Water Carrier.[113] And Botswana depends on the river's flow for both existing and planned agriculture, an interest in conflict with the river's important role in sustaining a vibrant ecosystem and attendant tourism industry in the Okavango Delta, the largest Ramsar Convention wetland in the world.

In 1994, these three countries signed the Agreement on the Establishment of a Permanent Okavango River Basin Water Commission ("OKACOM"), creating a commission to develop criteria for the equitable use and sustainable development of the river.[114] This agreement has developed into a more ambitious, broad based, long-term cooperative effort to collect and share the data necessary to develop a coherent management regime for the Okavango River-Delta.[115] This management effort began in earnest in 2004; the nascent regime, very much a creature of foreign support, is still in the capacity-building and modeling stage, but initial reports of its progress have been positive.[116] The agreement is facilitating cooperative activities throughout the basin, including in the upper basin in Angola in particular, such as the development of reliable hydrologic data to

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111. *ICPDR Climate Adaptation Strategy*, *supra* note 107, at 29.

112. *See* Volker Boege, *A Glass Half-Full or Half-Empty? Water, Conflict and Cooperation in Southern Africa*, *in* RESOURCE POLITICS IN SUB-SAHARAN AFRICA 273 (Matthias & Andreas Mehler eds. 2005).

113. *Id.*

114. Agreement on the Establishment of a Permanent Okavango River Basin Water Commission (OKACOM), Angl.-Bots.-Namib., art. 1, Sept. 15, 1994.

115. *See* ELIZABETH SODERSTROM ET AL., TRANSBOUNDARY COLLABORATIVE LEARNING: CASE STUDY IN THE OKAVANGO RIVER BASIN, DRAFT COMPREHENSIVE ASSESSMENT PROJECT REPORT 17 (Int'l Water Mgmt. Inst. 2016), http://www.iwmi.cgiar.org/assessment/files/word/ProjectDocuments/Okavango/Okavango_Draft%20Report.pdf.

116. *See* MARC ANDREINI ET AL., MID-TERM PROGRAMMATIC EVALUATION OF USAID/SOUTHERN AFRICA'S PROGRAM TO "IMPROVE MANAGEMENT OF SHARED RIVER BASINS" (2007), http://www.esd.ornl.gov/eess/global_change/pdfs/Evaluation%20of%20USAID%20Regional%20River%20Basin%20Program%20in%20Southern%20Africa_Final%20Report%20July%202007.pdf (last visited Feb. 28, 2016) (identifying successes and challenges facing the project, such as ensuring its technical and financial stability, bridging differences between USAID and other regional partners, confronting uncertain support from the Global Financial Facility, and improving communication with Angola through bilingual English-Portuguese personnel).

inform future development. The agreement also emphasizes "the interconnectivity of water resources management and biodiversity conservation. Sustainable use and management of terrestrial resources affect significantly the quality, quantity, and availability of water to all users within the basin." The agreement has led to an improved understanding of the resource base and resource use patterns that will inform future protection and management decisions in the river-delta, particularly in the Mucusso reserve, and it has contributed to the capacity for locally-engaged protected area monitoring and planning.[117] Finally, the agreement has also produced a land-use plan for both the Ramsar and non-Ramsar portions of the Ngamiland District in Botswana.[118]

D. SINGLE-ISSUE COOPERATION

Instances of single-issue cooperation include: (1) a state's decision to abandon or modify a proposed water impoundment or diversion based upon the objections of another riparian state[119]; (2) one state permits another to use a water storage facility[120]; (3) two or more states agree to provide *in situ* flows necessary to stabilize or restore a stressed aquatic ecosystem; or (4) mainstream states agree to include tributary states within the institutional water management structure.[121]

E. OUTCOME COOPERATION

Finally, outcome cooperation refers to concrete efforts to allocate, reallocate, or manage water in a transboundary basin. Examples of outcome cooperation include:

1. A decision by a riparian state to share with upstream or downstream states the financial benefits of water basin uses, such as from power generation

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117. U.S. AGENCY FOR INT'L DEV., OKAVANGO INTEGRATED RIVER BASIN MANAGEMENT PROJECT (IRBM) FINAL REPORT 25 (2009), http://www.okacom.org/okacoms-work/partners-and-projects/projects/partner-projects/irbm/irbm-documents/IRBM%20Final%20Report%20-%20August%2031%202009.pdf.

118. *Id.* at 35–36.

119. The literature abounds with domestic and international objections to large dams and diversion projects, but examples of one state abandoning a project after another objects are rare or non-existent. The reverse is usually the case. After the end of the Soviet Union, proposed large-scale diversions of the Siberian rivers to Central Asia were abandoned. *See* Michael L. Bressler, *Water Wars: Siberian Rivers, Central Asian Deserts, and the Structural Sources of a Policy Debate*, *in* REDISCOVERING RUSSIA IN ASIA: SIBERIA AND THE RUSSIAN FAR EAST 240 (Stephen Kotkin & David Wolff eds. 1995). Today, however, the Central Asian states are pushing for a revival of these proposals.

120. *See, e.g.*, 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, 542 U.N.T.S. 244.

121. In 2001, Upstream Guinea was added to the 1972 Convention Concerning the Status of the Senegal River after the three original states abandoned their "contracting states only" approach for a "riparian State perspective." Makane Moïse Mbengue, *A Model for African Shared Water Resources: The Senegal River Legal System*, 23 REV. OF EUROPEAN CMTY. & INT'L ENVTL. L. 59, 65 (2014).

revenues, joint reservoir uses, or payments by one state to another to forego certain uses;
2. An agreement between riparian states as to initial allocations of a river or watercourse[122];
3. An agreement between riparian states to reallocate a river to provide for more equitable apportionment and access among all basin states; or
4. An agreement between states to alter an existing water allocation regime to adapt to changing conditions, such as environmental degradation or climate disruption.

Three selected examples of outcome cooperation follow in the next section.

V. THREE EXAMPLES OF OUTCOME COOPERATION

Examples of outcome cooperation with tangible benefits are sparse, but this article offers three examples: (1) cooperation between Mexico and the United States to restore the Colorado River Delta; (2) cooperation between Canada and the United States to minimize climate impacts on the Great Lakes; and (3) Australia's efforts to restore the stressed Murray-Darling aquatic ecosystem. Not surprisingly, these examples primarily involve developed countries. The lessons of these case studies will be more difficult to replicate in basins with weaker allocation and management institutions or insufficient hydrologic information. Nonetheless, these examples illustrate what cooperation can achieve.

As climate change's adverse impacts grow in arid and semiarid areas, water stress and insecurity will dramatically increase. Effective riparian state cooperation will be necessary to manage this adaptation in a fair and sustainable manner. The alternatives to cooperation are economic injustice, social unrest, potential armed conflict, and large-scale migration—outcomes that can and should be avoided through greater cooperation.

A. THE RESTORATION OF THE COLORADO RIVER DELTA: MEXICO AND THE UNITED STATES ADAPT TO POST-TREATY ENVIRONMENTAL DEGRADATION

The Colorado River is so fully allocated that withdrawals by Mexico and the United States can dry up the River before it reaches the Delta.[123] The Mexico-United States Water Treaty allows users in both nations to divert the entire average flow upstream from its mouth, thus cutting off both the necessary

122. The 2003 Incomati Agreement between Mozambique, Swaziland, and South Africa is an example of an agreement that both allocates each state a fixed amount of water and sets downstream flow requirements. *See* A. Dan Tarlock, *Four Challenges for International Water Law*, TULANE ENVTL. L.J. 369, 394–95 (2010).

123. U.S. BUREAU OF RECLAMATION, COLORADO RIVER BASIN WATER SUPPLY AND DEMAND STUDY, EXECUTIVE SUMMARY 9 (2012), http://www.usbr.gov/lc/region/programs/crbstudy/finalreport/Executive%20Summary/CRBS_Executive_Summary_FINAL.pdf (annual demand shortfall estimated to be 3.2 million acre feet by 2060).

seasonal sediment deposits and water flows to sustain the Delta.[124] Until 2012, remnant Delta marshes survived precariously on wet year surplus "pulses" and upstream agricultural return flows.[125] After a long campaign by nongovernmental organizations ("NGOs") in the 1990s,[126] both Mexico and the United States finally abandoned their longstanding claims that the degradation of the Delta was an irremediable consequence of the Treaty, and moved instead to create an experimental Delta restoration flow regime.[127]

The two countries used the Treaty modification process to establish the new flow regime via a mechanism known as Minute 319,[128] a de facto amendment to the Treaty.[129] Minute 319 created a pilot program to deliver 158,088 acre-feet (195,000 million cubic meters) of base flow to the Colorado River limitrophe and delta. The water will come from two sources: a one-time pulse flow of 105,392 acre-feet, and a base flow of 52,696 acre-feet. The restoration flow will come entirely from water conserved in Mexico through the construction of more efficient water infrastructure. The base flow is being assembled in Mexico through NGO purchases of Mexican water rights. A water trust was established in 2010 and, as of 2013, about forty percent of the amount had been acquired. By the end of 2016, Minute 319 is expected to be replaced "by a comprehensive Minute that extends or replaces the substantive provisions of this Minute . . . ."[130]

In March 2014, approximately 105,392 acre-feet (130 mcm) of water was released into the dry riverbed below Morelos Dam, which straddles the U.S.-Mexico border just west of Yuma. The first of three planned pulse flows was a success:

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124. Treaty with Mexico Regarding Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, Feb. 3, 1944. *See also* NORRIS HUNDLEY, JR., DIVIDING THE WATERS: A CENTURY OF CONTROVERSY BETWEEN THE UNITED STATES AND MEXICO (U. Cal. Press 1966).

125. DANIEL F. LUECKE ET AL., A DELTA ONCE MORE: RESTORING RIPARIAN AND WETLAND HABITAT IN THE COLORADO RIVER DELTA, (Envtl. Def. Fund 1999), https://www.edf.org/sites/default/files/425_delta.pdf.

126. *See* Francisco Zamora-Arroyo et al., *Conservation Priorities in the Colorado River Delta: Mexico and the United States*, SONORA INST. (2002), http://www.sonoraninstitute.org/component/docman/doc_view/1307-conservation-priorities-in-the-colorado-river-delta-06152005.html. *See also* Jonathan S. King, Peter W. Culp & Carlos de la Parra, *Getting to the Right Side of the River: Lessons for Binational Cooperation on the Road to Minute 319*, 18 U. DENV. WATER L. REV. 36 (2014).

127. *See* A. Dan Tarlock, *Mexico and the United States Assume a Legal Duty to Provide Colorado River Delta Restoration Flows: An Important International Environmental and Water Law Precedent*, 23 REV. OF EUROPEAN CMTY. & INT'L ENVTL. L. 76 (2014).

128. Interim International Cooperative Measures in the Colorado River Basin through 2017 and Extension of Minute 318 Cooperative Measures to Address the Continued Effects of the April 2010 Earthquake in the Mexicali Valley, Baja California ("Minute 319"), U.S.-Mex., Nov. 20, 2012 [hereinafter Minute 319].

129. *See* C. Cadena, *A Minute of Clarity After Decades of Confusion: "Extraordinary Drought" in the Lower Rio Grande Basin*, 24 GEO. INT'L ENVTL. L. REV. 605, 622–626 (2012); Robert John McCarthy, *Executive Authority, Adaptive Treaty Interpretation, and the International Boundary and Water Commission, U.S.-Mexico*, 14 U. DENV. L. REV. 19 (2011).

130. Minute 319, *supra* note 128, art. III.

> As provided in Minute 319 of the U.S.-Mexico Water Treaty of 1944, a pulse flow of approximately 130 million cubic meters (105,392 acre-feet) was released to the riparian corridor of the Colorado River Delta from Morelos Dam at the U.S.-Mexico border. The water was delivered over an eight-week period that began on March 23, 2014 and ended on May 18, 2014. Peak flows were released early in this period to simulate a spring flood. Some pulse flow water was released to the riparian corridor via Mexicali Valley irrigation canals.[131]

B. THE CANADA-UNITED STATES GREAT LAKES CONSERVATION STRATEGY: THE DE FACTO DEDICATION OF THE GREAT LAKES TO ECOSYSTEM CONSERVATION

The Great Lakes, shared between Canada and the United States, contain twenty percent of the world's freshwater. The United States and Canada have developed a unique non-treaty regime that curbs unilateral actions by any U.S. state or Canadian province to remove water from the basin.[132] The states and providences have a long history of sub-treaty agreements, but the Great Lakes Water Resources Compact ("Compact") is a notable example of "extra" constitutional initiatives by sub-units of two national, federal governments.[133]

To accomplish their shared goal, the two countries could have amended the 1909 Boundary Waters Treaty,[134] but instead, between 2001 and 2005, the eight U.S. Great Lakes states negotiated the Compact, which makes it very difficult to divert water outside the Great Lakes Basin. With little fanfare, the Compact directly and indirectly adopted several key principles of international environmental law, such as the precautionary principle and the recognition that the Great Lakes are the common heritage of humankind.[135] Even small communities that straddle the divide between the Great Lakes and other drainages, which often include a small part of a state, must show that no feasible alternative supply exists to gain access to water located only a few miles away.[136] Similar anti-diversion prohibitions exist in Canada. While the Compact is an agreement between eight

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131. *Minute 319 Colorado River Delta Flows Monitoring: Initial Progress Report* 4–5, Int'l Boundary & Water Comm'n, U.S.-Mex., Dec. 4, 2014, http://www.ibwc.gov/EMD/Min319Monitoring.pdf.

132. *See* Noah D. Hall, *Toward a New Horizontal Federalism: Interstate Water Management in the Great Lakes Region*, 77 U. COLO. L. REV. 405 (2006).

133. *See, e.g.*, Gerard F. Rutan, *Micro-Diplomatic Relations in the Pacific Northwest: Washington State–British Columbia Interactions*, *in* PERFORATED SOVEREIGNTIES AND INTERNATIONAL RELATIONS 163, 184–86 (Ivo Duchacek et al. eds. 1988).

134. There was no treaty dispute between the two countries because the possible planned diversions that triggered the Compact and cooperation with Canada did not trigger Articles II and III of the Treaty to create a dispute. Joseph W. Dellapenna, *International Law's Lessons for the Law of the Lakes*, 40 U. MICH. J. L. REFORM 747, 754–757 (2007).

135. I have developed this argument in A. Dan Tarlock, *Five Views of the Great Lakes and Why They Might Matter*, 15 MINN. J. INT'L L. 21, 29–32 (2006).

136. Great Lakes–St. Lawrence River Basin Water Resources Compact, Pub. L. No. 110-342, § 4.9, 122 Stat. 3739. To trace the decade-plus efforts of a suburb of Milwaukee located in the Mississippi River basin, *see City of Waukesha Diversion Application*, GREAT LAKES–ST. LAWRENCE RIVER BASIN WATER RESOURCES COUNCIL, http://www.waukeshadiversion.org/ (last visited Feb. 28, 2016)

U.S. states and not a binational treaty, it should be viewed in the context of Ontario and Quebec's adoption of parallel legislation and Canada's enactment in 2002 of a strong anti-diversion law.[137]

The Compact was a hard sell within the Great Lakes region and across the United States, however, because it locked up twenty percent of the world's freshwater and ninety-five percent of the United States' freshwater supplies. To defend their collective actions with respect to securing the Great Lakes Basin resources, Canada and the United States had to explain why it was rational to prevent almost all out-of-basin diversions and dedicate the Great Lakes to non-consumptive uses. The International Joint Commission ("IJC") was able to leverage its reference process to help make the case for the Compact.[138]

In 1999, the two governments agreed to an IJC report. The resulting 2000 report[139] synthesized the available science on the Great Lakes hydrology through the lens of the precautionary principle. The report recommended that the Great Lakes states and Canadian provinces develop a strong anti-diversion regime based upon its conclusion that the Great Lakes constitute a fragile, fully allocated "nonrenewable resource."[140] As the report noted, less than one percent of the total volume of the Great Lakes is renewed annually by precipitation, and the levels remain relatively constant "with a normal fluctuation ranging from 30 to 60 cm (12-24 in.) in a single year."[141] Because water levels in the Great Lakes fluctuate based on precipitation and evaporation cycles, even small seasonal fluctuations can have dramatic and costly consequences for both the health of the Great Lakes ecosystem and navigational uses. Natural level cycles have been altered by human interventions, such as diversions, over time.

The report also urged the Great Lakes states and provinces to adopt a climate adaptation plan based upon the precautionary principle. The Report concluded that the Great Lakes are "highly sensitive to climatic variability,"[142] and that "[c]limate change suggests that some lowering of water levels is likely to occur . . . [and] the Commission believes that considerable caution should be exercised with respect to any factors potentially reducing water levels and outflows."[143]

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137. Province of Ontario Water Resources Act, R.S.O. 1986 (Can.).

138. *See* The Rt. Hon. Herb Gray, P.C., C.C., Q.C., *Canada and U.S. Approaches to the Great Lakes*, 31 CAN.-U.S. L.J. 287, 290 (2005) (The Compact allows the Commission to investigate issues referred to it by the two governments, hold public hearings in the Basin, and issue reports. State practice has made the reference process the Commission's most important function and the major source of its political influence; the customary expectation of joint Canada-U.S. requests is that both countries will respond to the reference.).

139. *Protection of the Waters of the Great Lakes: Final Report to the Governments of Canada and the United States*, INT'L JOINT COMM'N, http://www.ijc.org/php/publications/html/finalreport.html (last visited Feb. 28, 2016).

140. *Id.* at 5.

141. *Id.* at 6.

142. *Id.*

143. *Id.* at 21–22.

C. THE MURRAY-DARLING BASIN: THE REALLOCATION OF A RIVER FROM IRRIGATION TO IRRIGATION AND ECOSYSTEM RESTORATION

Australia's management of the Murray-Darling Basin, while not technically international transboundary watercourse management, is an important and much-studied example of measureable outcome cooperation. It is an ambitious effort to restore lost ecosystem services on a river that crosses sub-national political units. The Basin is plagued with environmental problems. such as over-salination and aquatic ecosystem degradation largely caused by upstream agricultural withdrawals. The root problem is that upstream diversions are increasing the salinity of the River in South Australia.[144]

In 1992, the Australian government and the four states in the basin (New South Wales, Queensland, South Australia, and Victoria—plus the Australian Capital Territory) agreed to the Murray-Darling Initiative to conserve the basin's ecosystem.[145] The Initiative led to the adoption of the federal-state Murray-Basin Agreement and the creation of a joint federal-state commission overseen by a federal-state ministerial council.

The Murray-Darling Commission ("the Commission") ultimately set base flows for ecosystem restoration based upon the impacts of different flows on the riverine environment. Both the federal and state governments recognized the need to limit water withdrawals, establish base flows, and stabilize and restore productive agricultural areas, especially those degraded by salination. The Australian government has no direct power to manage water, and initially had to rely on the four basin states to distribute the necessary withdrawal reduction burdens. To do this, in 1996, the Commission announced a cap based upon the volume of water that would have been used under the infrastructure management rules and climatic conditions as they existed in 1993-1994.[146]

The Agreement vests the Murray-Darling Commission with the power to control releases from specified upstream storage facilities. To restore lost ecosystem services, the Commission has adopted an artificial base flow regime and imposed yearly water diversion limits on the four basin states and the Australian Capital Territory. These changes are designed to spur gradual and modest rollbacks in existing uses that are fair and efficient and promote environmental objectives.[147]

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144. *A Brief History of the Murray–Darling Basin Agreement*, MURRAY–DARLING BASIN COMMISSION (2000), http://www.mdbc.gov.au/about/governance/agreement_history.htm (last visited Feb. 28, 2016).

145. *What We Do*, MURRAY–DARLING BASIN COMMISSION (2000), http://www.mdba.gov.au/what-we-do/managing-rivers/the-cap (last visited Feb. 28, 2016).

146. *See generally* PARLIAMENT OF AUSTRALIA, *Murray-Darling Basin management,* http://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/BriefingBook44p/MurryDarlingBasin (last visited Mar. 26, 2016).

147. *See id.*

The slow progress in restoring the Basin's ecosystem services ultimately led to the Australian government's more aggressive intervention. Australia invoked its international obligations under the Convention on Biological Diversity to enact the Water Act of 2007.[148] The Act replaced the Commission with the Murray-Darling Basin Authority. The Authority has developed a Living Murray Water Recovery Program, which follows a three-pronged approach to restore lost ecosystem services: (1) infrastructure measures; (2) market-based measures (such as water license purchases); and (3) regulatory measures.[149] The Authority must prepare a plan that imposes limits on the amounts of surface and groundwater that can be taken from basin water resources on a sustainable basis; such limits are known as long-term average sustainable diversion limits. The plan must also identify risks to Basin water resources, such as climate change, and develop strategies to manage those risks. Finally, the Authority also establishes the requirements that a state water resource plan must include to be accredited under the Act.[150]

The Living Murray Program has already produced many measureable benefits, from the Australian $1 billion to support the program, a comprehensive planning process, and the expenditure of more than Australian $1 billion to purchase more than 4,500 individual water trades.[151] The ultimate measure of the program's success, however, will be whether it halts the continuing decline of the basin and produces calculable ecological and economic benefits from ecosystem restoration.[152]

VI. CONCLUSION

Cooperation among riparian states is essential to national and basin-wide water security. To achieve full water security, however, cooperation must produce concrete, measureable benefits for all basin states. This requires an outcome- rather than input-oriented standard of cooperation. Some benefits, such as shared hydropower revenues or firm water allocations, may be immediately measurable, but others, such as comprehensive ecosystem restoration plans, can only be measured over longer timeframes. Ultimately, cooperation for cooperation's sake does not advance water security and often perpetuates unilateral action. Measur-

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150. *See generally* About Us, MURRAY-DARLING BASIN AUTHORITY (2007), http://www.mdba.gov.au/about-us (last visited Mar. 26, 2016).

148. Water Act 2007 (Austl.).

149. *See, e.g.*, *id.* ss 88–97 (setting forth entitlements and limitations on basin state water use).

151. AUSTRALIAN GOV'T, DEP'T OF THE ENV'T, *Progress of water recovery under the Restoring the Balance in the Murray-Darling Basin program*, http://www.environment.gov.au/water/rural-water/restoring-balance-murray-darling-basin/progress-water-recovery (last visited Feb. 28, 2016).

152. COMMONWEALTH SCI. AND IND. RES. ORG. [CSIRO], *Assessment of the Ecological and Economic Benefits of Environmental Water in the Murray–Darling Basin: The Final Report to the Murray–Darling Basin Authority from the CSIRO Multiple Benefits of the Basin Plan Project* (Mar. 28, 2012), https://www.acfonline.org.au/sites/default/files/resources/MDBA-Assessment_Ecological_Economic_Benefits.pdf.

able outcome cooperation and the specific benefits it affords requires a more robust legal framework.

International water law provides a three-pronged framework for such cooperation: (1) the core principle of equitable and reasonable use prohibits any one basin state from monopolizing the supply of a river, lake, or aquifer; (2) riparian states undertaking water use activities must adhere to specific duties to cooperate with other impacted states; and (3) where a binding basin use and management agreement exists, there also exists an emerging customary duty for those basin nations to cooperate to achieve the objectives of the agreement. Despite the many examples of incomplete or failed efforts to cooperate, many cooperative efforts have successfully produced immediate benefits, solidified promises to cooperate in the future, or established frameworks to adapt to changing environmental conditions. These examples of successful outcome cooperation serve as model precedents for the further evolution of international water law.