"Economy of Use" in the 1997 UN Convention on Shared Watercourses: An Attempt at Elucidation

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ABSTRACT

Article 6(5) of the 1997 United Nations ("UN") Convention on the Non-Navigable Uses of International Watercourses lists "economy of use" as one of the factors to determine the reasonable and equitable use of the waters of shared international watercourses. But, as used in the Convention, the phrase is ambiguous, and a more precise definition is desirable. The treaty and academic commentary suggest that the meaning of the obligation of "economy of use" is restricted to avoiding unnecessary wastage and achieving the best possible efficiency standards subject to resource constraints. This understanding is more precise but still less onerous than might be desired in the context of an impending water crisis. Support for a more onerous and more precise obligation is sought from an exhaustive survey of state practice, including 471 international instruments ranging from the mid-nineteenth century to the present. These instruments fail to support a more precise or onerous obligation. They do, however, permit the determination of a five-point spectrum of efficiency-related obligations, of which proscription against negligence (the current understanding) is only the least onerous, and the most onerous is use of efficiency as an allocative criterion (unused in state practice). The intervening points on the spectrum are cooperation towards specific efficiency goals, unilateral efficiency requirements, and open-ended cooperation (all finding varying degrees of acceptance in state practice). The reluctance of states to embrace and delineate precise efficiency-related obligations is a function of political reluctance more than practical difficulty, but this reluctance is bound to be revised in the very near future in the face of acute water shortages.

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Table of Contents

I. INTRODUCTION

It is commonly accepted today that the global community is headed for an international water crisis of gargantuan proportions. Though seventy percent of the surface of the Earth is covered in water, approximately ninety-seven percent of that is contained in the oceans and is unsuitable for consumptive uses such as drinking and sanitation.[1] Of the three percent of the Earth's surface that is covered in freshwater, a large portion is trapped in polar ice caps.[2] It is estimated that less than 0.5 percent of the seventy percent of the Earth's surface that is covered with water is suitable for human consumptive uses,[3] and of that miniscule amount, irrigation uses account for seventy percent.[4] Thus, there never was very much freshwater on the Earth to begin with.

In addition to the scarcity of freshwater resources, there has been an exponential increase in demand, primarily as a result of exponential increases in the world's population. The fixed and limited nature of the supply of freshwater resources, the increasing nature of the demand, and the critical importance of freshwater for human survival have all combined to create a global water crisis. As countries and communities find themselves in competition for essential resources which were earlier freely available, tensions and hostilities have increased. Academic and political discourse are littered with reference to the possibility of water wars,[5] safeguarding water supplies has become a national security priority,[6] and academic commentaries frequently begin with references to hoary adages[7] and Coleridge-ian verse.[8] In this context of potential crisis,

1. USGS, *How Much Water is There on, in, and Above the Earth?*, http://ga.water.usgs.gov/edu/earthhowmuch.html (last updated Aug. 14, 2013); WORLD BUS. COUNCIL FOR SUSTAINABLE DEV., WATER—FACTS AND TRENDS (2006), *available at* http://www.unwater.org/downloads/Water_facts_and_trends.pdf [hereinafter WBCSD].

2. USGS, *supra* note 1; WBCSD, *supra* note 1, at 1.

3. WBCSD, *supra* note 1, at 1.

4. WBCSD, *supra* note 1, at 3.

5. *See, e.g.*, MARQ DE VILLIERS, WATER WARS: IS THE WORLD'S WATER RUNNING OUT 3 (1999). De Villiers provides an overview of the global water crisis and specifically examines impending water crises in several areas including the Middle East, the Nile River basin, the Tigris-Euphrates system, and the Indian sub-continent.

6. *See, e.g.*, John C. Cruden, *Environmental Law and National Security*, *in* NATIONAL SECURITY LAW 1297, 1305 (John Norton Moore & Robert F. Turner eds., 2005).

7. *See, e.g.*, H.L.F. Saeijs & M. J. van Berkel, *The Global Water Crisis: the Major Issue of the Twenty-first Century, a Growing and Explosive Problem*, *in* THE SCARCITY OF WATER-EMERGING LEGAL AND POLICY RESPONSES 1 (Edward H.P. Brans et al. eds., 1997) (quoting Mohandas Karamchand Gandhi to say, "[T]here is enough for everyone's need; there is never enough for everyone's greed;"); Esther J. de Haan, *Balancing Free*

the international law of shared water resources takes on tremendous importance. A clear and predictable set of rules enforceable by international law will help prevent conflict by resolving disputes over rights to shared water resources and, more importantly, deter states from engaging in races to exploit and deplete shared resources.

The international law regime for the sharing of international watercourses is encapsulated in the 1997 UN Convention on the Law of International Watercourses.[9] The treaty is not currently in force.[10] However, during the vote in the General Assembly it was passed by a majority of more than 100, and only three states voted against it.[11] More importantly, the treaty has been widely accepted as codifying customary international law.[12] The treaty was developed through the efforts of the International Law Commission ("ILC"), at the request of the UN General Assembly, under the supervision of a series of five Special Rapporteurs,[13] and the stated purpose of those Rapporteurs was to codify the legal position with regard to *lex lata*.[14] This is especially true of

Trade in Water and the Protection of Water Resources in GATT, *in* THE SCARCITY OF WATER-EMERGING LEGAL AND POLICY RESPONSES 245, 245 (Edward H.P. Brans et al. eds., 1997) (quoting I. Sarageldin, Environment Vice-President of the World Bank, in saying, "[T]he saving grace for future wars over water would be if the universal natural resource water were to assume its proper place as an economically valued and traded community.").

8. *See, e.g.*, SAMUEL TAYLOR COLERIDGE, THE RIME OF THE ANCIENT MARINER 30, (1798) (frequently employs the phrase "water, water everywhere", and has thus proved particularly apt for use in this context.).

9. G.A. Res. 51/229, art. 1(1), U.N. GAOR, 51st Sess., Supp. No. 49, U.N. Doc. A/51/49 (annex), (May 21, 1997) [hereinafter 1997 UN Convention].

10. There are currently 31 states party to the treaty. Article 36(1) of the convention requires 35 states to ratify the treaty before it enters into force. *See Convention on the Law of the Non-Navigational Uses of International Watercourses*, TREATIES.UN.ORG, http://treaties.un.org/Pages/ViewDetails.aspx?src=UNTSONLINE&tabid=2&mtdsg_no=XXVII-12&chapter=27&lang=en#Participants (last updated Oct. 18, 2013).

11. Salman M.A. Salman, *The United Nations Watercourse Convention Ten Years Later: Why has its Entry into Force Proven Difficult?*, 32 WATER INT'L 1, 8 (March 2007), *available at* http://www.internationalwaterlaw.org/bibliography/articles/general/Salman-UNWatercoursesConventionTenYears.pdf.

12. *See, e.g.*, The Gabcikovo-Nagymaros Project (Hung. v. Slovak.), 1997 I.C.J. 7, ¶ 147 (Sept. 25); ATTILA TANZI & MAURIZIO ARCARI, THE UNITED NATIONS CONVENTION ON THE LAW OF INTERNATIONAL WATERCOURSES 2 (2001).

13. For a detailed analytical guide to the work of the ILC, *see Analytical Guide to the Work of the International Law Commission*, INT'L L. COMM'N (Aug. 21, 2013), http://legal.un.org/ilc/guide/gfra.htm.

14. Special Rapporteur on the Law of Non-Navigational Uses of International Watercourses, *First Rep. on the Law of the Non-Navigational Uses of International Watercourses*, ¶ 20, U.N. Doc. A/CN.4/295 (May 7, 1976) (by Richard D. Kearney),

Articles 5–7 (as numbered in the final convention) which were developed principally by the second and fifth Rapporteurs, Stephen M. Schwebel and Stephen C. McCaffrey, both of whom based their draft texts on exhaustive reviews of state practice.[15]

Article 5(1) of the final convention lays down a general obligation for states to "utilize an international watercourse in a reasonable and equitable manner."[16] Thus, the main legal rule governing the sharing of the waters of international rivers is that of reasonable and equitable utilization. Clearly, this falls short of the precision that might be desired from a legal instrument being relied on to avert the crisis scenario of water wars. This problem was recognized by Schwebel in his Third Report.[17] Notwithstanding the obvious and recognized shortcomings of this position, the rule has been deliberately left in this state for two reasons. The first is a concession to the obvious diversity of river basins across the world and the impossibility of creating universal rules,[18] and

reprinted in [1976] 2 Y.B. Int'l L. Comm'n 184, U.N. Doc. A/CN.4/SER.A/1976/Add.l(Part 1) [hereinafter Kearney *1st Report*].

15. Special Rapporteur on the Law of Non-Navigational Uses of International Watercourses, *Third Rep. on the Law of Non-Navigational Uses of International Watercourses*, ¶¶ 85–91, 106–10, U.N. Doc. A/CN.4/348 (Dec. 11, 1981) (by Stephen M. Schwebel), *reprinted in* [1982] 2 Y.B. Int'l L. Comm'n pt. 1, 65, U.N. Doc. A/CN.4/SER.A/1982/Add.1(Part 1) [hereinafter Schwebel *3rd Report*]; Special Rapporteur on the Law of Non-Navigational Uses of International Watercourses, *Second Rep. on the Non-Navigational Uses of International Watercourses*, ¶ 75, U.N. Doc. A/CN.4/399 (Mar. 30, 1987) (by Stephen C. McCaffrey), *reprinted in* [1986] 2 Y.B. Int'l L. Comm'n pt. 1, 87, U.N. Doc. A/CN.4/SER.A/1986/Add.l(Part 1) [hereinafter McCaffrey *2nd Report*].

16. 1997 UN Convention, *supra* note 9, art. 5, provides as follows:

Equitable and reasonable utilization and participation

> 1. Watercourse States shall in their respective territories utilize an international watercourse in an equitable and reasonable manner. In particular, an international watercourse shall be used and developed by watercourse States with a view to attaining optimal and sustainable utilization thereof and benefits therefrom, taking into account the interests of the watercourse States concerned, consistent with adequate protection of the watercourse.
>
> 2. Watercourse States shall participate in the use, development and protection of an international watercourse in an equitable and reasonable manner. Such participation includes both the right to utilize the watercourse and the duty to cooperate in the protection and development thereof, as provided in the present Convention.

17. Special Rapporteur on the Law of the Non-Navigational Uses of International Watercourses, *First Rep. on the Law of the Non-Navigational Uses of International Watercourses*, ¶¶ 81–83, U.N. Doc. A/CN.4/320 (May 21, 1979) (by Stephen Schwebel), *reprinted in* [1979] 2 Y.B. Int'l L. Comm'n pt. 1, 143, U.N. Doc. A/CN.4/SER.A/1979/Add.1(Part 1) [hereinafter Schwebel *1st Report*].

18. McCaffrey *2nd Report*, supra note 15, ¶¶ 175–78.

the second stems from a desire to provide for flexibility in the application of this rule in light of the factual context.[19] The fact that the Convention was intended to serve as a framework under the umbrella of which specific conventions and agreements could be negotiated[20] has also played a role in the open-ended nature of this formulation.

With a view to providing some clarity on the application of this principle, the convention lists, in Article 6, a set of factors on the basis of which reasonableness and equity of particular uses may be assessed.[21] The list of factors is explicitly inclusive, not exclusive, and has no internal order of priority.[22] Even with the combined effect of Articles 5

19. *Id.*; Edith Brown Weiss, *The Evolution of International Water Law*, in 331 RECUEIL DES COURS: COLLECTED COURSES OF THE HAUGE ACADEMY OF INTERNATIONAL LAW 162, 167, 199 (2009).

20. Special Rapporteur on the Non-Navigational Uses of International Watercourses, *First Rep. on the Law of the Non-Navigational Uses of International Watercourses*, ¶¶ 13, 24, U.N. Doc. A/CN.4/367 (April 19, 1983) (by Jens Evensen), *reprinted in* [1983] 2 Y.B. Int'l L. Comm'n pt. 1 155, U.N. Doc. A/CN.4/SER.A/1983/Add.1(Part 1) [hereinafter Evensen *1st Report*].

21. 1997 UN Convention, *supra* note 9, art. 6, provides as follows:

Factors relevant to equitable and reasonable utilization

> 1. Utilization of an international watercourse in an equitable and reasonable manner within the meaning of article 5 requires taking into account all relevant factors and circumstances, including:
>
> (a) Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character;
>
> (b) The social and economic needs of the watercourse States concerned;
>
> (c) The population dependent on the watercourse in each watercourse State;
>
> (d) The effects of the use or uses of the watercourses in one watercourse State on other watercourse States;
>
> (e) Existing and potential uses of the watercourse;
>
> (f) Conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect;
>
> (g) The availability of alternatives, of comparable value, to a particular planned or existing use.
>
> 2. In the application of article 5 or paragraph 1 of this article, watercourse States concerned shall, when the need arises, enter into consultations in a spirit of cooperation.
>
> 3. The weight to be given to each factor is to be determined by its importance in comparison with that of other relevant factors. In determining what is a reasonable and equitable use, all relevant factors are to be considered together and a conclusion reached on the basis of the whole.

22. Rep. of the Int'l Law Comm'n, 38th Sess., May 5–July 11, 1986, ¶¶ 238–39, U.N. Doc. A/41/10; GAOR, 41st Sess., Supp. No. 10 (1986), *reprinted in* [1986] 2 Y.B. Int'l L. Comm'n pt. 2, U.N. Doc. A/CN.4/SER.A/1986/Add.1(Part2) [hereinafter ILC

and 6, the legal position under the 1997 Convention remains distressingly ambiguous.

The 1997 Convention envisages the use of that instrument as an umbrella under which basin or river-specific agreements will be negotiated, but that aspiration is far from becoming a reality. The flexible nature of this formulation requires a strong supporting under-structure of procedural rules;[23] in fact, the good faith commitments of riparian states to procedural obligations that include negotiation, data sharing, dispute settlement, etc., have been recognized as critical to the functioning of this regime.[24] However, this expectation of ex ante collaborative negotiation of riparian rights is misplaced. Negotiations over riparian rights are usually conducted in the context of disagreements over water rights in increasingly politically charged and hostile environments. Expectations of calm, rational discourse among conflicting states, agreements between states to refer their disputes to third party adjudication or mediation, or successful efforts to negotiate agreements based on compromises are unrealistic in this situation. This is particularly worrisome because the uniquely ambiguous nature of the legal propositions contained in Articles 5 and 6 makes them especially amenable to invocation on both sides of an argument.[25] The net result then is a situation involving two sides convinced of the validity of their rights, feuding over a scarce and essential resource, in an arena with almost no binding rules. The spark to this powder keg is supplied by domestic political considerations, which force governments to adopt hard-line stances immune to compromise or diplomacy. Thus, notwithstanding the excellent arguments in favor of the flexible, open structure of Articles 5 and 6, it is submitted that there is

38th Session Report]; Rep. of the Int'l Law Comm'n, 45th Sess., May 3–July 23, 1993, ¶ 409, U.N. Doc. A/48/10; GAOR, 48th Sess., Supp. No. 10 (1993), *reprinted in* [1993] 2 Y.B. Int'l L. Comm'n pt. 2, U.N. Doc. A/CN.4/SER.A/1993/Add.1(Part2) [hereinafter ILC 45th Session Report]; Rep. of the Int'l Law Comm'n, 46th Sess., May 2–July 22, 1994, at 101, ¶¶ 3–4, U.N. Doc. A/49/10; GAOR, 46th Sess., Supp. No. 10 (1994), *reprinted in* [1994] 2 Y.B. Int'l L. Comm'n pt. 2, U.N. Doc. A/CN.4/SER.A/1994/Add.1(Part2) [hereinafter ILC 46th Session Report].

23. Special Rapporteur on the Non-Navigational Uses of International Watercourses, *Third Rep. on the Non-Navigational Uses of International Watercourses*, ¶ 35, U.N. Doc. A/CN.4/406 (March 30, 1987) (by Stephen C. McCaffrey), *reprinted in* [1987] 2 Y.B. Int'l L. Comm'n pt. 1, 15, U.N. Doc A/CN.4/SER.A/1987/Add.1(Part1) [hereinafter McCaffrey *3rd Report*].

24. IBRAHIM KAYA, EQUITABLE UTILIZATION—THE LAW OF THE NON-NAVIGATIONAL USES OF INTERNATIONAL WATERCOURSES 12–22 (2002).

25. *See, e.g.*, Schwebel *1st Report*, *supra* note 17, ¶ 83 (Rapporteur Schwebel referred to the arguments put forward by India and Bangladesh in their then ongoing dispute over the waters of the Hooghly River and pointed out that both states successfully and convincingly relied on the "reasonable and equitable use" requirement).

merit in attempting to introduce a greater measure of clarity and precision into the Convention's rules for determining whether a particular use is "reasonable and equitable."

While creating a more precise definition of "reasonable and equitable use" is a Herculean task, this Article takes on the more feasible challenge of defining "economy of use," which is one of the factors mentioned in Article 6(1)(f) of the Convention. Part II of this Article explains why "economy of use" has been singled out from amongst the many potential candidates available in Article 6. Part III undertakes a review of various sources including drafting history, contemporaneous practice, related provisions, and academic literature to form a preliminary understanding of the meaning of "economy of use." This preliminary understanding is tested for accuracy against an extensive review of over 450 instances of state practice in Part IV. Part V articulates a suggested cohesive interpretation of the obligation of "economy of use." The last section concludes the discussion by defining an agenda for the future.

Throughout this Article, the phrase "economy of use" (the formal language finally employed in Article 6(f) of the 1997 Convention) is used interchangeably with "efficiency of use" because, as will be demonstrated, this is what was contemplated by reference to "economy of use" and how the obligation of "economy of use" should be interpreted.[26]

II. THE PROMISE OF ECONOMY OF USE

Globally, fears regarding the impending water crises have been translated into consensus regarding the importance of efficient use and prevention of waste of water resources. This has been a hallmark, especially of the UN response to this situation.[27] This response resonates

26. *See infra* notes 52–55 and accompanying text.

27. *See, e.g.*, U.N. WATER, *Water in a Green Economy: a Statement by UN-Water for the UN Conference on Sustainable Development 2012*, http://www.unwater.org/downloads/UNW_RIOSTATEMENT.pdf (last visited Oct. 15, 2013); UN-WATER AND GLOBAL WATER PARTNERSHIP, *Roadmapping for Advancing Integrated Water Resources Management (IWRM) Processes*, http://www.unwater.org/downloads/UNW_ROADMAPPING_IWRM.pdf (last visited Oct. 15, 2013); UN-WATER, *Status Report on Integrated Water Resources Management and Water Efficiency Plans*, http://www.unwater.org/downloads/UNW_Status_Report_IWRM.pdf (last visited Oct. 15, 2013); UN-WATER, *Transboundary Waters: Sharing Benefits, Sharing Responsibilities*, http://www.unwater.org/downloads/UNW_TRANSBOUNDARY.pdf (last visited Oct. 15, 2013); UNESCO, MANAGING WATER UNDER UNCERTAINTY AND RISK, 1 U.N. World Water Rep. (4th ed. 2012), *available at* http://unesdoc.unesco.org/

with instinctive logic. When confronted with a situation of imminent shortage, the first human response is to reduce demand and to hoard supply, and it is these primal instincts that are reflected in the consensus around the importance of water conservation efforts. Over and above this, however, this Article suggests that there are three reasons for focusing on "economy of use": exceptional lack of clarity of the term, the possibility of immediate results, and the magnitude of the possible results.

A. Exceptional Lack of Clarity

"Avoidance of unnecessary waste of water" as an illustration of reasonable and equitable use was used in various instruments being discussed and debated by the international law community in the 1960s and 1970s.[28] Schwebel's Third Report refers to this pre-existing practice in adopting "efficiency of use" as a criterion for reasonable and equitable use, but that Report does not discuss the substantive meaning of the requirement.[29] Similarly, McCaffrey's Second Report, which is the only other report to discuss the question of equitable and reasonable use in any detail, does not discuss any of the factors because, at that stage of the ILC's deliberations, consensus favored omission of the list of factors from the draft.[30]

While this repeated reference to the "economy of use" principle is welcome proof of its importance, it does have the effect of denying future lawyers an insight into what that obligation could entail. As compared to the other principles, it has received much less discussion and thus is a prime candidate for greater elucidation.

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images/0021/002156/215644e.pdf; UNITED NATIONS ENV'T PROGRAMME, *Water and Wastewater Reuse—An Environmentally Sound Approach for Sustainable Urban Water Management*, http://www.unep.or.jp/Ietc/Publications/Water_Sanitation/wastewater_reuse/index.asp (last visited Oct. 15, 2013).

28. *See, e.g.*, U.N. Secretary-General, *Legal Problems Relating to the Non-Navigational Uses of International Watercourses: Supp. Rep. by the Secretary-General*, ¶¶ 367, 404, U.N. Doc. A/CN.4/274 (Mar. 25, 1974), reprinted in [1974] 2 Y.B. Int'l L. Comm'n pt. 2 265, U.N. Doc. A/CN.4/SER.4/1974/Add.1(Part 2) [hereinafter UNSG *Supplementary Report*] (referring to Principles II and III of "Asian-African Legal Consultative Committee—Draft propositions on the law of international rivers, formulated in 1973 by a Sub-Committee" [hereinafter AALCC Propositions], and Articles IV and V of "The Helsinki Rules on the Uses of the Waters of International Rivers, adopted by the International Law Association at its Fifty-Second Conference Held at Helsinki in 1966,"[hereinafter Helsinki Rules] use of the phrase "avoidance of unnecessary waste in the utilization of waters.").

29. Schwebel *3rd Report*, *supra* note 15, ¶¶ 91–110.

30. McCaffrey *2nd Report*, *supra* note 15, ¶ 178.

B. Immediacy of Results

Article 6 has seven clauses, and each sets out a list of seven factors and circumstances to be accounted for in order to utilize "an international watercourse in an equitable and reasonable manner."[31] As mentioned earlier, this is not an exclusive list. However, with the exception of the factors mentioned in Clause (f), "conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect", all the other factors are matters for factual assessment rather than agendas for action. The other factors include the natural characteristics of the river basin,[32] the socio-economic needs of the states involved,[33] the population dependent on the waters of the river(s),[34] the effects of one state's use(s) on the other state(s),[35] the existing and potential uses,[36] and the availability of alternatives.[37] Thus, by and large, the remaining factors are merely possible grounds on which an allocative decision may be based. In contrast, the factors in Article 6(1)(f) represent a possible way to enhance and augment the available resources to accommodate future uses. Moreover, within Article 6(1)(f), with the exception of "economy of use," all the other factors involve long-term actions and gestation periods. Conservation, protection, and development will not yield results in the near term, whereas efforts to maximize the efficiency of water usage will immediately manifest itself in a reduced demand or need for water. Thus, the immediacy of possible action and consequent results are major reasons for focusing on "economy of use" to the exclusion of other factors.

C. Magnitude of Result

A surprisingly large amount of current and potential conflict over water resources can be avoided simply by implementing more efficient methods for the use of water. For instance, in the Nile River Basin, flaws in the design of the Aswan High Dam mean that seventy cubic kilometers ("km^3") of water have to be kept in the dam's reservoir just to keep it operational,[38] and that twelve to thirteen km^3 of water per year is

31. 1997 UN Convention, *supra* note 9, art. 6(1).

32. *Id.* art. 6(1).

33. *Id.* art. 6(1)(b).

34. *Id.* art. 6(1)(c).

35. *Id.* art. 6(1)(d).

36. *Id.* art. 6(1)(e).

37. *Id.* art. 6(g).

38. JACK KALPAKIAN, IDENTITY, CONFLICT AND COOPERATION IN INTERNATIONAL RIVER SYSTEMS 32 (2004).

lost due to evaporation from the surface of the reservoir.[39] These figures are particularly horrifying when considering that rising and competing Ethiopian claims to the waters of the Nile are potentially a source of conflict[40] and that the most ambitious Ethiopian projects will require only a maximum of six km^3 of water per year.[41] Thus, more than double the most ambitious of Ethiopia's requirements could be fulfilled by eliminating unnecessary wastage from the reservoir of the Aswan Dam.

Similarly, twenty to fifty percent of the water used for irrigation purposes in Egypt is wasted due to leakages from old and low quality irrigation pipes.[42] The Sudanese Jebel Aulia Reservoir, reserved for Egyptian use, has a total capacity of 5.5 km^3, but an evaporation rate of 2.8 km^3 per year.[43] The reduced flow and velocity of the waters of the Nile as a result of the Aswan High Dam have led to severe siltage problems leading to reduced storage capacity in Sudanese dams (by two thirds in some cases) and reduced efficiency of Sudanese irrigation networks.[44]

These problems are present not just in the Nile River Basin. Water problems in most countries stem from inefficient and unsustainable uses of water.[45] Gypsum deposits in the Syrian portion of the Euphrates are damaging canals and preventing efficient irrigation in Syria.[46] India's Indira Gandhi Canal, which provides irrigation waters to Rajasthan, has

39. *Id.* at 32–33, Table 3.1.

40. As recently as October 2012, Egypt announced that it was prepared to bomb Ethiopian dams unless the Ethiopian government discontinued its plans to use the waters of the Nile. *See, e.g.*, Abel Abate, *Is Egypt about to bomb Ethiopian dams?* AFRICA REVIEW (Oct. 25, 2012, 02:01 PM), http://www.africareview.com/Opinion/Is-Egypt-about-to-bomb-Ethiopian-dams/-/979188/1597926/-/vnmdvoz/-/index.html); Joel Gulhane, *Egypt denies Plans to strike Ethiopian Dams*, DAILY NEWS EGYPT (Sep. 25, 2012), http://dailynewsegypt.com/2012/09/25/egypt-denies-plans-to-strike-ethiopian-dam-2/; Michael Kelley and Robert Johnson, *STRATFOR: Egypt Is Prepared To Bomb All Of Ethiopia's Nile Dams*, BUS. INSIDER (Oct. 13, 2012, 11:34 AM), http://www.businessinsider.com/hacked-stratfor-emails-egypt-could-take-military-action-to-protect-its-stake-in-the-nile-2012-10.

41. KALPAKIAN, *supra* note 38, at 7.

42. *Id.* at 32.

43. *Id.* at 36 (citing Dale Whittington & Elizabeth McClelland, *Opportunities for Regional and International Cooperation in the Nile Basin*, 17 WATER INT'L 146, 150 (1992). This figure is extremely dated, but provides an indicative example of the nature of gains that can be achieved through increasingly efficient uses of water.

44. *Id.* at 37.

45. HILAL ELVER, PEACEFUL USES OF INTERNATIONAL RIVERS: THE EUPHRATES AND TIGRIS RIVERS DISPUTE 62 (2002).

46. KALPAKIAN, *supra* note 38, at 107.

been criticized on the basis of its inefficiency.[47] Heavy siltation above the Mangla Dam in Pakistan causes its power generation capacity to vary between 300 Megawatts ("MW") and 1000 MW.[48] Jordan loses twenty-five percent of its water from its irrigation networks and fifty-five percent of the water in its municipal networks due to faulty piping.[49] The Palestinian population in the West Bank loses about half the water diverted for irrigation due to poor piping.[50]

Thus, significant gains are possible through improved efficiency and more economic uses of water. The magnitude of these potential gains justifies prioritization of "economy of use" amongst the other factors contained in Article 6. However, glib recitation of these statistics should not be construed as an indication that these problems relating to inefficient use of water can be easily cured or that such wastage could be easily prevented. There are, in many cases, significant political, technological, or economic barriers to achieving improved efficiency.[51]

III. FORMULATING AN INITIAL UNDERSTANDING OF "ECONOMY OF USE"

The sources reviewed in this Part may be divided into four subparts. Subpart A examines the meaning of "economy of use" as intended by the framers of the 1997 Convention and its various drafts. Subpart B examines contemporaneous understandings of "economy of use" at the time this language was introduced into the treaty. Subpart C examines contextual meanings for "economy of use," i.e., meanings derived from similar and related provisions in the 1997 Convention. Subpart D examines academic literature for suggested interpretations. Subpart E summarizes and concludes this Part.

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47. *Id.* at 157.

48. *Id.* at 154.

49. Jonathan M. Wenig, *Water and Peace: The Past, the Present, and the Future of the Jordan River Watercourse: an International Law Analysis*, 27 N.Y.U. J. INT'L L. & POL. 331, 358 (1995).

50. *Id.* at 359.

51. For instance, modification or replacement of the Aswan High Dam is a very expensive affair. Though Egypt's water needs could be far more efficiently met (with exponentially lower evapotranspiration losses) by using a reservoir built in one of the upstream countries on the Nile, Egypt has consistently rejected any such suggestions based on national security concerns. *See, e.g.*, KALPAKIAN, *supra* note 38, at 34–35. Pakistan displays similar fears with regard to proposed Indian constructions on the shared Indus river system. *See, e.g.*, Ramswamy R. Iyer, *Briscoe on the Indus Treaty: A Response*, 46 ECON. & POL'Y. WKLY. 6869 (2011).

A. Intended Meaning

As discussed earlier, the texts of Articles 5 and 6 of the 1997 Convention were inspired by drafts proposed by the International Law Association at its Helsinki conference and the proposed principles of the Asian-African Legal Consultative Committee ("AALCC").[52] Further, the Helsinki Rules and the AALCC Principles use the phrase "avoidance of unnecessary waste in the utilization of waters of the basin," while Schwebel's Third Report uses the phrase "efficiency of use" and the 1997 Convention employs the phrase "economy of use."[53] Do all of these phrases refer to the same obligation? Debates on the various drafts of the ILC articles clarify that "economy of use refers to the avoidance of unnecessary waste of water."[54] Further, the commentary to Article 6(1)(f) of the final ILC draft articles, the text of which was adopted without change by the General Assembly as Article 6(1)(f) of the 1997 Convention, provides that " 'economy of use' refers to avoidance of unnecessary waste of water."[55] It is thus clear that the obligation in the 1997 Convention is intended to be identical to that in the Helsinki Rules; further, given Schwebel's express intent to codify *lex lata*, it is submitted that these obligations are also identical to Schwebel's "efficiency of use." Simply by reviewing alternative formulations of identical obligations it is possible to infer that the final "economy of use" obligation carries connotations of avoiding unnecessary waste and encouraging efficient use.

The commentary to the Helsinki Rules elaborates:

> A 'beneficial use' need not . . . utilize the most efficient methods known in order to avoid waste and insure maximum utilization . . . [W]hile a patently imperfect solution, [this] reflects the financial limitations of many states; in its application, the present rule is not designed to foster waste but to hold states to a duty of efficiency which is commensurate with their financial resources. Of course, the ability of a state to obtain international finances will be considered in this context.[56]

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52. *See supra* note 28 and accompanying text.

53. Schwebel *3rd Report*, *supra* note 15, ¶¶ 91–110.

54. ILC 46th Session Report, *supra* note 22, at 101, ¶ 4; Rep. of the Int'l Law Comm'n, 39th Sess., May 4–July 17, 1987, at 36, ¶ 4, U.N. Doc. A/42/10; GAOR, 42nd Sess., Supp. No. 10 (1987), *reprinted in* [1987] 2 Y.B. Int'l L. Comm'n pt. 2, U.N. Doc. A/CN.4/SER.A/1987/Add.1(Part 2) [hereinafter ILC 39th Session Report].

55. ILC 46th Session Report, *supra* note 22, at 101, ¶ 4.

56. Cecil J. Olmstead, *The Helsinki Rules on the Uses of the Waters of International Rivers (1966)*, *in* INTERNATIONAL LAW OF WATER RESOURCES: CONTRIBUTION OF THE

The introduction of availability of resources as a constraint on the requirement of efficiency yields a weaker obligation than might be desired. The genesis of this weaker version has its roots in the reluctance of states to have their rights to international waters be made contingent on efficiency of use and, more particularly, to alleviate states' fears that preferential rights over international watercourses would be awarded to states with the means to employ more efficient and more expensive usage technologies.[57] Thus, as drafted, Article 6(1)(f) was intended to prevent unnecessary waste of water, subject to resource constraints.

B. Contemporaneous Understanding

For an understanding of the specific obligations sought to be created by this formulation, it may be useful to review contemporaneous technical and policy understandings of methods for enhancing efficiency in water usage. An understanding of what was technically feasible in the field of efficient use of water can shed light on what might reasonably have been contemplated by the framers of the 1997 Convention and the preceding draft articles.[58] A survey of legal, policy, and technical analyses of water efficiency measures and techniques over the last three decades of the twentieth century indicates the recognition of a vast array of conservation measures and initiatives. These can be divided into four broad themes.

The first is increased efficiency of irrigational uses of water, which was and continues to be a major source of water wastage.[59] Such an increase in efficient usage of irrigation was recognized as being

INTERNATIONAL LAW ASSOCIATION (1954–2000) 89, 102–03 (Slavko Bogdanović ed., 2001).

57. TANZI & ARCARI, *supra* note 12, at 134 ("This could suggest that the diligence employed by a watercourse state in maintaining an efficient and non water-wasting exploitation of an international watercourse, or its prospective capacity to do so, in relation to a given use is a relevant factor for determining the equitable character of this use. Yet, in line with the concept of optimal utilization discussed above, efficiency in water management per se does not give rise to a preferential title in the use of water.").

58. Customary international law rules on the interpretation of treaties recognize "any subsequent practice in the application of the treaty which establishes the agreement of the parties regarding its interpretation" as a factor to be considered in the interpretation of treaties. Vienna Convention on the Law of Treaties art. 31(3)(b), May 23, 1969, 1155 U.N.T.S. 331 [hereinafter VCLT]. The interpretive rules specified therein have been recognized as a codification of customary international law. *See, e.g.*, Maritime Delimitation and Territorial Questions (Qat. v. Bah.), 1995 I.C.J. 18, ¶ 33 (Feb. 15); Territorial Dispute (Libyan Arab Jamahiriya/Chad), 1994 I.C.J. 21 (Feb. 3); SIR IAN M. SINCLAIR, THE VIENNA CONVENTION ON THE LAW OF TREATIES 153 (1982).

59. *See supra* notes 42, 46, 47, 49, 50 and accompanying text.

achievable through: irrigational scheduling techniques to meet crop-water needs more precisely;[60] increased use of precipitation;[61] installation of gated pipes and drip irrigation;[62] use of laser leveling, crop mixtures, and patterns in fields;[63] limitation of evaporation and seepage by lining and covering ditches;[64] reduction of wastage in the form of non-productive use of water by weeds, deep percolation, and tail-water runoff;[65] increased conveyance efficiency by linking canals and making turnout structures watertight;[66] punishment for wastage in the form of practices like low consumptive use of irrigation water or field wetting;[67] and through sprinkler irrigation or furrow irrigation in conjunction with tail-water recovery systems, gated pipes, etc.[68]

The second theme is a broader critique of and reaction to appropriative water rights doctrines such as "use it or lose it" based appropriation doctrines. These doctrines have been criticized for contributing to wastage of water by disincentivizing water conservation efforts.[69] Responses to these doctrines have included limiting rights to water to fixed quantities,[70] legally recognizing the "public good" nature of water resources,[71] and instituting a system of permits for water use.[72]

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60. *See, e.g.*, J. David Aiken, *The National Water Policy Review and Western Water Rights Law Reform: An Overview*, 59 NEB. L. REV. 327, 330 (1980).

61. *See id.*

62. *See, e.g.*, David H. Getches, *Water Use Efficiency: The Value of Water in the West*, 8 PUB. LAND L. REV. 1, 13 (1987).

63. *See, e.g.*, Michael A. Gheleta, *Water Use Efficiency and Appropriation in Colorado: Salvaging Incentives for Maximum Beneficial Use*, 58 U. COLO. L. REV. 657, 658 (1986).

64. *Id.*

65. *See, e.g.*, Blaine E. Rawson, *Agricultural Water Conservation in Utah: More than Just a Drop in the Bucket*, 14 J. ENERGY, NAT. RESOURCES & ENVTL. L. 437, 438 (1994).

66. *See id.*

67. *See, e.g.*, Karen A. Russel, *Wasting Water in the Northwest: Eliminating Waste as a Way of Restoring Streamflows*, 27 ENVTL. L. 151, 157 (1997).

68. *See, e.g.*, Steven J. Shupe, *Waste in Western Water Law: A Blueprint for Change*, 61 OR. L. REV. 483, 503 (1982).

69. *See, e.g.*, Krista Koehl, *Partial Forfeiture of Water Rights: Oregon compromises Traditional Principles to Achieve Flexibility*, 28 ENVTL. L. 1137 (1998); Janet C. Neuman, *Beneficial Use, Waste, and Forfeiture: The Inefficient Search for Efficiency in Western Water Use*, 28 ENVTL. L. 919 (1998).

70. *See, e.g.*, Aiken, *supra* note 60, at 331.

71. *See, e.g.*, Getches, *supra* note 62, at 29.

72. *See, e.g.*, James O. Reavis, *Virgina Water Rights: Two Rules for One Source*, 11 WM. & MARY J. ENVTL. L. & ENVTL, PRACTICE NEWS 9, 10 (1986).

The third is an understanding of water as an economic good.[73] This may involve rationalizing water prices,[74] or allowing free economic transferability of water thereby creating an incentive to conserve water.[75] Alternatively, inefficient uses of water may be de-prioritized, subject to reasonable efficiency requirements.[76]

The fourth theme is a proscription against wastage across all aspects of water use. At a general level these include: broad obligations of diligence in avoiding waste and formulation and implementation of conservation plans as prerequisites to granting of water use permits;[77] government financial assistance for water conservation programs;[78] and recognition of the amenability of water to be reused and recycled for a number of purposes.[79] With respect to water use for domestic purposes, such proscriptions include: the encouragement of more efficient domestic and municipal use of water through the use of low cost plumbing devices like toilet dams and shower head flow restrictors;[80] incentives for conservation,[81] leak detection, and repair;[82] and rate structuring in conjunction with peak use programs.[83] With respect to industrial uses of water, proscriptions include encouraging efficiency through wastewater-reduction programs.[84]

Thus, contemporary practice recognized the availability of a wide variety of methods to avoid unnecessary wastage of water. The absence

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73. *See, e.g.*, Richard S. Campbell, *Water Allocation in British Columbia: An Economic Assessment of Public Policy*, 7 U. BRIT. COLUM. L. REV. 247, 248–52 (1972).

74. *See, e.g.*, Getches, *supra* note 62, at 23.

75. *See, e.g.*, Julia C. Bliss & Samuel J. Imperati, *The Legal Aspects of Appropriative Water Transfers in California*, 11 U.C. DAVIS L. REV. 441 (1978); James N. Corbridge, Jr., *Historical Water Use and the Protection of Vested Rights: A Challenge for Colorado Water Law*, 69 U. COLO. L. REV. 503 (1998); Jennifer L. Cordua, *The Search for New Supplies: Salvaging the Remains of Agricultural Water Conservation in California*, 31 U.C. DAVIS L. REV. 591, 593 (1997); Richard J. Moen et al., *A Proposal for Regulating Water Use in Minnesota*, 7 HAMLINE L. REV. 207 (1984).

76. *See, e.g.*, Getches, *supra* note 62, at 27.

77. *See, e.g.*, Douglas G. Caroom & Marica Newlands Fero, *Water Law*, *Annual Survey of Texas Law—Part I: Private Law*, 41 SW. L.J. 365, 380 (1987–1988).

78. *See, e.g.*, *id.*

79. Caroom & Fero, *supra* note 77, at 380*;* Getches, *supra* note 62, at 12; *see, e.g.*, League of Women Voters of Minnesota, *Facts and Issues—Minnesota's Liquid Asset: Water Use and Policy Options*, 8 HAMLINE J. PUB. L. & POL'Y 447, 459 (1987) [hereinafter League].

80. *See, e.g.*, Getches, *supra* note 62, at 23.

81. *See id.* at 24.

82. *See, e.g.*, League, *supra* note 79, at 460.

83. *See id.* at 460.

84. *See id.* at 460–61.

of explicit references to specific methods, strategies, or obligations in the final ILC draft articles of the 1997 Convention may be interpreted as a decision to leave implementation decisions in the hands of individual states, presumably concluding that the use of specific methods would be influenced by conditions specific to the river basin in question. Nevertheless, the availability of this smorgasbord of efficient use options could be interpreted to indicate the "economy of use" obligation was not intended to be a general prescription but rather a nudge in the direction of this impressive array of options.

C. Contextual Insights

The customary rules of treaty interpretation also demand scrutiny of the context of the treaty provision for insights into potential meanings. Particularly relevant in this regard is Article 5, which refers to "optimal utilization" of international watercourses.[85] Prima facie, "optimal" seems to carry the same connotation as "efficient" or "economic," and understanding the interpretation of "optimal utilization" in Article 5(1) might facilitate the understanding of Article 6(1)(f) and "economy of use."

The idea of optimal utilization of international watercourses is not new to international agreements relating to international watercourses[86] and has been a part of the contents of Articles 5 and 6 since its introduction by Schwebel.[87] Commentators have suggested that the use of the word "optimal" in this provision indicates a requirement of "best use."[88] This naturally raised concerns among states as to the possibility of loss of rights to the waters of international watercourses because of financial or technical incapability to make the "best use."[89] In response to this concern, the deliberations in the ILC specifically provided that:

> [a]ttaining optimum utilization and benefits does not mean achieving the "maximum" use, the most technologically efficient use, or the

85. 1997 UN Convention, *supra* note 16.

86. TANZI & ARCARI, *supra* note 12, at 105–06.

87. Schwebel *3rd Report*, *supra* note 15, ¶ 86.

88. ANTOINETTE HILDERING, INTERNATIONAL LAW, SUSTAINABLE DEVELOPMENT AND WATER MANAGEMENT 52 (2004); DOUGLAS FISHER, THE LAW AND GOVERNANCE OF WATER RESOURCES–THE CHALLENGE OF SUSTAINABILITY 198–99 (2009); Marjon Kroes, *The Protection of International Watercourses as Sources of Fresh Water in the Interest of Future Generations*, *in* THE SCARCITY OF WATER–EMERGING LEGAL AND POLICY RESPONSES 80, 86–87 (Edward P. Brans et al. eds., 1997).

89. Rep. of the Int'l Law Comm'n, 36th sess, May 7–July 27, 1984, ¶ 328, U.N. Doc. A/39/10; GAOR, 36th Sess., Supp. No. 10 (1984) [hereinafter ILC 36th Session Report].

> most monetarily valuable use. Nor does it imply that the State capable of making the most efficient use of a watercourse—whether economically, in terms of avoiding waste, or in any other sense—should have a superior claim to the use thereof. Rather, it implies attaining maximum possible benefits for all watercourse States and achieving the greatest possible satisfaction of all their needs while minimizing the detriment to, or unmet needs of, each.[90]

So far the intended meaning of "optimal utilization" in Article 5 is strikingly similar to that of "economy of use" in Article 6. In one crucial respect, however, the "optimal use" obligation in Article 5 is different. The requirement of "optimal utilization" of international watercourses is not one of simply deriving the maximum possible benefit from international watercourses subject to resources and abilities. It is an obligation to take into account the interests of all river basin states. In other words, this is a collective obligation of all river basin states to make optimal use of the shared waters of the international watercourse.

In this light it is possible to perceive Article 6(1)(f)'s obligation of "economy of use" as a localized version of Article 5(1)'s obligation of "optimal use." Article 5(1) requires the river basin states to cooperate in making the best possible use of the shared river basin, and Article 6(1)(f) requires individual river basin states to apply that same standard to their internal, national uses. This is further affirmation of the importance of "economy of use" amongst the list of factors referred to in Article 6. More importantly, an optimal use at the river basin level might well be an "economic use" at the national level. However, in the absence of further information on what was considered an optimal use by the framers, this is of limited utility.[91] Thus, consideration of the meaning of "optimal use" in Article 5(1) reinforces the "most efficient use subject to availability of resources" (best possible use) interpretation that was identified as the intended meaning of the "economy of use" obligation in Article 6(1)(f).

D. Interpretation in Academic Literature

The gist of the obligation of "economy of use" in academic writing is to avoid wanton wastage and to employ the most efficient consumption methods possible within available resources.[92] Hanging the

90. ILC 39th Session Report, *supra* note 54, at 31–32, ¶ 3.

91. Optimal use finds no elaboration in the *travaux* beyond what has already been mentioned.

92. Jerome Lipper, *Equitable Utilization*, *in* THE LAW OF INTERNATIONAL DRAINAGE BASINS 15, 46 (Albert Henry Garretson, Robert D. Hayton & Cecil J. Olmstead eds.,

requirement of efficiency on the prior and superior question of ability and availability of resources has led one commentator to argue that although the phrasing of the obligation in the 1997 Convention implies a broader obligation than previous versions,[93] the efficiency criterion is of limited utility in determining whether a use is reasonable and equitable. Rather, its utility is limited to choosing between competing prospective uses,[94] preventing negligent waste,[95] or facilitating cooperation to achieve greater efficiency.[96] As a standalone method for assessing the legality of a particular use in terms of the international law standard of reasonable and equitable use, this factor is limited by its dependence on the capabilities of the state in question[97] and is thus useful only in cases of negligent waste; even then, however, it is not applied as criterion of allocation, but rather as a determinant of need as wastage indicates lower need than stated.[98]

E. Summarizing the Content of the Obligation of "Economy of Use"

A review of the intended meaning of the obligation, contemporaneous practice, context, and academic commentaries has indicated that the obligation entails making the best possible use of the waters of international watercourses. "Best possible use" refers to the most efficient possible use subject to the availability of resources and at a bare minimum the avoidance of negligent waste. It would not be unreasonable at this stage to question the utility of undertaking a review of state practice. After all, the position seems relatively clear. Moreover, the position seems to be a reasonable one. Nonetheless, there is good reason to continue.

1967) (citing *Nebraska v. Wyoming*, 325 U.S. 589, 618 (1945), *Washington v. Oregon*, 297 U.S. 517, 527 (1936), and *Wyoming v. Colorado*, 259 U.S. 419, 484 (1922)).

93. Ximena Fuentes, *The Criteria for the Equitable Utilization of International Rivers*, 67 BRIT. Y.B. INT'L L. 337, 378 (1996).

94. *Id.* at 384–88 (referring to the jurisprudence of the Naramda Water Dispute Tribunal in India).

95. *Id*. at 381–82 (referring to the jurisprudence of the Rau Commission set up in British India to divide the waters of the Indus between the provinces of Sindh (now in Pakistan) and Punjab (now in India), the Krishna River Waters tribunal, and the Narmada Water Dispute tribunal).

96. *Id.* at 379–81 (referring to the Indus Water Treaty, 1960, between India and Pakistan, and the jurisprudence of the Rau Commission).

97. *Id.* at 383–84 (referring to the decision of the Argentinean Supreme Court in the case of La Pampa v. Mendoza (1987)).

98. *Id*. at 382.

The first reason is the limitations of the sources relied upon so far. Such academic studies are either extremely dated[99] or based on very limited state practice.[100] While the conclusions drawn by these eminent commentators cannot be faulted, the bases for their conclusions are hollow and, if only to provide better foundations for their conclusions, it is desirable to engage in a more exhaustive study of state practice. Similarly, the documents relied upon to derive understandings of the intended meaning of the obligation contained in very limited discussion on the contents of the obligation.[101]

The second reason is that the specific content of this obligation has not yet been ascertained. At a general level there is an obligation to prioritize efficiency subject to availability of resources. At a more specific level, between two prospective uses, efficiency can be a determinative criterion, or negligent wastage may be proscribed by operation of the efficiency requirement, or efficient use can entail cooperation between states to enhance economy of use. It is still not clear, however, exactly what "economy of use" entails. Does it require the use of specific methods to reduce wastage in irrigation? Does it impose specific quantitative standards? So far our understanding has been restricted to the general nature of the obligation, and nothing is known of its specific incidents. It is possible that state practice might yield specific practices that can elucidate the content of this obligation.

IV. TESTING THIS INITIAL UNDERSTANDING AGAINST STATE PRACTICE

This Part discusses the results of an exhaustive empirical survey of 471 instruments of state practice. It is divided into three parts. Subpart A describes the methodology utilized in this study. Subpart B describes the findings of the study. Subpart C sums up the conclusions drawn from the study.

99. Lipper, *supra* note 92.

100. TANZI & ARCARI, *supra* note 12 (referring primarily to the ILC discussions, which considered an exhaustive array of state practice from the perspective of establishing the customary nature of the reasonable and equitable use obligation, but did not examine that practice to understand the content of the efficiency obligation); *see also* Fuentes, *supra* note 93 (referring primarily to Argentinean, Indian, and American municipal judicial decisions).

101. *See supra* notes 28–30 and accompanying text.

A. Note on Methodology

The UNGA recommended that the ILC take up the topic of the "rules of international law related to international watercourses."[102] Prior to that, it had already requested the UN Secretary General ("UNSG") to undertake a survey of national laws, international treaties, international judicial decisions, and the work of international organizations on this topic.[103] The UNSG submitted the requested report in 1963 ("UNSG Report"),[104] followed by a supplementary report in 1974 ("UNSG Supplementary Report").[105] The UNSG's Reports contained summaries of the instruments referred to. The full texts of the instruments referred to in the UNSG Report were further published by the UN in a separate volume.[106] These three resources—the two UNSG Reports and the compendium of legislative texts—were heavily relied upon by the Special Rapporteurs.

For state practice through 1986, the date of the last Rapporteur's Report containing a detailed discussion of reasonable and equitable use of the factors relevant thereto,[107] this study has relied exclusively on the two UNSG Reports and the legislative texts compendium. For state practice after 1986, reference was made to the Ecolex database.[108]

In the course of this study, 471 international instruments were surveyed. Instruments were examined for explicit references to efficiency in usage of international rivers. It was determined that explicit references to efficiency and related concepts were necessitated by the ambiguous nature of the concept of efficiency. Arguably instruments that provide for the sustainable uses of international watercourses,[109] provide

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102. Progressive Development and Codification of the Rules of International Law Relating to International Watercourses, G.A. Res. 2669 (XXV), U.N. Doc. A/RES/2669(XXV) (Dec. 8, 1970).

103. Preliminary Studies on the Legal Problems Relating to the Utilisation and Use of International Rivers, G.A. Res. 1401 (XIV), U.N. Doc. A/RES/1401(XIV) (Nov. 21, 1959).

104. U.N. Secretary-General, *Legal Problems Relating to the Utilization and Use of International Rivers*, U.N. Doc. A/5409 (Apr. 15, 1963), *reprinted in* [1974] 2 Y.B. Int'l L. Comm'n pt. 2, 33, U.N. Doc. A/CN.4/SER.4/1974/Add.1(Part 2) [hereinafter UNSG *Report*].

105. UNSG *Supplementary Report*, *supra* note 28.

106. UN, LEGISLATIVE TEXTS AND TREATY PROVISIONS CONCERNING THE UTILIZATION OF INTERNATIONAL RIVERS FOR OTHER PURPOSES THAN NAVIGATION, U.N. Doc. ST/LEG/SER.B/12, U.N. Sales No. 63.V.4 (1963) [hereinafter LEGISLATIVE TEXTS].

107. McCaffrey *2nd Report*, *supra* note 15.

108. ECOLEX, http://www.ecolex.org/start.php (last visited Dec. 1, 2012).

109. *See* Protocol concerning the establishment of an International Commission for the Protection of the Saar against Pollution, Fr.-Ger., art. 1-3, Dec. 20, 1961, 1053

for efficiency in construction of structures on rivers,[110] require measures to curb pollution,[111] impose obligations to not obstruct navigation,[112] or make vague references to the use of international rivers for mutual benefit[113] all incorporate the concept of efficiency. The sustainable uses of international rivers or the prevention of pollution enable the derivation of greater benefit over a longer period from international rivers. Efficiency in construction allows for more resources to be dedicated to improving efficiency in usage of water. Prevention of obstructions to

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U.N.T.S. 515; UN ECON. COMM'N FOR EUROPE, PROTOCOL ON WATER AND HEALTH TO THE 1992 CONVENTION ON THE PROTECTION AND USE OF TRANSBOUNDARY WATERCOURSES AND INTERNATIONAL LAKES, 1999 (2006), *available at* http://www.euro.who.int/__data/assets/pdf_file/0007/88603/E89602.pdf; Tripartite Interim Agreement for Cooperation on the Protection and Sustainable Utilisation of the Water Resources of the Incomati and Maputo Watercourses, Mozam.-S. Afr.-Swaz., Aug. 29, 2002, *available at* http://www.ecolex.org/ecolex/ledge/view/RecordDetails?id=TRE-001811&index=treaties; Exchange of notes constituting an agreement regarding cooperation in meteorological and hydrological surveys in certain areas of the Nile Basin, Egypt-U.K., Mar. 20, 1950, 226 U.N.T.S. 287; Exchange of notes agreeing to the ratification of the protocol defining the boundary between French Equatorial Africa and the Anglo-Egyptian Sudan, together with the protocol, Fr.-U.K., Jan. 21, 1924, 28 L.N.T.S. 461.

110. *See* Exchange of notes constituting an agreement regarding the construction of the Owen Falls Dam, Uganda, Egypt-U.K., Dec. 5, 1949, 226 U.N.T.S. 273; Exchange of notes constituting an agreement with respect to the construction of remedial works at Niagara Falls, U.S.-Can., Sept. 13, 1954, 236 U.N.T.S. 382; Agreement concerning a study of the utilization of the water power of the Apipé Falls, Arg.-Para., art. 1, Jan. 23, 1958, 649 U.N.T.S. 179.

111. Convention on the Protection of Lake Constance against Pollution, Oct. 27, 1960, *in* UNSG *Report*, *supra* note 104, ¶¶ 435–38; *Report of the Conference on Water Pollution Problems in Europe, adopted by the Conference at its final meeting*, *in id.*, ¶ 27; Agreement on the International Commission for the protection of the Rhine against pollution art. 1, April 29, 1963, 994 U.N.T.S. 17; *see also The control of marine pollution and the protection of living resources of the sea: a comparative study of international controls and national legislation and administration*, *in* UNSG *Supplementary Report*, *supra* note 28, ¶¶ 356–357.

112. *Convention between Switzerland, Austria, Bavaria, Wurttemberg and the Grand Duchy of Baden to establish international regulations for navigation and port service on Lake Constance, Bregenz, 1867*, *in* UNSG *Report*, *supra* note 104, ¶ 469; *see also* Act regarding navigation and economic cooperation between the states of the Niger basin, art. 2, Oct. 26, 1963, 587 U.N.T.S. 10; *see also* Agreement concerning the Niger River Commission and the navigation and transport on the River Niger, art. 2, Nov. 25, 1964, 636 U.N.T.S. 418.

113. Convention for the solution of the problem of the Chamizal, U.S.-Mex., art. 1, Aug. 29, 1963, 15 U.S.T. 21; *see also* Agreement regulating the withdrawal of water from Lake Constance, art. 1, April 30, 1966, 620 U.N.T.S. 198; Treaty concerning the hydroelectric utilization of the water resources of the Paraná River, Braz.-Para., pmbl., April 26, 1973, 975 U.N.T.S. 426.

navigation ensures derivation of greater benefit from shared rivers. All of these provisions are in some way related to the concept of efficiency. However, none of the provisions completely captures the effects and requirements of the efficiency obligation. Any argument regarding the obligation of states to efficiently use the waters of shared watercourses must be based in explicit statements to that effect if it is to be irrefutable. The instrument must refer to maximizing benefit by making efficient uses of waters, or to the criterion of efficiency in exploitation of hydroelectric potential, or to sustainability and pollution control to facilitate efficient usage. The ambiguous nature of efficiency could justify identifying references to efficiency in most of these instruments, but the strongest basis for efficiency requires explicit references. Thus, this Article refers only to instruments containing explicit references to efficiency, economy of use, maximization of usage and benefits, minimization of wastage, and prevention of wastage.

Of the 471 instruments reviewed, seventy-one contained explicit references to efficiency. Conclusions regarding state practice on efficient uses of international rivers have been drawn from these seventy-one instruments. A tabulation of these instruments is provided in the appendix to this Article.[114]

At the outset, the fact that only seventy-one out of 471 instruments make explicit references to the efficient uses of international rivers raises concerns. Is it possible that claims regarding the recognition of an obligation to make efficient use of the waters of international rivers have been overstated? This conclusion is inaccurate. The existence of an obligation to use international waters efficiently may safely be assumed. *Arguendo* this was not true earlier, it is true now; in light of the discussion above, it is clear that the obligation of efficient use has been recognized as having the status of customary international law in the practice of states. Moreover, it must be reiterated that the seventy-one instruments referenced here are only those that make explicit mention of efficiency requirements. Efficiency requirements in one form or another underlie the other treaties as well.[115] Only the seventy-one instruments featuring explicit references have been discussed here because the ultimate objective is to assess the possibility of arguing for a more onerous obligation with regard to efficient uses of international rivers.

For the purposes of this study, reference has been made only to international treaties, judicial decisions, and the work of international

114. *See infra* Appendix at 162.

115. *See, e.g.*, Lipper, *supra* note 92, at 33 ("[T]reaties must be evaluated with caution; their significance rests not in the specific provisions of a particular treaty, but in underlying factors found in common among such treaties.").

organizations, collectively referred to as state practice. Municipal practice has been excluded because of its limited evidentiary value. First, it is not inconceivable that states would be willing to apply different principles with regard to municipal division of the waters of national rivers between federal units, but refuse to be bound by those standards with regard to international rivers. Second, the derivation of international law principles from municipal instruments requires an in-depth understanding of their interpretation and application in practice, subject to the specific legal system from which they hail. This is true of international instruments as well, but international instruments rely upon common interpretive principles to a far greater extent. State consent to the validity of norms derived therefrom can be assumed on the basis of the state having agreed to those instruments.[116]

B. State Practice

These seventy-one instruments were first scrutinized in terms of whether they provide active or passive support for the "economy of use" obligation. Twenty-four provide only passive support. The remaining forty-seven instruments were scrutinized to determine whether they create rights or duties relating to efficiency, and they were then further scrutinized to determine whether those rights and duties were general or specific. Some instruments create both rights and duties, some specific, some general, some both. These instruments have been discussed in detail in five categories: (1) passive, (2) active-general rights, (3) active-general duties, (4) active-specific rights, and (5) active-specific duties.

1. Passive

Twenty-four of the seventy-one sources surveyed evidence only passive support for the efficiency requirement, which is to say that they express general support for the idea of efficient use but give that obligation no substance. For instance, Article 9 of the Chad Basin Agreements refers to one of the functions of the Chad Basin Commission as "maintaining liaison between the member states with a view to the most efficient utilization of the waters of the basin."[117] Similarly, a 1964

116. Moreover, though seventy-one such instruments were identified, forty-six of these were from North America; these instruments would, therefore, provide a geographically skewed view. More importantly, only nine out of these seventy-one involved explicit references to the efficiency requirements (all from North America), severely limiting their evidentiary value within the parameters of this study.

117. Convention and statutes relating to the development of the Chad basin, May 22, 1964, *available at* http://www.fao.org/docrep/w7414b/w7414b05.htm.

agreement between Bulgaria and Greece provides that the purpose underlying cooperation is a desire to "derive the greatest possible benefit from the utilization of the waters."[118] In other words, these twenty-four sources are of limited use in determining the substance of the obligation to efficiently use the waters of international rivers, though they do support the existence of that requirement. These twenty-four instruments include the Helsinki Rules and the Asian-African Legal Consultative Committee Propositions.[119]

2. Active–General Rights

Only one instrument created a general right: the 1965 Draft Convention prepared by the Inter-American Juridical Committee, which creates a right for riparian states to demand that co-riparians adhere to international standards of efficiency.[120] This provision creates a theoretical right to demand compliance with international standards in the efficient use of international rivers. However, in the absence of clear

118. *Agreement on cooperation in the utilization of the waters of the rivers crossing the two countries, Athens, 1964 (Bulgaria, Greece), in* UNSG *Supplementary Report*, *supra* note 28, ¶ 269.

119. *See also The Campione Consolidation of the ILA Rules on International Water Resources, 1966–1999*, 69 INT'L L. ASS'N REP. CONF. 833, 836 (2000) (Article 4(j) provides for "the avoidance of unnecessary waste in the utilization of waters of the basin" as one of the factors to be considered in determining "reasonable and equitable" uses of the waters of "international drainage basins" under Article 3); Convention concerning water economy questions relating to the Drava, Austria-Yugoslavia, pmbl., May 25, 1954, 227 U.N.T.S. 128 (the preamble provides: "Desirous . . . of developing the utilization of the waters of the Drava for hydro-electric purposes by both parties to the greatest possible extent . . ."); Treaty relating to the uses of waters of the Niagara River, U.S.-Can., pmbl., Oct. 10, 1950, 1 U.S.T. 694 (the preamble recognizes that "the water resources of the Niagara river may be more fully and efficiently used . . . "); Protocol on Shared Watercourse Systems in the Southern African Development Community (SADC) Region, art. 2, Aug. 7, 2000, *available at* http://www.internationalwaterlaw.org /documents/regionaldocs/Revised-SADC-SharedWatercourse-Protocol-2000.pdf (Article 2(6) specifies as a general principle that "a shared watercourse system shall be used and developed by member states with a view to attaining optimum utilisation thereof"); Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin art.2, Apr. 5, 1995, 2069 U.N.T.S. 3 (Article 2 refers to the "prevention of wasteful use of Mekong river basin waters" as one of the objectives of the agreement).

120. *Draft convention on the industrial and agricultural use of international rivers and lakes, prepared by the Inter-American Juridical Committee in 1965, in* UNSG *Supplementary Report, supra* note 28, ¶ 379 (Article 7 provides: "No state may utilize or authorise the utilisation of an international river under conditions that are less strict than those to which the utilisation of domestic rivers is subjected by law, custom, or usage. A state may, however, demand that greater precautions or requisites be adopted when those that govern in another of the interested states are inferior to those that are generally or prevalently in force for international rivers.").

identification of such an international standard, the utility of this prescription is of dubious value. Moreover, this is only a draft convention, and hence, of limited evidentiary value.

3. Active—General Duties

Thirty instruments impose some form of general duty. These may be divided into three categories. Some treaties impose more than one form of express duty. First, twelve instruments create obligations of cooperation and consultation, either between the riparians themselves or through commissions that they set up for integrated river basin management.[121] For instance, Article III of the 1959 agreement between Egypt and Sudan relating to the Nile provides for consultation and cooperation for the carrying out of projects to reduce wastage of water to increase the total waters available.[122] Similarly, a 1956 agreement between Yugoslavia and Albania relating to frontier rivers and lakes

121. *See, e.g.*, Agreement concerning the Utilization of the Zambezi River, Zam.-Zim., art. 4–5, 18, July 28, 1987, *available at* http://www.fao.org/docrep/W7414B/w7414b17.htm [hereinafter Zambezi River Agreement] (Article 4 creates a council of ministers, and Article 5 provides that this council shall "give such directions to the Authority as will ensure the most efficient use of the Zambezi River and its installations." Article 18 creates information sharing and consultation obligations before abstracting water from the Zambezi "to ensure the efficient and equitable use of the waters"); Agreement on sharing of the Ganges waters, Bangl.-India, pmbl., art. VIII, Nov. 5, 1977, 17 I.L.M. 103 (Preamble affirms the desire of the parties to make "the optimum utilisation of the water resources of their region by joint efforts." Article VIII states the mutual recognition of the parties of the "need to cooperate . . . in finding a solution to the long-term problem of augmenting the flows of the Ganges during the dry season"); *Treaty between the Republic of Austria and the Czechoslovak Republic regarding the settlement of legal questions connected with the frontier described in article 27, paragraph 6, of the Treaty of Peace between [sic] the Allied and Associated Powers and Austria*, *in* UNSG *Report*, *supra* note 104, ¶ 890 [hereinafter Austria-Czech Treaty] (Article 29 requires the parties to "promote the construction of such works as are designed to . . . regularise the flow of water, provide the frontier communes with water, and ensure the utilisation of the waterpower supplied by the frontier waterways"); *Resolutions of the Conference*, 56 INT'L L. ASS'N REP. CONF. at viii, xiii (1975) (in the context of the navigable uses of international waterways, and considering the question of positive obligations to make improvements for mutual benefit, it was recognized that while the existence of a positive duty to carry out improvements could not be defended, nor could a right to obstruct development for mutual benefit in cooperation with co-riparians. The addition of Article XVIII was proposed, sub-clause (3) of which would impose a duty of negotiation upon co-riparians with regard to such improvement works located in more than one riparian country); *Berlin Rules on Water Resources*, 71 INT'L L. ASS'N REP. CONF. 334 (2004) (Article 11 creates a good faith duty of cooperation in the joint management of international drainage basins for the mutual benefit of basin states).

122. Agreement for the full utilization of the Nile waters, Sudan-United Arab Republic, art. 3, Nov. 8, 1959, 453 U.N.T.S. 64 [hereinafter 1959 Nile Agreement].

creates obligations for the parties to cooperate in measures to improve or to avoid deterioration in the quantity and quality of the water available to both parties.[123]

Second, seventeen instruments create generic obligations to reduce waste or ensure efficiency.[124] For instance, in the 1987 Zambezi River Agreement between Zimbabwe and Zambia, Article 5 provides that the Council created under the Agreement shall "give such directions to the Authority as will ensure the most efficient use of the Zambezi River and its installations."[125] Similarly, in a 1992 agreement between Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan and Turkmenistan, Article 10 states that the Commission set up under the agreement shall provide for "implementation of measures on the rational and economic use of water resources."[126]

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123. *Agreement between the government of the Federal People's Republic of Yugoslavia and the government of the People's Republic of Albania concerning water economy questions, together with the statute of the Yugoslav-Albanian water economy commission and with the protocol concerning fishing in frontier lakes and rivers, Belgrade, 1956*, *in* UNSG *Report*, *supra* note 104, ¶¶ 498–502.

124. *See, e.g.*, Treaty on the Development and Utilisation of the Water Resources of the Komati River Basin, S. Afr.-Swaz., art. 14, March 13, 1992, *available at* http://www.ecolex.org/ecolex/ledge/view/RecordDetails;jsessionid=2441B151ABD1F6A5EF48FAF1AC69C343?id=TRE-152358&index=treaties (Article 14 sets out the general rights and obligations of the parties relating to the project and Article 14(6)(a) provides that "the Parties shall use their best endeavours to . . . minimise waste and non-beneficial use of water from the Komati River Basin within their respective territories"); Treaty relating to cooperative development of the water resources of the Columbia River Basin, U.S.-Can., art. 3, Jan. 17, 1961, 15 U.S.T. 1555 (Article III requires that the US shall "maintain and operate its hydroelectric facilities in a manner that makes the most efficient use of the improvement in stream flow resulting from the operation of the new additional Canadian storage for hydro-electric power generation in the US power system"); Tripartite Interim Agreement, *supra* note 109, art. 4, 7 (Article 4(d) lists "promote partnership in effective and efficient water use" as one of the responsibilities of the parties. Article 7(5), titled "Sustainable Utilisation", provides: "The Parties are committed to develop measures towards improvement of efficiency and rational use of water and its conservation and to promote more efficient water use through adopting better available technology."); Austria-Czech Treaty, *supra* note 121; Rep. of the U.N. Water Conference, March 14–25, 1977, at 11–24, U.N. Doc. E/CONF.70/29, U.N. Sales No. E.77.II.A.12 (1977) (Chapter I.B of the report sets out in great detail the urgent need for implementing efficiency standards in the use of water, and sets out proposed strategies and plans to do so. The emphasis of the chapter, however, is on the development and implementation of these measures at a national level, and international involvement is restricted to providing assistance to this end.).

125. *See* Zambezi River Agreement, *supra* note 121.

126. Agreement on Cooperation in the Field of Joint Water Resources Management and Conservation of Interstate Sources art. 10, Feb. 18, 1992, *available at*

Third, six instruments create obligations to engage in research and development activities to increase efficient uses of water or to study questions of economy of water use.[127] For instance, the Agreement on the Action Plan for the Environmentally Sound Management of the Zambezi River between Botswana, Mozambique, Tanzania, Zambia, and Zimbabwe provides for the assessment of energy conservation measures "to achieve optimal efficiency in the exploitation of these resources" and for "cooperation in the application of existing international measures to reduce and control the degradation and wasteful use of the natural resource base."[128] Similarly, the terms of reference of the Helmand River Commission between Afghanistan and Iran include a clause mandating that the commission study "plans for new installations and methods

http://www.ecolex.org/ecolex/ledge/view/RecordDetails;jsessionid=EE16C656377B2CDC293839963E518643?id=TRE-153789&index=treaties.

127. *Agreement between the Federal People's Republic of Yugoslavia and the Romanian People's Republic concerning questions of water control on water control systems and watercourses on or intersected by the State frontier, together with the Statute of the Yugoslav-Romanian Water Control Commission*, *in* UNSG *Report*, *supra* note 104, ¶¶ 548–55 (The summary of article 2(2) provides: "With a view to improving the existing situation as regards the discharge of internal waters in the frontier district, the Mixed Commission shall examine and propose to the governments of the contracting states the amplification of existing water control systems and the erection of new installations and structures on water control systems and watercourses and in valleys and depressions on or intersected by the state frontier"); Tripartite Interim Agreement, *supra* note 109, art. 7 (Article 7(5) provides: "The Parties are committed to develop measures towards improvement of efficiency and rational use of water and its conservation and to promote more efficient water use through adopting better available technology"); Agreement on the Use of Water Management Facilities of Intergovernmental Status on the Rivers Chu and Talas, Kaz.-Kyrg., art. 10, Jan. 21, 2000, *available at* http://www.ecolex.org/ecolex/ledge/view/RecordDetails;DIDPFDSIjsessionid=6F55400700FBBC230ED2015C90CEFC66?action=i18n.SetLocale&id=LEX-FAOC067060&index=documents&locale=en_US (Article 10 provides: "The Parties shall implement joint research and development activities on the efficient use of water resources and water management facilities."); *European Water Charter, in* UNSG *Supplementary Report*, *supra* note 28, ¶ 373 (Principle II recognizes that "Fresh water resources are not inexhaustible. It is essential to conserve, control, and wherever possible, to increase them" and goes on to emphasize the importance of regarding "water as a precious commodity to be preserved and used wisely." Principle VIII recognizes that "The wise husbandry of water resources must be planned by the appropriate authorities." Principle IX provides that the "conservation of water calls for intensified scientific research, training of specialists and public information services." Principle X acknowledges that "water is a common heritage, the value of which must be recognized by all. Everyone has the duty to use water carefully and economically.").

128. Agreement on the Action Plan for the Environmentally Sound Management of the common Zambezi River System, May 28, 1987, *available at* http://www.ecolex.org/ecolex/ledge/view/RecordDetails?id=TRE-000971&index=treaties.

which might result in a more scientific use of available water in the delta area."[129]

These instruments provide a greater insight into the contents of the "economy of use" obligation than the passive instruments discussed above[130] because they indicate particular methods to achieve greater efficiency—cooperation, reduction of waste, and research and development. Nonetheless they are of limited utility because they provide very limited specific insight into the possible contents of the efficiency obligation. They do not, for instance, indicate specific areas for research, or set specific targets to be achieved in prevention of wastage or through cooperation. Moreover, they create obligations that are difficult to enforce because they are vague and devoid of specific requirements.

4. Active—Specific Rights

Four instruments create or discuss specific rights. Article II of the 1959 Nile Agreement between Egypt and Sudan allows Sudan to construct a reservoir to better utilize its share of the waters of the Nile.[131] The intent here seems to be to allow storage of water so that both states can be assured uninterrupted water supplies. This is an example of an agreement aiming to maximize the net water available to benefit all riparians. Annex II, Article I(1)(c) of the 1994 peace treaty between Israel and Jordan provides as follows: "In order that waste of water will be minimized, Israel and Jordan may use, downstream of point 121/Adassiya Diversion, excess flood water that is not usable and will evidently go to waste unused."[132] Both of these are examples of co-riparians cooperating to increase net water availability to the benefit of both. In the case of the Egypt-Sudan agreement, the storage of water during the flood season by Sudan allows both states access to an uninterrupted supply of water. In the Israel-Jordan example, both parties are cooperating to utilize water that was previously going waste.

Clause 8(vii) of the 1959 India-Nepal agreement relating to the Gandak River allows India to "regulate the flow into or close to the main western canal head temporarily, if such works are found to be necessary in the interest of the efficient maintenance and operation of the canal or

129. *Terms of reference of the Helmand River Delta Commission agreed by conferees of Afghanistan and Iran*, *in* UNSG *Report*, *supra* note 104, ¶ 355.

130. *See supra* notes 117–19 and accompanying text.

131. 1959 Nile Agreement, *supra* note 122.

132. Treaty of Peace, Isr.-Jordan, annex II(I)(1)(c), Oct. 26, 1994, 2042 U.N.T.S. 393 [hereinafter Israel-Jordan Peace Treaty].

power house."[133] In the 1927 agreement between Spain and Portugal relating to the river Douro, under Article 2(c) Portugal is allowed rights over a shared section of the river "with a view to obtaining the full benefit of the fall caused by the barrage . . . ."[134] Both of these treaties are examples of concessions by one riparian to allow the other riparian fuller enjoyment of its rights, in the interest of enhanced mutual welfare. In the India-Nepal example, Nepal agrees to subject its rights to temporary cessation by India for the purpose of maintenance of jointly constructed works to ensure their efficient operation. In the Spain-Portugal example, Spain conceded a small portion of its rights, thereby allowing Portugal greater benefit from its rights, reducing competition between them for shared resources.

5. Active—Specific Duties

Eighteen instruments create specific duties.

Five create obligations to store water in reservoirs to ensure availability and to reduce conflict.[135] For instance, under Article 8 of the

133. *Agreement between the government of Nepal and the government of India on the Gandak River irrigation and power project*, *in* UNSG *Report*, *supra* note 104, ¶ 352.

134. Convention to regulate the hydro-electric development of the international section of the River Douro, Port.-Spain, art. 2, Aug. 22, 1927, 82 L.N.T.S 131.

135. *See, e.g.*, *Convention between the Governments of the Union of Soviet Socialist Republics and Persia regarding the mutual use of frontier rivers and waters*, *in* UNSG *Report*, *supra* note 104, ¶ 327 [hereinafter USSR-Persia Agreement] (Article III of the Convention between the Governments of the Union of Soviet Socialist Republics and Persia regarding the mutual use of frontier rivers and waters prescribes cooperation in the construction of a reservoir on the Tedjen river to dam surplus waters and negate losses during the spring floods); *Agreement between the Austrian Federal Government and the Bavarian State Government concerning the diversion of water in the Rissbach, Durrach and Walchen districts*, *in id.*, ¶ 627 (Paragraph three makes the continuation of Austria's obligations under paragraph two (allowing waters of the designated streams to flow unhindered into Bavaria during specified times) subject to building of storage basins to ensure maintenance of sufficient volume of water in the upper Isar); E.J. Manner, *Regulation of the Flow of Water of International Watercourses*, 58 INT'L L. ASS'N. REP. CONF. 221, 221–25 (1978) (discussing the regulation of the flow of the water of international watercourses, the committee recognized that the natural flows of watercourses could lead to flooding and scarcity in successive seasons, and that the regulation of the flow of the waters of international watercourses through the use of reservoirs, etc. was essential for the efficient use of international river waters); E.J. Manner, *Regulation of the Flow of Water of International Watercourses, Second Report*, 59 INT'L L. ASS'N REP. CONF. 362, 362–64 (1980) (The Association debated suggested articles on "regulation of the flow of water of international watercourses"; Article 1 of the proposed articles defined regulation as "continuing measures intended for . . . increasing . . . the flow of the waters in an international watercourse", and the commentary to the

Colorado and Tijuana Rivers Treaty between the United States and Mexico, both governments "recognize that it is in their common interest to conserve and store waters in the international reservoirs and to make the maximum use of these structures for the purpose of obtaining the most beneficial, regular and constant use of the waters belonging to them."[136]

Three instruments require the construction and maintenance of works to ensure efficiency.[137] For instance, the 1923 Convention Relating to the Development of Hydraulic Power Affecting More Than One State requires selection of technical methods without reference to political considerations and with reference to physical factors which will ensure maximum yield.[138]

Two instruments incentivize efficient uses of international waters.[139] Article 9, titled "Recovery of Costs for Water Services," of a 2000 European Community directive requires member states to ensure by

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suggested article referred to "the regulation of stream flow" as "one of the oldest methods for increasing the availability of water.").

136. Treaty relating to the utilization of the waters of the Colorado and Tijuana Rivers and of the Rio Grande, U.S.-Mex., art. 8, Nov. 14, 1944, 59 Stat. 1219 [hereinafter Colorado and Tijuana Rivers Treaty].

137. Agreement concerning the utilization of the Yarmuk waters, Jordan-Syria, June 4, 1953, 184 U.N.T.S. 24; Declaration of the Government of the Republic of Hungary on the Termination of the Treaty Concluded Between the People's Republic of Hungary and the Socialist Republic of Czechoslovakia on the Construction and Joint Operation of the Gabcikovo-Nagymaros Barrage System, paras. 5–6, Sept. 16, 1977, 32 I.L.M. 1260 (1993) [hereinafter Hungary Declaration] (Construction and maintenance of works to ensure efficiency).

138. Convention relating to the development of hydraulic power affecting more than one State, Dec. 9, 1923, 35 L.N.T.S. 75 (Article 5 requires selection of technical methods without reference to political considerations and with reference to physical factors which will ensure maximum yield.).

139. *Economic Commission for Europe's Recommendations concerning the protection of international rivers*, *in* UNSG *Supplementary Report*, *supra* note 28, ¶¶ 346–47 (The preamble to the 1971 recommendation recognizes that "[i]t is accepted that only careful planning and rational management of the allocation, utilization and conservation of water resources as well as a disciplined use of water for the various legitimate purposes can assure that requirements will be met in the future and that the natural environment will be improved and preserved." Recommendation 2(j) further suggests that states "assess users" charges in a way that relates to the effect on the balance of water resources in each case, taking into account the various criteria such as abstractions made and the pollution caused. Section 2 of the preamble of the 1972 recommendation recognizes that "Water, which was formerly abundant and cheap, is today regarded in many countries as a limited economic resource needing careful planning and management", and section 2(b) notes as a common feature of southern European countries, "intense evapotranspiration, resulting in very heavy water consumption for irrigation, particularly in summer.").

2010 "that water-pricing policies provide adequate incentives for users to use water resources efficiently."[140] Article 11(3) of that directive, in illustrating "basic measures" (minimum requirements), refers to "measures to promote an efficient and sustainable water use."[141]

Two other agreements take a slightly different approach. Instead of moving towards increasing net availability, and being resigned to certain net losses, the Souris River Basin Agreements between the United States and Canada mandate sharing the effects of loss of water through evaporation.[142]

The remaining six agreements provide unique examples of specific duties towards achieving "economy of use." The Zambezi River Agreement requires coordination, including coordination between a hydroelectric project and other similar works to maximize efficiency.[143] The Indus Waters Treaty mandates assistance from India to Pakistan to develop capabilities for the exploitation of alternative water sources.[144] The 1934 Maritza-Ebros Agreement between Greece and Turkey requires both parties to clear bushes and trees that might hinder water flow.[145] Section B of the minutes of the 1957 meeting between Greek and Yugoslavian delegations relating to Lake Dojran outlines the goal of minimizing surface evaporation.[146] The Belgium-Germany frontier agreement of 1919 refers to protection and maintenance of transboundary

140. Council Directive 2000/60, art. 9, 11, 2000 O.J. (L 327) 1 [hereinafter EC Directive].

141. *Id.*

142. Agreement amending the Agreement of October 26, 1989 (T.I.A.S. No. 11731) for Water Supply and Flood Control in the Souris River Basin, U.S.-Can., Annex B, Dec. 22, 2000, KAV 5917, Temp. State Dept. No. 01-70 [hereinafter Souris River Basin Agreement Amendment]; Agreement for Water Supply and Flood Control in the Souris River Basin, U.S.-Can., ¶ 4.2, Operating Plan, Oct. 26, 1989, T.I.A.S. No. 11731 [hereinafter Souris River Basin Agreement].

143. Zambezi River Agreement, *supra* note 121.

144. The Indus Waters Treaty 1960, India-Pak., art. 4–5, Sept. 19, 1960, 419 U.N.T.S. 126 (Article 4(1) requires Pakistan to construct a system of works to replace diversion of water for irrigation from eastern rivers, with water from the western rivers, and Article 5(1) requires India to provide financial assistance for this purpose.).

145. *Agreement between Greece and Turkey concerning the control of hydraulic works on both banks of the River Maritza-Ebros*, *in* UNSG *Report*, *supra* note 104, ¶ 733 [hereinafter Maritza-Ebros Agreement].

146. *Minutes of meetings held by delegations of the People's Federal Republic of Yugoslavia and the Kingdom of Greece from 26 August to 1 September 1957 to work out a procedure and plan for cooperation in making hydro-economic studies of the drainage area of Lake Dojran*, *in* UNSG *Report*, *supra* note 104, ¶¶ 658–67 [hereinafter Yugoslavia-Greece Minutes].

water supply pipes.[147] The 1956 Germany-France Agreement relating to the portion of the Rhine River located between Basle and Strasbourg imposes an interesting example of highly specific design requirements intended to increase efficiency.[148]

All eighteen of these agreements create distinct, specific obligations, but they all adopt a common approach to maximizing the efficient use of international waters. They all seek to increase the net availability of water, whether by providing development assistance so that a co-riparian can better exploit its own rivers, promoting storage during high flow times to prevent shortage and conflict during low flow times, incentivizing efficient usage, protecting and maximizing the efficiency of shared infrastructure, or preventing avoidable loss of water. Cooperative actions to increase net water availability thus emerge as a major theme amongst the agreements which create specific obligations.

C. Drawing Conclusions from State Practice

The previous Subpart of this Part surveyed seventy-one instruments. In any empirical study it is necessary to critically evaluate the quality of the data before using it to draw conclusions. Only forty-seven of the seventy-one instruments provided active support for the efficiency obligation to the extent of being able to provide color to the obligation. Of those forty-seven, only eighteen indicated specific obligations and only four indicated specific rights that were capable of indicating specific obligations that might be included in the obligation of "economy of use." Of the eighteen duty-imposing instruments, only thirteen are binding,[149]

147. *Provisions relating to the common frontier between Belgium and Germany, drawn up by a boundary commission made up of representatives of the British Empire, France, Italy, Japan, Belgium and Germany under the terms of the Treaty of Versailles of 28 June 1919 concerning that frontier*, *in* UNSG *Report*, *supra* note 104, ¶¶ 465–67 [hereinafter Belgium-Germany Frontier Agreement] (Articles II(8), III(1) and III(3), inter alia, create obligations to protect water supply pipes which cross the frontier with a view to preventing adverse influences on the quantity or quality of water available.).

148. Convention on the regulation of the upper course of the Rhine between Basle and Strasbourg, Fr.-Ger., art. 1, Oct. 27, 1956, 1461 U.N.T.S. 16 [hereinafter Germany-France Agreement] (Article 1 mandates use of a connecting canal between the hydroelectric plant and the Rhine, linking each reach to the succeeding one, instead of the earlier used navigable derivation canals, thereby avoiding the need for a number of low output hydroelectric stations; this increased efficiency, however, comes at a higher cost.).

149. Zambezi River Agreement, *supra* note 121; Colorado and Tijuana Rivers Treaty, *supra* note 136; Souris River Basin Agreement, *supra* note 142; Souris River Basin Agreement Amendment, *supra* note 142; USSR-Persia Agreement, *supra* note 135; Indus Waters Treaty, *supra* note 144; Belgium-Germany Frontier Agreement, *supra* note 147; Maritza-Ebros Agreement, *supra* note 145; Austria-Bavaria Agreement, *supra* note

and out of these thirteen, only four belong to the period between 1986 and 2012.[150] Of the four right-creating instruments, all four are binding, but only one belongs to the 1986–2012 period.[151] Only the binding instruments should be considered. Binding instruments represent clear statements from states as to the obligations they are willing to take on. Non-binding instruments suffer from the risk of being expressive of *lex ferenda*. This reduces the indicative instrument collection to thirteen duty-imposing and four right-creating instruments.

This collection of instruments is of limited utility for drawing any general conclusions regarding the content of the efficiency obligation. The primary reason for this is that there are too few instruments to yield any conclusions of general relevance. Out of a sum total of 471 instruments, a mere seventeen cannot form the basis of any conclusions as to the progressive development of international law. Further, the number of countries represented in these instruments is less than fifty and the number is that high only because one of the instruments is a directive of the European Union. Excluding that instrument, the number is closer to twenty. The willingness of these twenty states to take on more specific obligations with regard to efficient uses of waters cannot be cited as evidence of an emerging norm of customary international law. While this quantum of state practice is not insignificant, it is highly geographically restricted. Finally, out of the seventy-one instruments that formed the initial set, only nineteen have been entered into after 1986. That implies that fifty-two of these instruments were considered by the ILC's Rapporteurs and no inferences regarding the content of the efficiency obligation were drawn. This would suggest the ILC's reluctance to rely on such conclusions as may be drawn from these instruments.

V. THE SPECTRUM OF OBLIGATIONS OF "ECONOMY OF USE"

This Article began with the objective of ascribing greater clarity to the phrase "economy of use" as used in Article 6(1)(f) of the 1997

135; Germany-France Agreement, *supra* note 148; Yugoslavia-Greece Minutes, *supra* note 146; Hungary Declaration, *supra* note 137; EC Directive, *supra* note 140.

150. Zambezi River Agreement, *supra* note 121; Souris River Basin Agreement, *supra* note 142; Souris River Basin Agreement Amendment, *supra* note 142; EC Directive, *supra* note 140.

151. Israel-Jordan Peace Treaty, *supra* note 132.

Convention. Only limited success may be reported on that front. The previous two sections make clear that it is not possible to elaborate upon the specific *lex lata* content of the obligation of "economy of use" in terms of precise percentage-based reduction in wastage, specific measures required to be implemented, etc. Nonetheless, it is possible to define clearer contours for the obligation of "economy of use" than are currently available. These contours are descriptive rather than prescriptive—they are not intended to attach specific obligations to the general obligation of "economy of use"; instead, they are intended to provide an overview of the categories of obligations subsumed within the general obligation. This is a spectrum of actual obligations under the general obligation of efficient use—it does not include implicit or passive references to "economy of use."

The utility of this exercise lies first in providing a clearer overview of current practice, second in establishing a foundation upon which to build future inquiries and discussions, and third in attaining greater precision in discussing the general obligation. Architects of water-sharing agreements may rely on this spectrum to understand the various options available for including efficiency obligations.

The efficiency obligation should be perceived as a spectrum with two clear extremes and three broad set of options in between—five levels in all.

The most rigid and onerous extreme of this spectrum, level five, is the use of efficiency as a criterion for the allocation of waters. In other words, current and potential competing uses of the waters of shared watercourses would be assessed on the basis of efficiency of use and magnitude of benefit. This model is not seen in practice except where deciding between otherwise equal potential uses.[152] This lack of use in practice is not unwarranted. The right of a community and a country to access an essential resource like water should never be made contingent on its financial or economic ability.

The next, less onerous, level, level four, includes cooperative measures to prevent or reduce wastage or increase efficiency. These include the entire gamut of measures taken to increase net availability of water, including concessions of rights to facilitate better enjoyment by co-riparians,[153] development assistance for co-riparians,[154] joint construction and maintenance of water use infrastructure,[155] specification

152. *See supra* note 94 and accompanying text.

153. *See supra* notes 133–34 and accompanying text.

154. *See supra* note 144 and accompanying text.

155. *See supra* notes 135–36 and accompanying text.

of standards for the construction and maintenance of water use infrastructure,[156] etc. Conceding the difficulty of drawing definitive conclusions from the limited state practice available, it is interesting, nonetheless, that a large portion of the state practice surveyed does fall within level four.[157] Insofar as state practice reveals support for anything other than the default position of prohibiting negligent waste, this level of obligation enjoys a large measure of support.

The middle level, level three, includes a series of unilateral measures designed to prevent or reduce wastage or increase efficiency. These include incentivizing efficiency,[158] unilaterally reducing wastage, maintaining water use infrastructure,[159] utilizing storage reservoirs,[160] etc. There are relatively few agreements in this category, which is unsurprising given the unilateral nature of the obligations incurred in this category.

The penultimate level, level two, is a general duty to cooperate in attaining greater efficiency. This duty may manifest in the form of increased communication, research, or waste reduction. It does not specify a particular goal or method. It is merely a duty of cooperation with the broad goal of efficient use.[161]

The final level, level one, is the least extreme and consists of an obligation to avoid negligent waste of the waters of shared watercourses subject to resources and abilities.[162] This is the current position, not just with regard to the efficiency obligation, but with regard to the reasonable and equitable use obligations itself. As discussed above, the use of "optimal" in Article 5 indicates a general requirement of best possible use there as well.[163] Level one fits within the interpretation of the efficiency obligation suggested in Part II. It runs through all of the agreements as an implicit acceptance of the efficiency obligation—a constant guard against waste.

The key question in level one addresses the degree of inhibition posed by the cost requirement. To what extent is a lack of resources acceptable as an excuse for negligent waste? To begin, a lack of resources is not in and of itself an adequate excuse; the intended meaning of the efficiency obligation takes into account the possibility of acquiring

156. *See supra* notes 137–38 and accompanying text.
157. *See generally supra* notes 131–48 and accompanying text.
158. *See supra* note 144 and accompanying text.
159. *See supra* note 137 and accompanying text.
160. *See supra* note 135 and accompanying text.
161. *See supra* notes 121–29 and accompanying text.
162. *See supra* notes 97–98 and accompanying text.
163. *See supra* notes 85–91 and accompanying text.

financial support as well.[164] In addition, within the context of the global water crisis, development assistance from the international community as well as co-riparians for increased efficiency in water usage should be prioritized, if not in the interest of global welfare, then at least in the interests of enhanced survival capacity of the state and people in question.

From a normative perspective, the ideal position on this spectrum is level four—cooperation between riparians towards specific efficiency goals. This suggested superiority is based not just in the enunciation of specific efficiency goals, but equally in the requirement of cooperation between riparians, which is the best way to avoid conflicts over rivers and the best way to give effect to the intended meaning of the reasonable and equitable use requirements as obligations of procedural cooperation. As already mentioned, many of the instruments surveyed do fall in this category.

VI. CONCLUSION

This Article started with the objective of attempting to attach specific and precise duties to the general obligation of "economy of use." It concludes with identifying a five-part spectrum of categories of obligations that gives expression to the efficiency obligation. The extremes of this spectrum remain as developed in the initial understanding in Part II—inefficiency as a disqualification at one end and avoidance of negligent waste at the other. This article does not argue that there is a specific elaboration of the efficiency obligation that can be derived from state practice or from other sources. Rather, this article surveys various possible interpretations, categorizes them, and arranges them in a spectrum of obligations with a view to providing a better understanding of practice with regard to efficiency obligations and with a view to guiding future practice. From a normative perspective, efficiency obligations are best phrased as cooperative obligations towards broad efficiency goals, and many instruments which explicitly discuss the efficiency obligation do phrase the requirement of "economy of use" in this manner.

The inability to pin down a specific, precise obligation results from a lack of state practice on the point. This begs the question of why states are so reluctant to commit to concrete obligations regarding the efficient uses of international river waters. One possible explanation may lie in the

164. *See supra* note 56 and accompanying text.

fear of denial of uses on grounds of relative inefficiency of use.[165] However, the law is clear that relative inefficiency cannot form the basis for denial of a reasonable use. Additionally, efficiency is but one of the factors in Article 6. Lastly, this would represent the most extreme end of the spectrum of efficiency-related obligations; it is possible for states to take on less onerous obligations but to still take on efficiency obligations.

Another possible explanation lies in the difficulty of achieving greater efficiency of use. This explanation is also unsatisfactory. First, as discussed above, while efficiency gains are not necessarily easy or inexpensive, in many parts of the world water use is so inefficient that easy efficiency gains are, in fact, possible.[166] Second, an abundance of research has been conducted on methods to increase the efficiency of water usage and on comparison of methods and modes of implementation, including, for instance, water users' associations,[167] de-linking water rights from land rights,[168] water charges,[169] allocation of water rights,[170] irrigation efficiency,[171] etc.[172]

One convincing explanation for this lack of specific obligations is the unwillingness of states to bind themselves into tight legal obligations regarding their uses of international watercourses. The same reason would explain the extraordinarily low number of ratifications of the 1997 convention. The implication of this explanation is that enhanced legal clarity regarding the obligation to use international watercourses efficiently is elusive because it is obstructed by political reluctance.

This political reluctance is bound to change in the face of the impending necessity for institutionalized legal mechanisms for ensuring efficient uses of water. A future research agenda on this subject will have three components: first, an examination of the municipal practices of states to ascertain possible dominant themes in terms of legally mandated efficiency; second, an examination of emerging international practice in terms of emerging treaties and water sharing agreements; and third, an elucidation of the role of costs in mitigating or exacerbating legal obligations for efficient uses of international watercourses.

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165. *See supra* notes 56–57 and accompanying text.

166. *See supra* notes 38–51 and accompanying text.

167. SALMAN M.A. SALMAN, THE LEGAL FRAMEWORK FOR WATER USERS' ASSOCIATIONS—A COMPARATIVE STUDY (1997).

168. STEPHEN HODGSON, MODERN WATER RIGHTS—THEORY AND PRACTICE (2006).

169. STEFANO BURCHI & ARIELLA D'ANDREA, PREPARING NATIONAL REGULATIONS FOR WATER RESOURCES MANAGEMENT 275–80 (2003).

170. *Id.* at 3–91.

171. BURCHI & D'ANDREA, *supra* note 169, at 245–49.

172. *See also supra* notes 58–84 and accompanying text.

APPENDIX

INTERNATIONAL INSTRUMENTS ON EFFICIENCY IN USAGE OF INTERNATIONAL RIVERS

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
1	Afr	1959	Agreement between the United Arab Republic and the Republic of Sudan for the full utilization of the Nile waters, *in* U.N. Secretary-General, *Legal Problems Relating to the Utilization and Use of International Rivers—Report by the Secretary-General*, U.N. Doc. A/5409 (Apr. 15, 1963), *reprinted in* [1974] 2 Y.B. Int'l L. Comm'n pt. 2, 33, 65 [hereinafter UNSG *Report*].	Article II(1, 2) allows Sudan to construct the Roseires Reservoir on the Blue Nile to "better exploit its share". Article III provides for consultation and cooperation for the carrying out of projects to reduce wastage of water to increase the total waters available.	Int'l instru-ment	Active	N/A	Facilitate efficient use	Y	N/A	N/A	N/A
2	Afr	1964	Convention and statutes relating to the development of the Chad basin (Cameroon, Chad, Niger, Nigeria), *in* U.N. Secretary-General, *Legal Problems Relating to the Utilization and Use of International Rivers: Supp. Rep. by the Secretary-General*, U.N. Doc. A/CN.4/274 (Mar. 25, 1974), *reprinted in* [1974] 2 Y.B. Int'l L. Comm'n pt. 2, 265, 290 [hereinafter UNSG *Supplementary Report*].	Article 9 of the statutes lists among the functions of the commission created by Article 1 of the convention, "maintaining liaison between the member states with a view to the most efficient utilization of the waters of the basin."	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
3	Afr	1964	Draft agreement on water utilization and conservation in the Lake Chad Basin, prepared by the FAO Legal Office, *in* UNSG *Supplementary Report*, at 335.	Article IV requires that "Each member state shall, with regard to schemes or projects for water utilization in its territory, take every reasonable measure to. . . prevent . . . waste . . ."	Int'l instru-ment	Active	N/A	N/A	N/A	Y	N/A	N/A
4	Afr	1965	Various treaties relating to the Gambia River Basin, *in* Special Rapporteur on the Non-Navigational Uses of International Watercourses, *Third Rep. on the Non-Navigational Uses of International Watercourses*, n.138, U.N.. Doc. A/CN.4/348 and Corr. 1 (Dec. 11, 1981) (by Stephen M. Schwebel), *reprinted in* [1982] 2 Y.B. Int'l L. Comm'n 65 [hereinafter Schwebel *3rd Report*].	Recognize the importance of cooperation to make optimal use of shared waters.	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A
5	Afr	1972	Various treaties relating to the Senegal River Basin, *in* Schwebel *3rd Report*, at n.136.	Recognize the importance of cooperation to make optimal use of shared waters.	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
6	Afr	1987	Agreement between the Republic of Zimbabwe and the Republic of Zambia concerning the Utilization of the Zambezi River, *available at* http://www.fao.org/docrep/W7414B/w7414b17.htm (last visited on Dec. 1, 2012).	Article 4 creates a council of ministers and Article 5 provides that this council shall: "give such directions to the Authority as will ensure the most efficient use of the Zambezi River and its installations". Article 18 creates information sharing and consultation obligations before abstracting water from the Zambezi "to ensure the efficient and equitable use of the waters." Annexure I deals working arrangements for the sharing of energy from the Kariba dam, and Article 7 provides that: "in the spirit of acquiring maximum benefit for the two States, the Kariba generating schemes shall, as much as is reasonably practicable, be operated in conjunction with the other generating schemes."	Int'l instru-ment	Active	N/A	N/A	Y	Y	N/A	Efficient operation of Kariba generating scheme by organizing with other projects

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
7	Afr	1987	Agreement on the Action Plan for the Environmentally Sound Management of the common Zambezi River System adopted at Harare on 28 May 1987 between the Governments of the Republic of Botswana, the People's Republic of Mozambique, the United Republic of Tanzania, the Republic of Zambia, and the Republic of Zimbabwe, *available at* http://www.ecolex.org/server2.php/libcat/docs/TRE/Multilateral/En/TRE000971.txt (last visited on Dec. 1, 2012).	Paragraph 12.2 under Category B projects under Annex I calls for the assessment of energy conservation measures "to achieve optimal efficiency in the exploitation of these resources." Paragraph 29(g) of the introduction to Annex I calls for "cooperation in the application of existing international measures to reduce and control the degradation and wasteful use of the natural resource base."	Int'l instru-ment	Active	N/A	N/A	Y	N/A	Y	N/A
8	Afr	1988	Agreement on the Action Plan for the Environmentally Sound Management of the Common Zambezi River System, with accompanying annexes and appendices, 27 I.L.M. 1112, 1123 (1988).	Paragraph 29(g) recognizes the importance of "measures to reduce and control the degradation and wasteful uses of the natural resource base . . ."	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
9	Afr	1990	Agreement between the Federal Republic of Nigeria and the Republic of Niger concerning the Equitable Sharing in the Development, Conservation and Use of their Common Water Resources, *available at* http:// www.ecolex.org/server2.php/ libcat/docs/TRE/Full/Other/TRE-152355.pdf (last visited Dec. 26, 2013).	Article 2 refers to "reasonable and equitable use" of the shared river waters, and Article 5 sets out the factors to be considered in determining such use. Article 5(k) reads: "the avoidance of unnecessary waste in the utilization of waters, with dues regard for the technological and financial capabilities of each contracting party."	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A
10	Afr	1992	Treaty on the Development and Utilization of the Water Resources of the Komati River Basin between the Government of the Kingdom of Swaziland and the Government of the Republic of South Africa, *available at* http://www.ecolex. org/server2.php/libcat/docs/TRE/Full/Other/TRE-152358.doc (last visited Dec. 26, 2013).	Article 14 sets out the general rights and obligations of the parties relating to the project, and Article 14(6)(a) provides that "the Parties shall use their best endeavours to . . . minimise waste and non-beneficial use of water from the Komati River Basin within their respective territories."	Int'l instru-ment	Active	N/A	N/A	N/A	Y	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
11	Afr	1995	Protocol on Shared Watercourse Systems in the Southern African Development Community (SADC) Region, *available at* http://www.ecolex.org/server2.php/libcat/docs/TRE/Multilateral/En/TRE001267.txt (last visited Dec. 1, 2012).	Article 2(6) specifies as a general principle that "a shared watercourse system shall be used and developed by member states with a view to attaining optimum utilization thereof."	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A
12	Afr	2000	Revised Protocol on Shared Watercourses in the Southern African Development Community Region, *available at* http://www.Afrnwater.org/SADCprotocol.PDF (last visited Dec. 1, 2012).	Article 3(8)(a), setting out general principles, sets out factors for the determination of "reasonable and equitable use", which are identical to those contained in the 1997 UN convention (cl. vi).	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
13	Asia	2000	Agreement between the Government of the Kazakh Republic and the Government of the Kyrgyz Republic on the Use of Water Management Facilities of Intergovernmental Status on the Rivers Chu and Talas, *available at* http://faolex.fao.org/docs/texts/bi-67060E.doc (last visited Dec. 26, 2013).	The preamble provides: "mutually aspiring to find a more unassailable and fair solution to the efficient use of water management facilities in compliance with generally acknowledged norms of international law on water resources." Article 10 provides: "The Parties shall implement joint research and development activities on the efficient use of water resources and water management facilities."	Int'l instru-ment	Active	N/A	N/A	N/A	N/A	Y	N/A
14	Afr	2002	Tripartite Interim Agreement between the Republic of Mozambique and the Republic of South Africa and the Kingdom of Swaziland for Cooperation on the Protection and Sustainable Utilisation of the Water Resources of the Incomati and Maputo Watercourses, *available at* http://www.ecolex.org/server2.php/libcat/docs/TRE/Full/En/TRE-001811.doc (last visited Dec. 26, 2013).	Article 4(d) lists "promote partnership in effective and efficient water use" as one of the responsibilities of the parties. Clause 5 of Article 7, titled "Sustainable Utilisation", provides: "The Parties are committed to develop measures towards improvement of efficiency and rational use of water and its conservation and to promote more efficient water use through adopting better available technology."	Int'l instru-ment	Active	N/A	N/A	Y	Y	Y	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
15	Am	1944	Exchange of notes constituting an agreement between the United States of America and Canada relating to a study to be made by the International Joint Commission with respect to the Upper Columbia River Basin, *in* UNSG *Report*, at 76.	Paragraph 2 tasks the commission to determine whether further development of the river basin would be practicable and in public interest, bearing in mind factors such as efficient development of water power, etc.	Int'l instru-ment	Active	N/A	N/A	N/A	Y	N/A	N/A
16	Am	1944	Treaty between the United States of America and Mexico relating to the utilization of the waters of the Colorado and Tijuana Rivers, and of the Rio Grande (Rio Bravo) from Fort Quitman, Texas, to the Gulf of Mexico, *in* UNSG *Report*, at 79.	Under Article 8, both governments "recognize that it is in their common interest to conserve and store waters in the international reservoirs and to make the maximum use of these structures for the purpose of obtaining the most beneficial, regular and constant use of the waters belonging to them."	Int'l instru-ment	Active	N/A	N/A	N/A	N/A	N/A	Storage of waters in reservoirs to increase availability
17	Am	1950	Treaty between the United States of America and Canada relating to the uses of the waters of Niagara River, *in* UNSG *Report*, at 84.	The preamble recognizes that "the water resources of the Niagara river may be more fully and efficiently used…"	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
18	Am	1961	Treaty between the United States of America and Canada relating to cooperative development of the water resources of the Columbia River Basin, *in* UNSG *Report*, at 76.	Article II requires that the US shall "maintain and operate its hydroelectric facilities in a manner that makes the most efficient use of the improvement in stream flow resulting from the operation of the new additional Canadian storage for hydro-electric power generation in the US power system."	Int'l instru-ment	Active	N/A	N/A	N/A	Y	N/A	N/A
19	Am	1965	Draft convention on the industrial and agricultural use of international rivers and lakes, prepared by the Inter-American Juridical Committee in 1965, *in* UNSG *Supplementary Report*, at 349.	Article 7 provides: "No state may utilize or authorise the utilisation of an international river under conditions that are less strict than those to which the utilisation of domestic rivers is subjected by law, custom, or usage. A state may, however, demand that greater precautions or requisites be adopted when those that govern in another of the interested states are inferior to those that are generally or prevalently in force for international rivers."	Int'l instru-ment	Active	Adherence to int'l efficiency standards by co-riparians	N/A	N/A	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
20	Am	1969	Treaty on the River Plate Basin, Brasilia, (Argentina, Bolivia, Brazil, Paraguay, Uruguay), *in* UNSG *Supplementary Report*, at 291.	Article I provides for the "reasonable utilization of water resources, particularly through regulation of watercourses and their multiple and equitable uses."	Int'l instru-ment	Active	N/A	N/A	N/A	Y	N/A	N/A
21	Am	1989	Agreement amending the Agreement of October 26, 1989 (T.I.A.S. 11731) for Water Supply and Flood Control in the Souris River Basin, effected by Exchange of Notes at Ottawa December 20 and 22, 2000, entered into Force December 22, 2000, K.A.V. 5917, Temp. State Dept. No. 01-70.	Annex B recognizes the loss of water through evaporation and endeavors to distribute the effects of the evaporation losses between both parties.	Int'l instru-ment	Active	N/A	N/A	N/A	N/A	N/A	Share loss of evaporated water
22	Am	1989	Agreement between the United States of America and Canada regarding the Boundary Waters of the Souris River, 11731 T.I.A.S. i.	Paragraph 4.2 of the attached operating plan recognizes the loss of water through evaporation and endeavors to distribute the effects of the evaporation losses between both parties.	Int'l judicial ruling	Active	N/A	N/A	N/A	N/A	N/A	Share loss of evaporated water

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
23	Am	1997	Minute No. 297 of the International Boundary and Water Commission concerning Operations and Maintenance Program and Distribution of its Costs for the International Project to improve the Quality of the Waters of the Rio Grande at Laredo, Texas-Nuevo Laredo, Tamaulipas, *available at* http://www.ecolex.org/server2.php/libcat/docs/TRE/Bilateral/Other/bi-16744.htm (last visited Dec. 1, 2012).	Joint Report of the Principal Engineers considers efficiency of the treatment plant as an important consideration.	Int'l judicial ruling	Pass.	N/A	N/A	N/A	N/A	N/A	N/A
24	Asia	1926	Convention between the governments of the Union of Soviet Socialist Republics and Persia regarding the mutual use of frontier rivers and waters, *in* UNSG *Report*, at 96.	Article III prescribes cooperation in the construction of a reservoir on the Tedjen river to dam surplus waters and negate losses during the spring floods.	Int'l instru-ment	Active	N/A	N/A	N/A	N/A	N/A	Storage of waters in reservoirs to increase availability
25	Asia	1950	Terms of reference of the Helmand River Delta Commission agreed by conferees of Afghanistan and Iran, 1950, *in* UNSG *Report*, at 98.	Clause A(4) of the paragraph listing functions of the commission mandates that the commission study "plans for new installations and methods which might result in a more scientific use of available water in the delta area."	Int'l instru-ment	Active	N/A	N/A	N/A	N/A	Y	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
26	Asia	1953	Agreement between the Republic of Syria and the Hashemite Kingdom of Jordan concerning the utilization of the Yarmuk waters, Damascus, 1953, *in* UNSG *Report*, at 103.	Preamble: "considering the advantages which the two countries would derive from the efficient collection and use of the waters . . . ". Article 2 states that the reason behind the execution of the Yarmuk scheme is that it is an "economical and effective way of providing the additional water needed by Jordan and the electric power needed by both states." Article 11 imposes maintenance obligations on both states "to facilitate the maximum use of the capacity of the reservoir."	Int'l instru-ment	Active	N/A	N/A	N/A	N/A	N/A	Construct and maintain works to ensure efficiency
27	Asia	1959	Agreement between the government of Nepal and the government of India on the Gandak River irrigation and power project, *in* UNSG *Report*, at 98.	Clause 8(vii) allows India to "regulate the flow into or close to the main western canal head temporarily, if such works are found to be necessary in the interest of the efficient maintenance and operation of the canal or power house".	Int'l instru-ment	Active	N/A	Temporary suspension of obligations to ensure efficient use	N/A	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
28	Asia	1960	Treaty between India and Pakistan regarding the use of the waters of the Indus, Karachi, 1960, *in* UNSG *Report*, at 99.	Preamble provides: "[both governments] being equally desirous of attaining the most complete and satisfactory utilisation of the Indus system of rivers . . ." Article 4(1) requires Pakistan to construct a system of works to replace diversion of water for irrigation from eastern rivers, with water from the western rivers, and Article 5(1) requires India to provide financial assistance for this purpose.	Int'l instru-ment	Active	N/A	N/A	N/A	N/A	N/A	Reduce reliance on specific parts of shared river system, and duty to assist in reduction of such reliance
29	Asia	1977	Bangladesh-India agreement on sharing of the Ganges' waters, *in* Schwebel *3rd Report*, at n.135.	Preamble affirms the desire of the parties to make "the optimum utilisation of the water resources of their region by joint efforts." Article VIII states the mutual recognition of the parties of the "need to cooperate . . . in finding a solution to the long-term problem of augmenting the flows of the Ganges during the dry season."	Int'l instru-ment	Active	N/A	N/A	Y	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
30	Asia	1992	Agreement between the Republic of Kazakhstan, the Republic of Kyrgyzstan, the Republic of Uzbekistan, the Republic of Tajikistan and Turkmenistan on Cooperation in the Field of Joint Water Resources Management and Conservation of Interstate Sources, *available at* http://www.ecolex.org/server2.php/libcat/docs/TRE/Full/Other/TRE-153789.doc (last visited Dec. 26, 2013).	Article 10 stipulates that the commission set up under the agreement shall provide for: "implementation of measures on the rational and economic use of water resources."	Int'l instru-ment	Active	N/A	N/A	N/A	Y	N/A	N/A
31	Asia	1994	Treaty of Peace between the State of Israel and the Hashemite Kingdom of Jordan, 1994, *available at* http://faolex.fao.org/docs/texts/bi-17463.doc (last visited Dec. 26, 2013).	Article 6 deals with water, and Article 6(4)(a) commits parties to cooperation in "minimising wastage of water resources ". Annex II deals with water allocation, Article I with allocation, Article I(1) with the waters of the Yarmouk river, and Article I(1)(c) provides: "In order that waste of water will be minimized, Israel and Jordan may use, downstream of point 121/Adassiya Diversion, excess flood water that is not usable and will evidently go to waste unused."	Int'l instru-ment	Active	N/A	Right to use excess flood waters to avoid waste	Y	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
32	Asia	1995	Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin, Chiang Rai, 1995 (Cambodia, Laos, Thailand, Vietnam), 34 I.L.M. 865, 868 (1995).	Article 2 refers to the "prevention of wasteful use of Mekong river basin waters" as one of the objectives of the agreement.	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A
33	Eur	1922	Provisions relating to the common frontier between Belgium and Germany, drawn up by a boundary commission made up of representatives of the British Empire, France, Italy, Japan, Belgium and Germany under the terms of the Treaty of Versailles of 28 June 1919 concerning that frontier, Aix-la-Chapelle, 1922, in UNSG *Report*, at 114.	Articles. II(8), III(1) and III(3), *inter alia*, create obligations to protect water supply pipes which cross the frontier with a view to preventing adverse influences on the quantity or quality of water available.	Int'l instru-ment	Active	N/A	N/A	N/A	N/A	N/A	Protect trans-border supply pipes
34	Eur	1927	Convention between Spain and Portugal to regulate the hydro-electric development of the international section of the river Douro, *in* UNSG *Report*, at 141.	Under Article 2(c), Portugal is allowed rights over a shared section of the river "with a view to obtaining the full benefit of the fall caused by the barrage . . . ".	Int'l instru-ment	Active	N/A	Use specific portion of shared waters to enhance efficiency of use	N/A	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
35	Eur	1928	Treaty between the Republic of Austria and the Czechoslovak Republic regarding the settlement of legal questions connected with the frontier described in article 27, paragraph 6, of the Treaty of Peace between the Allied and Associated Powers and Austria, signed at Saint-Germain-en-Laye on 10 September 1919, *in* UNSG *Report*, at 167.	Article 29 requires the parties to "promote the construction of such works as are designed to…regularise the flow of water, provide the frontier communes with water, and ensure the utilisation of the waterpower supplied by the frontier waterways."	Int'l instru-ment	Active	N/A	N/A	Y	Y	N/A	N/A
36	Eur	1934	Agreement between Greece and Turkey concerning the control of hydraulic works on both banks of the River Maritza-Ebros, *in* UNSG *Report*, at 145.	Clause (c) in Part III requires states to clear trees and bushes which would otherwise hinder the flow of the water.	Int'l instru-ment	Active	N/A	N/A	N/A	N/A	N/A	Clear bushes and trees which might hinder water flow
37	Eur	1948	Agreement between the Austrian Federal government and the Bavarian state government concerning the diversion of water in the Rissbach, Durrach and Walchen Districts, *in* UNSG *Report*, at 135.	Paragraph 3 makes the continuation of Austria's obligations under paragraph 2, allowing waters of the designated streams to flow unhindered into Bavaria during specified times, subject to building of storage basins to ensure maintenance of sufficient volume of water in the upper Isar.	Int'l instru-ment	Active	N/A	N/A	N/A	N/A	N/A	Storage of waters in reservoirs to increase availability

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
38	Eur	1952	Agreement between the government of the Republic of Austria and the government of the Federal Republic of Germany and of the Free State of Bavaria concerning the Donaukraftwerk-Jochenstein-Aktiengesellschaft, *in* UNSG *Report*, at 137.	The agreement creates a private limited corporation for the purposes of construction and operation of a dam on the Danube at Jochenstein. Article 1 stipulates that the company shall: "[. . . utilize it [the dam] as efficiently as possible . . .]."	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A
39	Eur	1954	Convention between the government of the Federal People's Republic of Yugoslavia and the Federal Government of the Austrian Republic concerning water economy questions relating to the Drava, *in* UNSG *Report*, at 142.	Preamble provides: "Desirous . . . of developing the utilization of the waters of the Drava for hydro-electric purposes by both parties to the greatest possible extent . . . ."	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A
40	Eur	1954	Agreement between the Federal People's Republic of Yugoslavia and the Republic of Austria concerning water economy questions in respect of the frontier sector of the Mura and the frontier waters of the Mura, together with the statute of the permanent Yugoslav-Austrian Commission for the Mura, *in* UNSG *Report*, at 149.	Article 1(1) stipulates that "[w]ater economy questions . . . are considered to be of interest to both contracting states" and creates a permanent Yugoslav-Austrian Commission for the Mura, which is charged in Article 1(2) with, *inter alia*, "water supply".	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
41	Eur	1955	Agreement between the government of the Federal People's Republic of Yugoslavia and the government of the Hungarian People's Republic concerning water economy questions together with the statute of the Yugoslav-Hungarian Water Economy Commission, *in* UNSG *Report*, at 125.	The treaty creates obligations for the parties to cooperate in measures to improve, or to avoid deterioration in, the quantity and quality of the water available to both parties.	Int'l instru-ment	Active	N/A	N/A	N/A	N/A	N/A	N/A
42	Eur	1955	Agreement between the Federal People's Republic of Yugoslavia and the Romanian People's Republic concerning questions of water control on water control systems and watercourses on or intersected by the state frontier, together with the statute of the Yugoslav-Romanian Water Control Commission, *in* UNSG *Report*, at 126.	Article 2(2) provides: ". . . With a view to improving the existing situation as regards the discharge of internal waters in the frontier district, the Mixed Commission shall examine and propose to the governments of the contracting states the amplification of existing water control systems and the erection of new installations and structures on water control systems and watercourses and in valleys and depressions on or intersected by the state frontier."	Int'l instru-ment	Active	N/A	N/A	N/A	N/A	Y	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
43	Eur	1956	Agreement between the government of the Federal People's Republic of Yugoslavia and the government of the People's Republic of Albania concerning water economy questions, together with the statute of the Yugoslav-Albanian Water Economy Commission and with the Protocol concerning fishing in frontier lakes and rivers, *in* UNSG *Report*, at 120.	The treaty creates obligations for the parties to cooperate in measures to improve, or to avoid deterioration in, the quantity and quality of the water available to both parties.	Int'l instru-ment	Active	N/A	N/A	Y	N/A	N/A	N/A
44	Eur	1956	Minutes of meetings held by delegations of the Federal People's Republic of Yugoslavia and the Kingdom of Greece from 23 to 30 March 1956 to discuss the water level of Lake Dojran, Salonica, *in* UNSG *Report*, at 138.	Article III specifies the interest of the parties in the "accumulation and better utilization of the water".	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
45	Eur	1956	Convention between the Federal Republic of Germany and the French Republic on the regulation of the upper course of the Rhine between Basle and Strasbourg, and attached protocol, *in* UNSG *Report*, at 155.	Article 1 mandates use of a connecting canal between the hydroelectric plant and the Rhine, linking each reach to the succeeding one, instead of the earlier used 'navigable derivation canals', avoiding the need for a number of low output hydroelectric stations; this increased efficiency, however, comes at a higher cost. Article 2 further provides for the execution of the works in "the most rational manner possible, with a view to securing the maximum economic efficiency in the production of electronic power."	Int'l instru-ment	Active	N/A	N/A	N/A	N/A	N/A	Use of specific design
46	Eur	1957	Minutes of meetings held by delegations of the Federal People's Republic of Yugoslavia and the Kingdom of Greece from 26 August to 1 September 1957 to work out a procedure and a plan for cooperation in making hydro-economic studies of the drainage area of Lake Dojran, *in* UNSG *Report*, at 139.	Section A outlines the goal of minimizing wastage through surface evaporation.	Int'l instru-ment	Active	N/A	N/A	N/A	Y	N/A	Minimize surface evaporatio n

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
47	Eur	1957	Agreement between the government of the Italian Republic and the government of the Federal People's Republic of Yugoslavia concerning the supply of water to commune of Gorizia in accordance with Annexe V, paragraph 5 of the Treaty of Peace with Italy, and exchange of notes, *in* UNSG *Report*, at 144.	Article 6 provides for the "development and maintenance of the springs and installations . . . in order to ensure a full output and to guarantee the regularity and continuity of the water supply."	Int'l instru-ment	Active	N/A	N/A	N/A	Y	N/A	N/A
48	Eur	1958	Agreement concerning water-economy questions between the government of the Federal People's Republic of Yugoslavia and the government of the People's Republic of Bulgaria, *in* UNSG *Report*, at 121.	The treaty creates obligations for the parties to cooperate in measures to improve, or to avoid deterioration in, the quantity and quality of the water available to both parties.	Int'l instru-ment	Active	N/A	N/A	Y	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
49	Eur	1963	Treaty concerning the connexion between the Scheldt and the Rhine, (Belgium, Netherlands), *in* UNSG *Supplementary Report*, at 309.	Article 3(h) calls for the "making of arrangements in the interest of the water economy, including the prevention of salinization and of water pollution, and Article 3(i) calls for "such temporary or permanent works and arrangements as may prove necessary or desirable in connexion with or as a result of the execution of the aforementioned works, with a view to their efficient maintenance, use and operation and to the adaptation of existing conditions to the new works and the new water conditions."	Int'l instru-ment	Active	N/A	N/A	N/A	Y	N/A	N/A
50	Eur	1964	Agreement on cooperation in the utilization of the waters of the rivers crossing the two countries, Athens, 1964 (Bulgaria, Greece), *in* UNSG *Supplementary Report*, at 315.	Article 1 provides that the purpose underlying cooperation is a desire to "derive the greatest possible benefit from the utilization of the waters".	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
51	Eur	1967	Council of Europe, Euran Water Charter, *in* UNSG *Supplementary Report*, at 342.	Principle II recognizes that "[f]resh water resources are not inexhaustible. It is essential to conserve, control, and wherever possible, to increase them", and goes on to emphasize the importance of regarding "water as a precious commodity to be preserved and used wisely." Principle VIII recognizes that "The wise husbandry of water resources must be planned by the appropriate authorities." Principle IX provides that the "conservation of water calls for intensified scientific research, training of specialists and public information services". Principle X acknowledges that "water is a common heritage, the value of which must be recognized by all. Everyone has the duty to use water carefully and economically."	Int'l instru-ment	Active	N/A	N/A	N/A	Y	Y	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
52	Eur	1969	Report of the panel of experts on the legal and institutional aspects of international water resources development, *in* UNSG *Supplementary Report*, at 334.	"The report observes that cooperation among riparian states in respect of the development of their shared water resources has in many cases led to a more efficient exploitation than would otherwise have been possible."	Int'l instru-ment	Active	N/A	N/A	Y	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
53	Eur	1973	Economic Commission for Europe's recommendations concerning the protection of international rivers, *in* UNSG *Supplementary Report*, at 332.	The preamble recognizes that "only careful planning and rational management of the allocation, utilization and conservation of water resources as well as a disciplined use of water for the various legitimate purposes" will result in met requirements and an improved and preserved natural environment. Recommendation 2(j) suggests that users' charges relate to the effect on the water resources balance, using criteria like abstractions and pollution. The preamble of the 1972 recommendation recognizes that although water was "formerly abundant and cheap," it is now "a limited economic resource needing careful planning and management", and section 2(b) notes as a common feature of southern European countries, "intense evapotranspiration, resulting in very heavy water consumption for irrigation, particularly in summer."	Int'l instru-ment	Active	N/A	N/A	N/A	Y	N/A	Incentivize efficiency

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
54	Eur	1977	Declaration of the Government of the Republic of Hungary on the Termination of the Treaty concluded between the People's Republic of Hungary and the Socialist Republic of Czechoslovakia on the Construction and joint Operation of the Gabcikovo-Nagymaros Barrage System signed in Budapest on 16 September 1977, 32 I.L.M. 1260, 1264 (1993).	One of the reasons cited by Hungary for terminating the treaty was the low efficiency of the construction techniques and materials originally intended to be used under the terms of the treaty.	Int'l instru-ment	Active	N/A	N/A	N/A	N/A	N/A	Construct and maintain works to ensure efficiency
55	Eur	2000	Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a Framework for Community Action in the Field of Water Policy, 2000 O.J. (L 327) 1.	Article 9, titled "Recovery of Costs for Water Services", requires member states to ensure by 2010 "that water-pricing policies provide adequate incentives for users to use water resources efficiently". Article 11(3), in illustrating "basic measures" (minimum requirements) refers to " measures to promote an efficient and sustainable water use"	Int'l instru-ment	Active	N/A	N/A	N/A	Y	N/A	Incentivize efficiency

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
56	Int'l	1923	Convention relating to the development of hydraulic power affecting more than one state, Geneva, 1923, *in* UNSG *Report*, at 57.	Article 5 requires selection of technical methods without reference to political considerations and with reference to physical factors to ensure maximum yield.	Int'l instru-ment	Active	N/A	N/A	N/A	N/A	N/A	Construct and maintain works to ensure efficiency
57	Int'l	1964	Study on 'abstraction and use of water: a comparison of legal regimes' submitted under resolution 1033 D (XXXVII) (ECOSOC), *in* UNSG *Supplementary Report*, at 327.	The study begins with the question of "whether the laws encourage the efficient use of water . . .", and goes on to state that "The question is whether that [use of water as a tool of social engineering] makes for efficiency—undoubtedly an important objective of water legislation—and, if not, the extent to which efficiency may have to yield to other desiderata incidental to water use."	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A
58	Int'l	1966	The Helsinki Rules on the Uses of the Waters of International Rivers, adopted by the International Law Association at its Fifty-Second Conference held at Helsinki in 1966, *in* UNSG *Supplementary Report*, at 357.	Article V(i) recognizes "the avoidance of unnecessary waste in the utilization of waters of the basin" as a factor to be considered in the determination of "reasonable and equitable share" in terms of Article IV.	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
59	Int'l	1970	Work of the Committee on Natural Resources, *in* UNSG *Supplementary Report*, at 328.	The draft agenda prepared by the inter-government panel of specialists on the United Nations water conference established under ECOSOC Resolution 1973 E (LII) of June 2, 1972 included question 5 which concerned "optimization in planning of water resources, taking into account their multiple uses."	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A
60	Int'l	1972	Action plan for the human environment, Stockholm, 1972, *in* UNSG *Supplementary Report*, at 326.	Recommendation 51(b)(ii) recognizes that "The basic objective of all water resource use and development activities from the environmental point of view is to ensure the best use of water and to avoid its pollution in each country."	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A
61	Int'l	1973	Asian-African Legal Consultative Committee, Draft propositions on the law of international rivers, formulated in 1973 by a sub-committee, *in* UNSG *Supplementary Report*, at 338.	Proposition III(f) recognizes "the avoidance of unnecessary waste in the utilization of waters of the basin" as a factor to be considered in the determination of "reasonable and equitable share" in terms of Proposition II.	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
62	Int'l	1974	Report of the Fifty-Sixth Session of the International Law Association, New Delhi, 56 INT'L L. ASS'N REP. CONF. (1975).	In the context of the navigable uses of international waterways, and considering the question of positive obligations to make improvements for mutual benefit, it was recognized that while the existence of a positive duty to carry out improvements could not be defended, nor could a right to obstruct development for mutual benefit in cooperation with co-riparians. The addition of Article VXIII was proposed, sub-clause (3) of which would impose a duty of negotiation upon co-riparians with regard to such improvement works located in more than one riparian country.	Int'l instru-ment	Active	N/A	N/A	Y	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
63	Int'l	1977	Rep. of the U.N. Water Conference, March 14–25, 1977, *in* Special Rapporteur on the Non-Navigational Uses of International Watercourses, *Second Rep. on the Non-Navigational Uses of International Watercourses*, n.261, U.N.. Doc. A/CN.4/399 (Mar. 19, 1986) (by Stephen C. McCaffrey), *reprinted in* [1987] 2 Y.B. Int'l L. Comm'n pt. 2, 87.	Chapter I.B of the report sets out in great detail the urgent need for implementing efficiency standards in the use of water, and sets out proposed strategies and plans to do so. The emphasis of the chapter, however, is on the development and implementation of these measures at a national level, and international involvement is restricted to providing assistance to this end.	Int'l instru-ment	Active	N/A	N/A	N/A	Y	N/A	N/A
64	Int'l	1978	Report of the Fifty-Eighth Session of the International Law Association, Manila, 58 INT'L L. ASS'N. REP. CONF. 221 (1978).	In discussing the regulation of the flow of the water of international watercourses, the committee recognized that the natural flows of watercourses could lead to flooding and scarcity in successive seasons, and that the regulation of the flow of the waters of international watercourses through the use of reservoirs, etc. was essential for the efficient use of international river waters.	Int'l instru-ment	Active	N/A	N/A	N/A	N/A	N/A	Storage of waters in reservoirs to increase availability

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
65	Int'l	1980	Report of the Fifty-Ninth Session of the International Law Association, Belgrade, 59 INT'L L. ASS'N REP. CONF. 362 (1980).	The Association debated suggested articles on 'regulation of the flow of water of international watercourses'. Article I of the proposed articles defined regulation as "continuing measures intended for . . . increasing . . . the flow of the waters in an international watercourse", and the commentary to the suggested article referred to "the regulation of stream flow" as "one of the oldest methods for increasing the availability of water."	Int'l instru-ment	Active	N/A	N/A	N/A	N/A	N/A	Storage of waters in reservoirs to increase availability
66	Int'l	1981	Conclusions and proceedings of the United Nations interregional meeting of international river organisations (Dakar, Senegal, 5–14 May 1981), *in* Schwebel *3rd Report*, at nn.177–78.	The right and duty of states to participate in the "wise husbanding of the system's water resources" were affirmed.	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
67	Int'l	1982	Draft Articles on Water Pollution in an International Drainage Basin, 60 INT'L L. ASS'N REP. CONF. 531 (1982).	Applies Article XXXI of the Helsinki Rules which provides for the resolution of disputes relating to "present or future utilization" in accordance with the "fullest most efficient use . . . ".	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A
68	Int'l	1986	Introduction to Draft Rules on International Groundwaters, 62 INT'L L. ASS'N REP. CON'F. 231, 241 (1986).	The discussion emphasized the importance of efficient utilization of groundwater resources.	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A
69	Int'l	2000	The Campione Consolidation of the ILA Rules on International Water Resources, 1966–1999, 69 INT'L L. ASS'N REP. CONF. 833, 836 (2000).	Article 4(j) provides for "the avoidance of unnecessary waste in the utilization of waters of the basin" as one of the factors to be considered in determining "reasonable and equitable" uses of the waters of "international drainage basins" under Article 3.	Int'l instru-ment	Pass.	N/A	N/A	N/A	N/A	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
70	Int'l	2002	Report of the World Summit on Sustainable Development at Johannesburg, South Afr, Aug. 26–Sept. 4 2002, *available at* http://www.johannesburgsummit.org/html/documents/summit_docs/131302_wssd_report_reissued.pdf (last visited Dec. 1, 2012).	Paragraph 15 in Chapter III, titled "Changing Unsustainable Patterns of Consumption and Production", provides: "delinking economic growth and environmental degradation through improving efficiency and sustainability in the use of resources".	Int'l instru-ment	Active	N/A	N/A	N/A	Y	N/A	N/A

	Area	Year	Source	Comments	Type	Active/ passive	General right	Specific right	Duty: coop-eration	Duty: effici-ent use	Duty: R&D	Duty: specific
71	Int'l	2004	Berlin Rules on Water Resources, 71 INT'L L. ASS'N REP. CONF. 334 (2004).	The commentary to Article 7, in setting out a requirement for sustainable uses of international waters, provides: "The right to the use of the water . . . never included the right to waste, destroy, or fully consume the resource." Article 11 creates a good faith duty of cooperation in the joint management of international drainage basins for the mutual benefit of basin states. Article 13(2)(f) provides "economy of use of the water resources of the international drainage basin and the costs of measures taken to achieve these purposes" as one of the factors to be considering while determining whether a use is "reasonable and equitable".	Int'l instru-ment	Active	N/A	N/A	Y	N/A	N/A	N/A