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Transboundary Water Rights: A Valuation for Efficient Allocation

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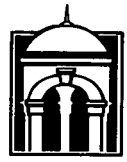

TRANSBOUNDARY WATER RIGHTS: A VALUATION FOR EFFICIENT ALLOCATION

I. INTRODUCTION

A comparative approach to transboundary water[1] law seeks a principle as elusive as the governed medium, a principle which attempts to distill water issues and rights to a central idea or list of ideas. Scholars are at variance in defining the salient principles behind transboundary water law.[2] However, a common idea embodied in these discussions emerges: the value of riparian[3] rights.

The world's "first commodity"[4] is not only subject to economic valuation but, to a much greater extent, legal valuation. Cost distortions that misallocate water arise from several sources. First, externalization of cost distorts the real value of water. Evidenced in the legal doctrine of prior

1. "Transboundary waters' means any surface or groundwaters which mark, cross or are located on boundaries between two or more states;" Convention on the Protection and Use of Transboundary Watercourses and Int'l Waters, art. 1, Mar. 17, 1992, 31 I.L.M. 1312 (1992).

2. "[C]urrent population growth has to be the single, most salient factor affecting both water supply and water quality." Ann Berkley Rodgers & Albert E. Utton, *The Ixtapa Draft Agreement Relating to the Use of Transboundary Groundwaters*, 25 NAT. RESOURCES J. 713 (1985); Xue Hanquin, *Relativity in International Water Law*, 3 COLO. J. INT'L ENVTL. L. & POL'Y 45, 46 (1992) (identifying two fundamental principles of water law: (1) equitable utilization, and (2) prevention of water pollution); Paul Marshal Parker, *High Ross Dam: The International Joint Commission Takes a Hard Look at the Environmental Consequences of Hydroelectric Power Generation — The 1982 Supplementary Order*, 58 WASH. L. REV. 445 (1983) (fundamental principle of international water law identified as: (1) absolute sovereignty of each nation within its boundaries; and (2) equitable apportionment); Melissa Crane, *Diminishing Water Resources and International Law: U.S.-Mexico, A Case Study*, 24 CORNELL INT'L L.J. 299 (1991) (the reason for a lack of a notable principle in groundwater law is: (1) Scientific uncertainty, (2) territorial sovereignty, (3) Competing doctrines in environmental law); Gretta Goldenman, *Adapting to Climate Change: A Study of International Rivers and Their Legal Arrangements*, 17 ECOLOGY L. Q. 741 (1990) (the treaties neglect an understanding of variables in water principles because those variables are changing as a result of, *inter alia*, climate changes); Julia R. Wilder, *The Great Lakes as a Water Resource: Questions of Ownership and Control*, 59 IND. L. J. 463 (1984) (problems in water rights stem from the demand on transcontinental water exportation); Dante A. Caponera, *Patterns of Cooperation in International Water Law: Principles and Institutions*, 25 NAT. RESOURCES J. 563, 587 (1985) ("Agreements on the allocation of costs and benefits are sufficient to determine each state's share and responsibilities . . .").

3. "'Riparian Parties' means the parties bordering the same transboundary waters." *Supra* note 1; A riparian owner has access or the right to access a navigable river. Scranton v. Wheeler, 179 U.S. 141, 173 (1900); Navigability is not navigability in fact as in the English sense. County of St. Clair v. Lovingston, 90 U.S. 46, 55 (1874).

4. *The First Commodity*, ECONOMIST, Mar. 28, 1992, at 11.

appropriation,[5] or in subsidies,[6] these distortions often originate from the assignment of property rights of entitlement to water, thereby disrupting efficient use of this valuable resource. For example, consider the situation where agrarians receiving water at below cost, flood their lands to irrigate. Aside from losses by evaporation, this practice increases the rate at which fertilizers leach into return flows, increasing the nutrient content of the stream. This in turn escalates bacteria count, and eventually the downstream riparians must treat this water in order to make it potable. In this example, the costs of efficient use have been disrupted because the non-assignment of true or real costs creates greater costs in the end. Secondly, sovereignty is perhaps the most cost distorting factor because inefficient policies are tied to the concept of sovereignty.[7] In a world with rapidly growing population and dwindling potable water supplies,[8] this resource may continue to be worth blood.[9]

This comment will compare various approaches to the allocation of transboundary water rights. First, an overview of the different sources of water and the systems in place to allocate those waters is presented. Some inaccuracies in the information upon which scholars rely will be clarified. Secondly, basic water law concepts, used in the treatment of transboundary water rights, will demonstrate how existing regimes distort efficient allocation of this resource and create waste. Various treaties, cases, and codes will be presented to form a basis for problems inherent in transboundary water dispute resolution. Finally, a proposal will be forwarded that may aid decision-makers in negotiating agreements. A market-based approach grounded on the initial equitable apportionment threshold evolves as the best successor to an administratively determined allocation.

II. LEGAL UNDERSTANGING OF THE HYDROLOGIC CYCLE

A. *The Hydrologic Cycle and Data*

The hydrologic cycle consists of evaporation of open bodies of water, transpiration from biological units, precipitation, groundwater flows, and surface water flows.[10] The current stage of transboundary water law emphasizes surface flows and groundwater or aquifer sources.[11] A "drain-

5. H. Stuart Burness & James P. Quirk, *Water Law, Water Transfers, and Economic Efficiency: The Colorado River*, 23 J.L. & ECON. 111, 123 (1980).

6. *See supra* note 4.

7. This concept assumes many forms, for example the so called "food security" issue leads to inefficient use of water. *Id.*; Self-sufficiency in food production can take on extreme distortions, especially in a world historically devoted to trade. Saudi Arabia has become the world's seventh largest exporter of wheat, but must sell it at a quarter of the cost. Priit J. Vesilind, *Water: The Middle East's Critical Resource*, NAT'L GEOGRAPHIC, May 1993, at 57.

8. *See supra* note 4.

9. "'The next war in the Middle East will be fought over water, not politics,' UN Secretary General Boutros-Ghali." Vesilind, *supra* note 7, at 51; India and Pakistan have fought three full-scale wars over water rights since 1948. Joseph W. Dellapenna, *Surface Water in the Iberian Peninsula: An Opportunity for Cooperation or a Source of Conflict*, 59 TENN. L. REV. 803 (1992).

10. TAYLOR R. ALEXANDER & GEARY S. FICHTER, ECOLOGY 112 (1973).

11. *See generally* Hanquin, *supra* note 2.

age basin" may encompass both surface and subterranean sources. The term will be used to address both systems for the purposes of this comment.[12] It should be noted, however, that the drainage basin concept is not universal.[13] In order to determine the relative value of a commodity, parties need objective information. Scholars and jurists alike recognize the problem of attaining a good factual base so that riparian rights can be allocated appropriately.[14] Our understanding of the hydrologic cycle demonstrates that different sources of water are valued differently. For this reason, laws must be sensitive to the real long-term values of water. The more sophisticated society's understanding of the hydrologic cycle is, the more accurate the law can be in reflecting the rights allocated. Nations recognize the need for accurate data[15] when dealing with contentious water rights, but may lack the technology to attain it.[16] Some nations have the resources to draft treaties that contemplate extensive hydrologic relationships which exist in transboundary water systems.[17] Perhaps the most encouraging document that recognizes these areas is the Bellagio Draft Treaty, which addresses supply.[18] Once accurate data is obtained, the laws must respond to a dynamic, self-correcting regime to allocate this commodity.

Some regions use data on water levels in making a comparative analysis of transboundary riparian rights.[19] This data may include information on recharge rates, seasonal levels, or water quality. Even at this late stage of development[20] a problem exists in determining the exact share of each contending drainage basin in an equitable apportionment scheme.[21] Most states follow the equitable apportionment scheme in allocating trans-

12. Some agreements marry the flow of water to the basin concept. "An international drainage basin is a geographical area extending over two or more States determined by the watershed limits of the system of waters, including surface and underground waters, flowing into a common terminus." INTERNATIONAL LAW ASSOCIATION, REPORT OF THE FIFTY-SECOND CONFERENCE HELD AT HELSINKI chap. 1, art. III. (1966) [HELSINKI RULES].

13. The International Law Commission was unable to agree on the "basin" concept on whether subterranean flows should be included. Robert D. Hayton, *Observation on the International Law Commission's Draft Rules on the Non-Navigational Uses Of International Watercourses: Articles 1-4*, 3 COLO. J. INT'L ENVTL. POL'Y 31 (1992).

14. *See* ALBERT E. UTTON, THE DEVELOPMENT OF INTERNATIONAL GROUNDWATER LAW 16 (1981); JOHAN G. LAMMERS, POLLUTION OF INTERNATIONAL WATERCOURSES 18 (1984).

15. "The agreements shall provide for the establishment of joint bodies [charged with the tasks] . . . *inter alia* . . . to elaborate joint monitoring systems concerning water quality and quantity." *See supra* note 1, art. 9.

16. Vesilind, *supra* note 7, at 50.

17. *See* Crane, *supra* note 2.

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

19. See B.R. CHAUHAN, SETTLEMENT OF INTERNATIONAL WATER LAW DISPUTES IN INTERNATIONAL DRAINAGE BASINS (1981).

20. The cradles of civilization tended to be inseparable from surface water flows such as the Euphrates, Tigris, Nile, Danube, Rhine, Seine, Mekong, and Yangtze. *See supra* note 4; Thomas O'Neil, *The Mekong*, NAT'L GEOGRAPHIC, Feb. 1993, at 11; *See supra* note 2, at 12.

21. Leo Goss & Albert E. Utton, *Settlement of International Water Law Disputes in International Drainage Basins*. By B.R. Chauhan, 79 AM. J. INT'L L. 192 (1985)(book review).

boundary riparian rights.[22] The principle set forth by the Institute of International Law in 1911 states the basic idea behind equitable apportionment: no sovereign may use or allow waters to be used in such a way that would seriously injure another state.[23] The contemporary lawyer must be willing to deal with technical concepts of hydrology, hydrogeology and related sciences[24] in order to determine the fact-intensive notion of equitable use. Indeed, the new standards mandate the use of "best available technology" in attaining hydrologic information.[25] The assignment of relative values to the source of transboundary waters is essential to this calculation. Only when values are determined can sovereigns set priorities in times of crisis.

B. Groundwater

Some scholars resurrect inaccurate or misleading concepts of the hydrologic cycle.[26] Legal scholars', jurists', and sovereigns' identification of the source of water in dispute is essential for accurate value assessment[27] of ultimate riparian rights. Sources must be identified at the outset of the value-determining process. Generally, groundwater sources can be identified as rechargeable from surface rains or flows, non-rechargeable, or the source may have elements of each.[28]

A bright line definition may be evidenced in the nomenclature associated with various sources. Water is "mined" when the net recharge rates are less than rates of withdrawal.[29] The mining concept clarifies the dualism evidenced by elements of rechargeable and non-rechargeable characteristics in a single aquifer. Short-run problems can occur if data is lacking on recharge rates. Long-run problems occur where subterranean water-courses have changed their flows, thus altering the existing hydrogeology.[30] Careful monitoring of an aquifer can remedy these situations when they occur. But for the majority of conditions, the mining threshold is readily identifiable, understandable and workable. Where only a century ago the existence of subterranean water-courses was unforeseeable,[31] today con-

22. "Riparian parties shall cooperate on the basis of equality and reciprocity . . . . " *See supra* note 1, art. 9, § 2(a).

23. *Introduction to* RESTATEMENT (THIRD) OF FOREIGN RELATIONS LAW pt. VI, ch. 3 (1987).

24. *See* Hayton, *supra* note 13, at 31.

25. *Supra* note 1, art. 9 § 2(i).

26. "[T]he reality that surface waters feed groundwaters . . ." Melissa Crane, *Diminishing Water Resources and International Law: U.S.-Mexico, A Case Study*, 24 CORNELL INT'L L.J. 299 (1991) (erroneously overbroad).

27. CLARK E. CORKER, ET. AL., GROUNDWATER LAW, MANAGEMENT AND ADMINISTRATION A1-30 (National Water Commission, PB-205-527 1971).

28. *Id.*

29. Patrick E. Corbett, Note, *The Overlooked Farm Crisis: Our Rapidly Depleting Water Supply*, 61 NOTRE DAME L. REV. 454, 455, n. 3 (1986).

30. The Bellagio Draft Treaty does not directly address this long-run scenario; however, the International Boundary and Water Commission's conferences have established joint commissions to "measure, distribute and manage shared waters." *Bellagio Conference on International River Commissions*, TRANSBOUNDARY RESOURCES REPORT, Summer 1993, at 1.

31. Dillon v. Acme Oil Co., 2 N.Y.S. 289 (1888).

temporary legal regimes have detailed information on aquifer data.[32] Indeed, the "sharing of data" clause is turning up in contemporary agreements with increasing regularity.[33]

The Bellagio Draft Treaty's excellent treatment of varied water supplies demonstrates an understanding of the rechargeable groundwater valuation problem:

> "Drought" means a condition of abnormal water scarcity in a specific area resulting from natural conditions. "Drought Alert" means the declared condition provided for in Article XII. "Drought Emergency" means the declared emergency provided for in Article XII.[34]

By stratifying the levels, the treaty contemplates the differing values of water like no other treaty before it. Article XII establishes a "Drought Management Plan," which outlines a use and warning system for sovereigns to effectuate with their border denizens.[35] The onus is on the sovereign to monitor groundwater by maintaining a database on the water levels.[36]

C. *Nonrechargeable and Fossil Aquifers*

The economics of nonrenewable natural resources differs from that of renewable natural resources.[37] An economic valuation of this source must govern the intelligent use of this commodity to achieve the long-term priorities of a sovereign. For example, nonrechargeable groundwater drawn from nonrechargeable aquifers, may become dry, too alkaline, or too saline for consumption with continued draft.[38] Given the limited nature of this resource, it must be treated differently than rechargeable sources, which usually have a lower replacement cost than nonrechargeable sources. Policy makers and covenanting parties must evaluate waters in making use of nonrechargeable resources efficient. For example, nonrechargeable waters may be best designated as strategic reserves when relative values of water are high; by no means should such sources be used for a seasonal agrarian project where the economic justification for the crop is unlikely to justify the removal of that resource for eternity. A valuation threshold may be evidenced by the relationship:

$$\varpi(\theta)FVf(y,y') + DC > RMP$$

32. PAUL S. OSBORNE, Environmental Protection Agency: Suggested Operation Procedures for Aquifer Pumping Tests, EPA/54015-93/503 Feb. 1993, at 2; J. SIDENVALL, *Safeguarding the Water Supplies in Uppsala, Sweden*, GROUNDWATER POLLUTION IN EUROPE, (John A. Cole ed., 1974); EDWIN H. CLARK, II & PHILLIP J. CHERRY, GROUNDWATER: MANAGING THE UNSEEN RESOURCE: A HANDBOOK FOR STATES (1992).

33. *See, e.g., infra* note 57.

34. Hayton, *supra* note 18, at 678.

35. *Id.* at 707.

36. *Id.* at 688.

37. JOHN MCINERNEY, THE ECONOMICS OF ENVIRONMENTAL AND NATURAL RESOURCES POLICY 40 (John A. Butlin ed., 1981).

38. Vesilind, *supra* note 7, at 62.

In this example, policy-makers may determine the value of the nonrechargeable source by multiplying the likelihood of the crisis event's occurrence (ϖ) times the real cost of the resource during those times (θ) as adjusted for the future value, with the term being a function of the year at which the next crisis will occur (y) and the number of years that resource will remain viable once tapped (y'). The cost of alternative sources should then be added in the event of actual source depletion (DC). If this value is greater than the current real market price adjusted for distortions (RMP), then that source should not be accessed.

Fossil aquifers[39] are a source of groundwater that must undergo a capital-intensive desalinization process. The brackish nature of this water source may be the result of latent mineral deposits, intrusion of tidal waters, or withdrawal from aquifers at such a rate that mineral concentrations remaining reach non-potable levels.[40] This process is undertaken by some countries in order to make the water potable, but remains uneconomical for agrarian pursuits.[41]

The Bellagio Draft Treaty does not directly address a contingency plan on how to differentiate these waters outside of the drought scenario. The treaty does, however, open the door for some type of dialogue regarding so-called "transboundary groundwater conservation areas."[42] The dispute resolution process set forth in the Bellagio Draft Treaty emphasizes mutual agreement and charges a commission to determine the appropriateness of various actions under prevailing conditions.[43]

At this point, the core of the problem with riparian right valuation breaks down. "Equity" and "reasonable use" are illusory when sovereigns allow the use of all sources, all of the time, irrespective of cost. Unless the concepts of equity and reasonableness have a benchmark, traditional inequities will persist. Moreover, valuation analysis will help in the long-run. The more rechargeable the source, the more it should be used in routine, low-cost situations.[44] As it stands now, most aquifers are freely accessible at the will of the user. Indeed, sovereigns promote such behavior. These decisions are made when sovereigns act as job suppliers and market participants; sovereign as agrarian or sovereign as utility are the most common examples.

D. Groundwater Rights and Reason

Most groundwater sources are best protected by the laws of traditional nonrenewable resources. Correlative rights protect users of a common aquifer. Under the doctrine of correlative rights, when waters are not confined to the borders of a land owner (or sovereign) the user of the common

39. These are aquifers with brackish waters. Vesilind, *supra* note 7, at 62.
40. *See generally* Vesilind, *supra* note 7, *and* ALEXANDER, *supra* note 10.
41. Vesilind, *supra* note 7, at 62.
42. *Supra* note 18, at 692.
43. *Supra* note 18, at 693.
44. *See also* Corker, *supra* note 27, at A1-38.

aquifer must not waste the water or make unreasonable use of that water.[45] Since all landowners hold coequal rights,[46] an equitable use of the aquifer is assured. This doctrine is commonly used in the oil and gas context.[47] The parallel between petroleum and nonrechargeable aquifers is obvious as both are nonrenewable commodities.

The problem with the reasonableness standard is that the true value of the resource is distorted. Nations often believe their behavior to be reasonable when it is not. Sovereigns who refuse to trade, or who promote wasteful industries for sovereignty's sake, are unreasonable from an economic perspective.[48] When parties allocate transboundary water rights by agreements, the compacts they create should utilize an economic valuation of the resource. Data on the aquifer is essential to successful fact-pleading in an arbitration or negotiation when determining reasonableness.

E. Surface Flows and Prior Appropriation

Surface flow visibility allows for greater accuracy in allocation compared to complex groundwater flows. Perhaps the instances of surface flow misallocation result from the perceived simplicity and availability of this source. However, legally imposed economic distortions abound. Water subsidies to agrarians are a great source of distortion, but are by no means the only one.[49] A legal doctrine alive in the American West, as applied to treaties, generates severe distortions. Under the doctrine of prior appropriation, once an individual appropriates water and puts such water to beneficial use, that individual has a valid right to divert and use that quantity of water against all riparians who appropriate water later in time.[50] This doctrine has been applied within a state as well as across borders.[51] The beneficial user need not be limited to groundwater; surface flows are included under this doctrine as well.[52]

Prior appropriation hails from the turn of the century, when governments placed little or no value on natural resources.[53] Although its intent was to make unsettled land productive, this doctrine exists vestigially in multinational treaties.[54] Prior appropriation distorts the true value because it assigns a property right to a commodity on an entitlement basis. Variables that often go into the valuation of a commodity are completely absent in the prior appropriation regime. Location, shortage risk, source of water, prevailing quality, and externalities of the hydrologic cycle are disregarded

45. Lindsley v. Natural Carbonic Gas Co., 220 U.S. 61 (1911).

46. Correlative rights and reasonable use are often indiscernible. *See supra* note 27, at vi-vii.

47. *See* Young v. Ethyl Corp., 521 F.2d 771 (8th Cir. 1975).

48. *See, e.g.*, Vesilind, *supra* note 7.

49. *See also* note 4.

50. Arizona v. California, 373 U.S. 546, 555 (1963).

51. Nebraska v. Wyoming, 325 U.S 589 (1945).

52. *See* Corker, *supra* note 27, at viii, ix.

53. Zach Willey, *Behind Schedule and Over Budget: The Case of Markets, Water and Environment*, 15 HARV. J. L. & PUB. POL'Y 391, 396-97 (1992).

54. "(1) What is a reasonable and equitable share . . . is to be determined by relevant factors . . . [including] . . . (2)(d) the past utilization of the waters of the basin . . . ." HELSINKI RULES ch. 1, art. V.

under the non-dynamic concept of "first in time." Commodities should be subject to the dynamic forces of risk allocation present in a market environment.

Law and economics scholars have presented strong evidence demonstrating that an equal sharing regime leads to profit maximization over a prior appropriation scheme.[55] A prior appropriator with superior rights will not be maximizing his profit if he continues to repeat behaviors that yield consistent losses in the aggregate; he will continue to produce wasteful products until the sovereign compels the appropriator to do otherwise. The withdrawal of a subsidy usually puts a stop to wasteful endeavors. Agriculture is the largest institutional user of water.[56] Such use may be "beneficial" in the eyes of the entitled but economic and environmental heresy to most others.

F. Agreements Attempting to Deal with Values

The basis for a strong international market-based regime exists in several agreements. The Agreement on Cooperation on Management of Water Resources in the Danube Basin[57] between the Federal Republic of Germany, the European Economic Community, and the Republic of Austria, sets strong criteria for exchange of information when determining the management of the Danube.[58] Although this treaty functions as little more than an "agreement to agree," the data disclosure function gives parties a strong basis upon which to allocate riparian resources. This type of agreement represents an excellent opportunity for each riparian to make market-based arguments that assure that appropriate flows are determined with attention to allotment, water quality, and economic impact of diminished flows. These values, once agreed upon, would be present in the resulting compact.

The Agreement on the Full Utilization of the Nile Waters[59] contains clauses for the allocation of short-term shortages, but not for long-run shortages. Like the Bellagio Treaty it contemplates water supply reduction.[60] Surpluses are allocated proportionally to pre-existing rights.[61] The surplus treatment could be characterized as inefficient if the preexisting rights are not profit-maximizers.[62] Thus, we return to the idea of prior appropriation. A problem with the very establishment of this treaty was the historical notion of water entitlement for agrarian pursuits.[63] Such entitlement based thought circumvents any notions of efficient use. Hence,

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55. Burness, *supra* note 5, at 121.

56. *Supra* note 4; *see* Crane, *supra* note 2, at 301.

57. Agreement on Cooperation on Management of Water Resources in the Danube Basin, Dec. 1, 1987, F.R.G.-Aus.-EEC, 1990 O.J. (L 90) 2.

58. *Id.* art. 1.

59. Agreement on the Full Utilization of the Nile Waters, Nov. 8, 1959, Egypt-Sudan, 453 U.N.T.S. 51 (1959).

60. *Supra* note 29.

61. *See* Goldenman, *supra* note 2, at 767.

62. *See generally* Burness, *supra* note 5.

63. *See* Goldenman, *supra* note 2, at 750.

the agrarian practices in Egypt demonstrate a misallocation by wasteful use.[64]

Similarly, the Agreement on Sharing the Ganges' Waters[65] contemplates allocation for short-term shortages, but does not contemplate long-term allocations. The base allocation is fixed, and the surplus is proportional.[66] To some extent these allocations are indicative of a more dynamic system as compared to a pure prior appropriations system. Fortunately, the prior appropriation elements in this agreement do not vest until times of plenty.

The Treaty on the Utilization of the Waters of the Colorado and Rio Grande[67] sets priorities, not temporally, but by most crucial needs.[68] Notions of equity favor this type of allocation over an absolute grant in time. For example, there is a general preference for domestic use over agrarian use.[69] These priorities allow a sovereign to allocate in times of crisis; however, an administrative solution is not required. Market priorities are clear. In most markets, water for domestic use is a higher priority than recreational use and is priced as such both in times of crisis and in non-critical times.[70]

G. The Problem with Administration

The Agreement on Regulations of Boundary Waters[71] between Spain and Portugal establishes minimum flow guarantees to Portugal, the downstream riparian. Unfortunately, the International Joint Commission (IJC) was unable to establish minimum flows of the Guadiana, a river of decreasing flows resulting from Spain's use and pollution.[72] This is the problem that results when non-private parties defer to a third party on allocating rights when that third party does not have a direct interest or a benchmark with which to measure flows.

The inequities of the Guadiana result from inefficient transboundary natural resources management.[73] Moreover, these inequities strikingly

64. *Id.* at 750-51.

65. Agreement on Sharing of the Ganges' Waters, Nov. 5, 1977, Bangl.-India, 17 I.L.M. 103 (1978).

66. Goldenman, *supra* note 2, at 758.

67. Treaty Relating to Water Utilization of the Colorado, Tijuana, and Rio Grande Rivers, Feb. 3, 1944, U.S.-Mex., 59 Stat. 1219, T.S. No. 944 (1944).

68. Crane, *supra* note 2, at 302.

69. Arizona, 373 U.S. at 620.

70. *See, e.g., APS Review Gas Market Trends,* Arab Press Service Organization, Dec. 21, 1992, *available in* LEXIS, Nexis Library, Arab Press Service File; Phil Hampton, *Despite Cost, Drought-Hit California Tests Desalination,* Gannett News Service, *available in* LEXIS, Nexis library, Gannett News Service file; Gerald Kopplin, *Minnesota Infant Fish Farming Industry Faces Opponents,* UPI, Jan. 24, 1990, *available in* LEXIS, Nexis Library, UPI File; Teresa Carp, *The State vs. The Quagmire,* OREGON BUSINESS, September, 1988, at 97.

71. Agreement on Regulations of Boundary Waters, Nov. 20, 1866, Spain-Port., 129 Consol. T.S. 453.

72. Dellapenna, *supra* note 9, at 812.

73. L.F.E. Goldie, *Equity and the International Management of Transboundary Resources,* 25 NAT. RESOURCES J. 665 (1985).

illustrate the essential nature of disclosure. Information on water quality and flow levels was the missing link that would have helped the downstream riparian make its case. The lack of this information compromised Portugal's position[74] in that no foundation for argument existed until things went seriously awry. Political and budgetary constraints on a sovereign or other third-party commission resource often leave such bodies unable to respond to the need for constant monitoring, necessitated by the dynamic nature of this resource. Unfortunately, many contemporary agreements call for "management" of resources without reference to an economic valuation. Other agreements are sensitive to some economically-based versus administratively-based allocation of waters.[75] The matter of Guadiana would be best dealt with by covenants drafted by parties who hold an interest in the riparian flow: Spain, Spanish riparians, Portugal, and Portuguese riparians. Regarding the pollution of the Guadiana, the upstream riparian is sending costs downstream in the form of pollution. Transboundary riparians would do well to document costs of remedies or lost profits. The Guadiana is dramatic evidence that the IJC is not the best allocator of resources. A market solution is required, but only after a benchmark of an equitable level is established. That benchmark must evolve from data.

III. A System for Valuation: Resource Efficiency

A. Off on the Right Foot: Initial Equitable Apportionment

Both upstream and downstream riparians should begin from an initial equitable apportionment (IEA) before negotiating any agreement or signing any treaty. The compact that develops should bind all riparians to economically tenable, market-based value of this resource. This market approach to water allocation is not a new concept.[76] The accumulation of data and projections based on historical usage, rate growth, climatological data, and water sources,[77] are essential to agreement. Adjusting provisions allowing for amendment as new data comes forward is essential to an enduring agreement. An assessment of variables in the long run will assure riparian progeny of a level of economic stability regarding this essential commodity. Premiums should be paid to riparians who choose not to subsidize or maintain industries which are perpetuated by loss-generating governmental programs. It is essential that the IEA favor efficiency over entitlement. That efficiency can only be achieved if the compacts created

74. *See generally* Dellapenna, *supra* note 9.

75. *Compare,* Maastricht Treaty, EEC, art. 130-39, Feb. 7, 1992, 31 I.L.M. 247 (1992) ("[T]he counsel, acting unanimously on a proposal from the Commission and after consulting the European Parliament and the Economic and Social Committee, shall adopt . . . measures concerning town and county planning [of the] management of water resources."), *with* Treaty Establishing the African Economic Community, Jun. 3, 1991, 30 I.L.M. 1241 (1991) ("The objectives of [the agreement] . . . [are] to contribute . . . to the . . . *long-term sustainable development* of the river basin.")(emphasis added).

76. *See generally* Corker, *supra* note 27.

77. For example, nonrechargeable sources may be designated by sovereigns as "reserves" requiring a long-term valuation. Surplus riparian flows may go to the highest valued use through a bidding procedure.

are responsive to changing market forces. Provisions allowing amendments upon a showing of changed circumstances are essential. In the long-run, riparians will bid for more or less allocation[78] depending on expected variances from the IEA. This market-based approach may avoid some of the environmental damages inherent in many transboundary water agreements,[79] damages resulting from agreements that are unresponsive to new information.

B. Externalities

Waste is a product of inefficiency and occurs when commodities are not properly valued. Improper valuation of true costs to an economic system is largely the result of externalities. Externalities are those costs which accrue to society-at-large from the acts of individual parties.[80] Sovereigns attempt to cure the injurious effects of externalities through regulatory regimes or taxing policies.[81] Withholding subsidies is often more beneficial to the efficient producers in the short-run, and to the prosperity of the sovereign in the long-term. Central to any efficient market is accurate information.[82] Indeed, the ideas set forth in this comment mandate a duty on the parties to disclose information so an equitable allocation of rights is possible. Information on water quality and flows could have helped the case of the Guadiana. Information from riparians on lost profits or increased costs would help settle claims. To internalize these externalities, it is essential to determine their true costs and then create provisions in the transboundary water agreements that address these costs.

C. Pareto Efficiency

Once the IEA is established and the true costs of various situations are ascertained, the system will be self sustaining. The agrarian will pay the urbanite for greater use of water, in an attempt to reach Pareto efficient trade,[83] where both parties are satisfied. The value of water to industries in an urban center will be compared to the competing agrarian users' valuation.

The assignment of non-absolute property rights is the initial stage in creating a market where values can be assessed and ultimately exchanged. Property rights are non-absolute because the doctrine of waste is never left out of the calculation. Bargaining from these market-established rights, the parties cannot fail to reach an efficient outcome.[84] As with all markets, information freely exchanged among the parties determines the proper val-

78. *See* Corker, *supra* note 27, at A1-38-A1-41.

79. Willey, *supra* note 53, at 398-399.

80. *See* JOHN A. BUTLIN, THE ECONOMICS OF ENVIRONMENTAL AND NATURAL RESOURCES POLICY 3, 23 (John A. Butlin ed., 1981).

81. *See* MCINERNEY, *supra* note 37, at 55.

82. *See* MICHEL POTIER, THE ECONOMICS OF ENVIRONMENTAL AND NATURAL RESOURCES POLICY 183 (John A. Butlin ed., 1981).

83. *See* HAL R. VARIAN, INTERMEDIATE MICROECONOMICS, 546-47 (1987).

84. R.H. Coase, *The Problem of Social Cost*, 3 J. L. & ECON. 1 (1960).

uation of rights. This move away from the concept of sovereigns holding absolute property rights[85] toward an efficiency-based market system focused on the long run will resolve most of the problems revealed in the multipartite malaise that is transboundary water law.[86]

D. Demands on the System

The governing body of a sovereign would do well to be sensitive to the demands of various economic sectors[87] on consumptive water use.[88] In the aggregate, inputs to the economic activity of choice determine the price the goods can fetch in the world market.[89] Favoring endeavors of positive economic impact would help determine notions of equitable use. Existing evidence demonstrates that a shift from traditional water uses to new applications results in positive economic impact, whereas subsidies have a negative impact.[90] The choice in output, if left up to the water resource consumer, would favor the more profitable alternative.[91] For example, agrarians are starting to learn the value in producing higher-value, less-thirsty crops.[92] These wealth-increasing practices will continue only if users are made to pay for the true value of water. Privatization of state-owned water systems is the first step in this process. The real valuation of water has proven itself effective in not only allocating the resource more efficiently but also creating environmentally-friendly and profitable outcomes.[93]

Nations must look to the entirety of the hydrodynamics within their borders. They must assess the waters accessible, the external demands such as population growth, and the industrial base. The advocacy of economic valuation of these factors is catching the ear of international organizations.[94] Once these factors are made part of a long-term plan, nations will be able to intelligently come to the negotiation table and draft treaties based on market reason. Usufructuary principles must be abandoned if transboundary water rights are to be allocated in such a way as to be self-sustaining.

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85. 21 Op. Att'y Gen. 281-92 (1898).

86. *See, e.g., supra* note 2.

87. *See* CORKER, *supra* note 27, at A1-38.

88. Parties may favor various industries over others. An eye on the factors required to produce the products of a given industry are important for intelligent long-run planning of water uses and needs. For example, one gallon of milk requires five gallons of water, one gallon of gasoline requires ten gallons of water, one pound of synthetic rubber requires 300 gallons of water. ALEXANDER & FICHTER, *supra* note 10.

89. *See, e.g., Japanese Technology: Highest Frontier,* Economist, Dec. 2, 1989, at 13.

90. Willey, *supra* note 53, at 407.

91. *See generally* Coase, *supra* note 84.

92. *Rice Crackers*, ECONOMIST, Aug. 7, 1993, at 58.

93. The United Kingdom's privatization of water companies began with a valuation system favoring cost of supply versus cost of the customer's home, such a system is environmentally preferable. *Greenery and Poverty*, ECONOMIST, Sept. 18, 1993, at 80.

94. *The Price of Everything, the Value of Nothing*, ECONOMIST, July 31, 1993, at 63.

IV. Conclusion

The failure to assign a real value to water denies society of the necessary touchstone for resolving transboundary water rights. Externalities and subsidies form some distortions that lead to waste. Any legal framework based on entitlement of water by the assignment of a usufructuary property value in a dynamic world economy is as responsive to change as a fly in amber. These entitlement-based vestiges, present in many transboundary treaties, are responsible for much of the waste evidenced.

Sovereigns should use market based rationalizations when making decisions on transboundary water rights. Once the parties determine an initial equitable position, provisions in the agreement to account for changes in system dynamics, based on full disclosure of all hydrological data, will play a central role to a truly equitable agreement. Sovereigns should focus on the long-term as population increases and demand strains the finite supply of potable water. These demands on the hydrologic system must be planned in advance, so each water user can be held to the disciplines of this commodity market.

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