CRITERIA FOR EQUITABLE ALLOCATIONS: THE HEART OF INTERNATIONAL WATER CONFLICT

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ABSTRACT

At the heart of most international water conflicts is the question of 'equitable' allocations, criteria for which are vague and often contradictory. However, application of an equitable water-sharing agreement along the volatile waterways of the globe is a prerequisite to hydropolitical stability. This paper explores the question of equity measures for water-sharing agreements in the context of global hydropolitics and is divided into three parts. The first section provides a brief summary of the general principles of equitable allocations. These include the general "rights-based" criteria for allocations which find favor in the legal realm, generally relying on relative hydrography or chronology of use, and the "efficiency-based" criteria of economics. The second section describes the practice of water resources allocations as exemplified in the Transboundary Freshwater Dispute Database -- a computerized database of 145 treaties relating to international water resources compiled at Oregon State University; 49 of these treaties delineate specific water allocations.

The third section contrasts the principles and practice of water equity. What is noticeable in reading through the practice of water conflict resolution, as documented in these 49 treaties, is just how rarely the general principles are explicitly invoked, particularly the extreme principles of absolute sovereignty or absolute riverain integrity. Many of the treaties simply divide water equally between riparians, some divide the benefits derived from the waters equally -- not at all the same thing. Most favor existing uses, and/or guarantees to down-stream riparians; the upstream riparian is favored only rarely. One interesting pattern which emerges, is that while many international water negotiations begin with differing legal interpretations of rights , whether measured by hydrography or chronology, they often shift rather to a needs-based criteria for water allocations, as measured by some mutually agreeable parameter such as irrigable land or population. Mostly, one is struck by the creativity of the negotiators in addressing specific language to each very specific local setting and concerns.

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THE PAPER

INTRODUCTION

As global populations continue to grow exponentially, and as environmental change threatens the quantity and quality of natural resources, the ability for nations to peacefully resolve conflicts over internationally distributed water resources will increasingly be a factor in stable and secure international relations. There are close to 261 international rivers, covering almost half of the total land surface of the globe, and untold numbers of shared aquifers (Wolf et al. forthcoming). Water has been a cause of political tensions between Arabs and Israelis; Indians and Bangladeshis; Americans and Mexicans; and all ten riparian states of the Nile River. Water is the only scarce resource for which there is no substitute, over which there is poorly-developed international law, and the need for which is overwhelming, constant, and immediate.

These resource conflicts will gain in frequency and intensity as water resources become relatively more scarce and their use within nations can no longer be insulated from impacting on one's neighbors. It has been suggested that more conscious attention to the art and science of negotiation, mediation and arbitration can provide useful insights for resolving these conflicts without recourse to the limited solutions possible in international courts of law or, worse, the devastating possibility of armed conflict.

The central issue at the heart of the international water quantity disputes is the fact that there are no internationally accepted criteria for allocating shared water resources, or their benefits. (1) The questions considered, although usually dealt with within the realms of law or economics, are inherently geographical (Karan 1961): Can one generalize a code of conduct for locations (watersheds) which are by nature hydrologically, politically, and culturally unique (White 1957)? How does one develop guidelines for allocating a vital resource which is mobile, which fluctuates in time and in space, and which ignores political boundaries?

This paper begins with a description of criteria for water-sharing which have evolved over time within legal and economic frameworks, and their strengths and weaknesses. This is followed by the contrast between these general principles and the practice of allocating water, as exemplified in transboundary water treaties. The Transboundary Freshwater Dispute Database includes a collection of 145 water treaties -- 49 of those delineate specific water allocations to co-riparians. Trends in treaty practice and the relative weights of general principles and the unique local setting are then described.

CRITERIA FOR WATER ALLOCATIONS -- GENERAL PRINCIPLES

At the heart of water conflict management, is the question of "equity." A vague and relative term in any event, criteria for equity are particularly difficult to determine in water conflicts, where international water law is ambiguous and often contradictory, and no mechanism exists to enforce principles which are agreed-upon. However, application of an "equitable" water-sharing agreement along the volatile waterways of the world is a prerequisite to hydropolitical stability which, finally, could help propel political forces away from conflict in favor of cooperation. It took decades of tense negotiations, for example, to reach accords on the Danube, Indus, Ganges, and Jordan Rivers, while talks continue in fits and starts along the Parana, the Nile and the Tigris-Euphrates. This section describes some measures of water-sharing equity which do exist, their strengths, and their weaknesses, in the context of global hydropolitics.

A. **International Water Law (2)**

According to Cano (1989, 168), international water law did not substantially begin to be formulated until after World War I. Since that time, organs of international law have tried to provide a framework for increasingly intensive water use, focusing on general guidelines which could be applied to the world's watersheds. These general principles of customary law, codified and progressively developed by advisory bodies and private organizations, are termed "soft law," and are not intended to be legally binding, but can provide evidence of customary law and may help crystallize that law. While it is tempting to look to these principles for clear and binding rules, it is more accurate to think in terms of guidelines for the process of conflict resolution: "(T)he principles (of customary law) themselves derive from the process and the outcomes of the process rather than prescribe either the process or its outcome" (Dellapenna, personal communication 1997).

The concept of a "drainage basin," for example, was accepted by the International Law Association (ILA) in the Helsinki Rules of 1966, which also provides guidelines for "reasonable and equitable" sharing of a common waterway (Caponera 1985). Article V lists no fewer than eleven factors which must be taken into account in defining what is "reasonable and equitable." (**3**) There is no hierarchy to these components of "reasonable use;" rather they are to be considered as a whole. One important shift in legal thinking in the Helsinki Rules is that they address the right to "beneficial use" of water, rather that to water per se (Housen-Couriel 1994, 10). The Helsinki Rules have explicitly been used only once to help define water use -- the Mekong Committee has used the Helsinki Rules definition of "reasonable and equitable use" in formulation of their Declaration of Principles in 1975, although no specific allocations were determined. (**4**)

When the United Nations considered the Helsinki Rules in 1970, objections were raised by some nations as to how inclusive the process of drafting had been. In addition and, according to Biswas (1993), more importantly, some states (Brazil, Belgium, China, and France, for instance) objected to the prominence of the drainage basin approach, which might be interpreted as an infringement on a nation's sovereignty. Others, notably Finland and the Netherlands, argued that a watershed was the most "rational and scientific" unit to be managed. Others argued that, given the complexities and uniqueness of each watershed, general codification should not even be attempted. On December 8, 1970, the General Assembly directed its own legal advisory body, the International Law Commission (ILC) to study "Codification of the Law on Water Courses for Purposes other than Navigation." (**5**)

It is testimony to the difficulty of marrying legal and hydrologic intricacies that the ILC, despite an additional call for codification at the U.N. Water Conference at Mar de Plata in 1977, took 21 years to complete its Draft Articles. It took until 1984, for example, for the term "international watercourse" to be adequately defined (a process described in exquisite detail by Wescoat 1992; see also Teclaff 1996). Problems both political and hydrological slowed the definition: in a 1974 questionnaire submitted to member states, about half the respondents (only 32 of 147 nations responded by 1982) supported the concept of a drainage basin (eg. Argentina, Finland and the Netherlands), while half were strongly negative (eg. Austria, Brazil, and Spain) or ambivalent (Wescoat 1992, 311); "watercourse system" connoted a basin, which threatened sovereignty issues; and borderline cases, such as glaciers and confined aquifers, both now excluded, had to be determined. In 1994, more than two decades after receiving its charge, the ILC adopted a set of 32 draft articles. (**6**) The UN General Assembly adopted the articles, with some revisions (**7**), as the Convention on the Law of the Non-Navigational Uses of International Watercourses on May 21, 1997. The vote was 103 in favor, three (Turkey, China, and Burundi) against, and 27 abstentions.

The 1997 Convention includes language very similar to the Helsinki Rules, requiring riparian states along an international watercourse in general to communicate and cooperate. Provisions are included for exchange of data and information, notification of possible adverse effects, protection of eco-systems, and emergency situations. Allocations are dealt with through equally vague but positive language. Much of the discussions leading to the Convention centered on how "reasonable and

equitable use" within each watercourse state, "with a view to attaining optimal utilization thereof and benefits therefrom," is balanced with an obligation not to cause significant harm (Tanzi 1997). Reasonable and equitable use is defined similar to the Helsinki Rules, to be based on a non-exhaustive list of seven relevant factors. (**8**) The text of the ILC articles does not offer guidelines for prioritizing these factors, suggesting in Article 6 only that "the weight to be given to each factor is to be determined by its importance," and that "all relevant factors are to be considered together." Article 10 says both that, "in the absence of agreement or custom to the contrary, no use...enjoys inherent priority over other uses," and that, "in the event of a conflict between uses..[it shall be resolved] with special regard being given to the requirements of vital human needs."

Groundwater is focused on, most recently, in the Ballagio Draft Treaty, developed as a document of "soft law" in a process described by Hayton and Utton (1989). It too includes eight factors for consideration in allocations, (**9**) and suggests that, "the weight to be given to each factor is to be determined by its importance in comparison with that of the other relevant factors."
The uniqueness of each basin and its riparian states suggest that any universal set of principles must, by necessity, be fairly general. The problems arise when attempts are made to apply this reasonable but vague language to specific water conflicts. For example, riparian positions and consequent legal rights shift with changing boundaries, many of which are still not recognized by the world community. Furthermore, international law only concerns itself with the rights and responsibilities of states. Some political entities who might claim water rights, therefore, would not be represented, such as the Palestinians along the Jordan or the Kurds along the Euphrates. (**10**)

The process is further complicated in the rare cases of formal litigation or arbitration -- there are few specialized institutions for international law making, interpreting, or enforcing. The International Court of Justice (ICJ) in the Hague, for example, hears cases only on specific points of law, only with the consent of the parties involved, and no practical enforcement mechanism exists to back up the Court's findings. A state with pressing national interests can therefore disclaim entirely the court's jurisdiction or findings (Rosenne 1995).

Given all the intricacies and limitations involved, it is hardly surprising that the International Court of Justice has only recently decided its first case regarding international water law. (**11**)

B. Rights-Based Criteria: Hydrography vs. Chronology

1. Extreme Principles

Customary international law has focused on providing general guidelines for the watersheds of the world. In the absence of such guidelines, some principles have been claimed regularly by riparians in negotiations, often depending on where along a watershed a riparian state is situated. Many of the common claims for water rights are based either on hydrography, i.e. from where a river or aquifer originates and how much of that territory falls within a certain state, or on chronology, i.e. who has been using the water the longest.

Initial positions are usually extreme (from Housen-Couriel 1994, and Matthews 1984). The "doctrine of absolute sovereignty" is often initially claimed by an upstream riparian. This principle, referred to as the Harmon Doctrine for the US attorney-general who suggested this stance in 1895 regarding a dispute with Mexico over the Rio Grande, argues that a state has absolute rights to water flowing through its territory (LeMarquand 1993; McCaffrey 1996) (**12**). Considering this doctrine was immediately rejected by Harmon's successor and later officially repudiated by the US (McCaffrey 1996), was never implemented in any water treaty (with the rare exception of some internal tributaries of international waters), was not invoked as a sources for judgment in any international water legal ruling, and was explicitly rejected by the international tribunal over the Lac Lanoux case in 1957 (described below), the Harmon Doctrine is wildly over-emphasized as a principle of international law. (**13**)

The down-stream extreme claim often depends on climate. In a humid watershed, the extreme principle advanced is "the doctrine of absolute riverain integrity," which suggests that every riparian is entitled to the natural flow of a river system crossing its borders. This principle has reached acceptance in the international setting as rarely as absolute sovereignty. In an arid or exotic (humid headwaters region with an arid down-stream) watershed, the down-stream riparian often has older water infrastructure which is in its interest to defend. The principle that rights are acquired through older use is referred to as "historic rights" (or "prior appropriations" in the US), that is, "first in time, first in right".

These conflicting doctrines of hydrography and chronology clash along many international rivers, with positions usually defined by relative riparian positions. (**14**) Down-stream riparians, such as Iraq and Egypt, often receive less rainfall than their up-stream neighbors and therefore have depended on river-water for much longer historically. As a consequence, modern "rights-based" disputes often take the form of upstream riparians such as Ethiopia and Turkey arguing in favor of the doctrine of absolute sovereignty, with downstream riparians taking the position of historic rights. (**15**)

2. Moderated Principles

It quickly becomes clear in negotiations that keeping to an extreme position leads to very little room for bargaining. Over time, rights become moderated with responsibility such that most states eventually accept some limitation to both their own sovereignty and to the river's absolute integrity. The process which led to the disavowal of the legal principles of absolute sovereignty and absolute riverain integrity was the Lac Lanoux case (Laylin and Bianchi 1959; MacChesney 1959). The Carol river crosses from the French into the Spanish Pyranees. In the early 1950's, France, asserting absolute sovereignty, proposed diverting water from the river across a divide towards the Font-Vive for hydropower generation -- Spain would be compensated monetarily. Spain objected, asserting absolute riverain integrity and the existing irrigation needs on its side of the border. Even when France agreed to divert back first the water needed for Spanish irrigation, then all of the water being diverted, through a tunnel between watersheds, Spain insisted on absolute riverain integrity, claiming it did not want French hands on its tap. (**16**) Both absolute principles were effectively dismissed when a 1957 arbitration tribunal ruled in the case that "territorial sovereignty...must bend before all international obligations," effectively negating the doctrine of absolute sovereignty. Yet the tribunal also admonished the downstream state from the right to veto "reasonable" upstream development, thereby negating the principle of natural flow or absolute riverain integrity. This decision made possible the 1958 Lac Lanoux treaty (revised in 1970), in which it is agreed that water is diverted out-of-basin for French hydropower generation, and a similar quantity is returned before the stream reaches Spanish territory.

The "doctrine of limited territorial sovereignty" reflects rights to reasonably use the waters of an international waterway, yet with the acknowledgment that one should not cause harm to any other riparian state.

In fact, the relationship between "reasonable and equitable use," and the obligation not to cause "significant harm," is the more-subtle manifestation of the argument between hydrography and chronology. As noted above, the 1997 Convention includes provisions for both concepts, without setting a clear priority between the two. The relevant articles are:

Article 5: 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 waterscourse States with a view to attaining optimal and sustainable utilization thereof and benefits therefrom, taking into account the interests of the waatercourse 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.

Article 7: Obligation not to cause significant harm

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

Article 10: Relationship between different kinds of uses

> 1. In the absence of agreement or custom to the contrary, no use of an international watercourse enjoys inherent priority over other uses.
> 2. In the event of a conflict between uses of an international watercourse, it shall be resolved with reference to the principles and factors set out in articles 5 to 7, with special regard being given to the requirements of vital human needs.

Not surprisingly, up-stream riparians have advocated that the emphasis between the two principles be on "equitable utilization," since that principle gives the needs of the present the same weight as those of the past. Likewise, down-stream riparians (along with the environmental and development communities) have pushed for emphasis on "no significant harm," effectively the equivalent of the doctrine of historic rights in protecting pre-existing use.

The debate over which doctrine, "reasonable use" or "no harm" shall have priority has been intense, and was one of the focuses of discussion leading to the Convention (Tanzi 1997). According to Khassawneh (1995, 24), the Special Rapporteurs for the ILC project had come down on the side of "equitable utilization" until the incumbency of J. Evensen, the third Rapporteur who argued for the primacy of "no appreciable harm." Commentators have had the same problem reconciling the concepts as the Rapporteurs: Khassawneh (1995, 24) suggests that the latter Rapporteurs are correct that "no appreciable harm" should take priority, while, in the same volume, Dellapenna (1995, 66) argues for "equitable use" and suggests that the evolution of Article 7 (which in the Convention includes a clause to mitigate harm and discuss compensation) is evidence of these intentions (personal communication, 1997). Wouters (1996) proposes that the ILC Draft clearly favors "no harm" but that treaty practice suggests that "equitable use" is more advisable. Utton (1996) describes the roots of "no harm" more as a water quality issue, and advises that the Convention be written as such. The World Bank, which must follow prevailing principles of international law in its funded projects, recognizes the importance of equitable use in theory but, for practical considerations, gives "no appreciable harm" precedent -- it is considered easier to define -- and will not finance a project which causes harm without the approval of all affected riparians (see World Bank 1993, 120; and Krishna 1995, 43-45).

Even as the principles for sharing scarce water resources evolve and become more moderate over time, the essential argument still emphasizes the rights of each State -- the sense that a riparian is entitled to a certain quantity or use of water depending on certain physical or historical constructs -- generally resting on the fundamental dispute between hydrography and chronology. In addition, defining concepts which are intentionally vague both for reasons of legal interpretation and for political expediency -- "reasonable," "equitable," and "significant" -- guarantee continued ambiguity in the principles of customary law.

C. Economic Criteria (17)

One lately emerging principle incorporated into water conflict resolution theory is the allocation of water resources according to its economic value. Here we distinguish between "efficiency" -- the allocation of water to its highest value use -- and "equity" -- the distribution of gains from an allocation (Howe 1996). The idea of an efficient distribution is that different uses and users of the water along a given water way may place differing values on the resource. Therefore, water-sharing should take into consideration the possibility of increasing the overall efficiency of water utilization by re-allocating the water according to these values. This principle alone may not be accepted as equitable, or fair, by the parties involved. However, inclusion of economic aspects in water resource allocation may enhance better cooperation and future collaboration in joint projects in the region of concern.

Allocation according to the economic value of water has usually been demonstrated using two approaches. The long-standing approach assumes a hypothetical central planning authority who knows what is "best" for society -- a "social planner" in economic terms -- who views the region as one planning unit. The social planner maximizes regional welfare subject to all available water resources in the region and given all possible water utilizing sectors. In some instances the social planner (government) also includes preferences (policy). A second approach is the "water market" approach which employs the market mechanism to achieve an efficient allocation of scarce water resources among competing users.

Examples of these approaches can be found in several studies which consider institutional and economic aspects of international cooperation for interbasin development. Goslin (1977) examined the economic, legal and technological aspects of the Colorado River Basin allocation between the US riparian states and Mexico. Krutilla (1969) analyzed the economics of the Columbia River Agreement between the US and Canada. LeMarquand (1976; 1977) has developed a framework to analyze economic and political aspects of a water basin development. And Haynes and Whittington (1981) suggested a social planner solution for the entire Nile Basin. One team of researchers has been working to monetize the water dispute on the Jordan River, arguing that it will be easier to negotiate responsibility for a sum of money than over a scarce and emotional natural resource (Fisher 1994).

These studies generally argue that to solve cooperatively the problem of water allocations within a basin, the parties involved should realize some mutual benefit that can be achieved only through cooperation and be allocated to the parties. In cases of cooperation, each party needs to participate voluntarily, and to accept the joint outcome from the cooperative project. Once a cooperative interest exists, the only problem which remains to be solved is the allocation of the associated joint costs or benefits. For a cooperative solution to be accepted by the parties involved, it is required that (a) the joint cost or benefit is partitioned such that each participant is better off compared to a non-cooperative outcome; (b) the partitioned cost or benefit to participants are preferred in the cooperative solution compared to sub-coalitions that include part of the potential participants, and (c) all the cost or benefit is allocated.

Recent studies have questioned the equity and justice associated with market allocations (see, for example, Margat 1989; London and Miley 1990; Tsur and Easter 1994; and Frohlich and Oppenheimer 1994), while others (eg. Wolf 1995; Dellapenna, forthcoming) question whether related issues of property rights, externalities, transaction costs, and intangible values can be resolved to the point necessary for a functional water market. The conclusion from these studies is that economic considerations alone may not provide an acceptable solution to water allocation problems, especially to solve water allocation disputes between nations.

Perhaps as a consequence of these issues, economic criteria have never been explicitly used to determine water allocations in an international treaty and, while in some cases States have

compensated co-riparians for water, no international water market has ever been established.

CRITERIA FOR WATER ALLOCATIONS -- PRACTICE

A. Transboundary Freshwater Dispute Database

The practice of allocating transboundary water resources can be found in the treaties negotiated between co-riparian states. The UN Food and Agriculture Organization has identified more than 3,600 treaties relating to international water resources dating between 805 and 1984, the majority of which deal with some aspect of navigation (UN FAO 1978; 1984). Since 1814, approximately 300 treaties have been negotiated which deal with non-navigational issues of water management, flood control or hydropower projects, or allocations for consumptive or non-consumptive uses in international basins. Restricting ourselves to those which deal with water per se, excluding those which focus on boundaries or fishing rights, we have collected the full text of 145 treaties in a Transboundary Freshwater Dispute Database (described in more detail in Hamner and Wolf 1998). The Database includes a systematic computer compilation of these treaties, which are catalogued by basin, countries involved, date signed, treaty topic, allocations measure, conflict resolution mechanisms, and non-water linkages. (**18**) It also includes primary and secondary sources on the negotiation processes for fourteen detailed case studies. (**19**)

The literature includes very little systematic work on the body of international water treaties as a whole, although authors have often used treaty examples to make a point about specific conflicts, areas of cooperation, or larger issues of water law (see for example Vlachos 1990; Eaton and Eaton 1994; Housen-Couriel 1994; Dellapenna 1995; and Kliot 1995). In two important exceptions, Dellapenna (1994) describes the evolution of treaty practice dating back to the mid-1800's, and Wescoat (1995) assesses historic trends of water treaties dating from 1648–1948 in a global perspective. Furthermore, the reports of the ILC Rapporteurs and related commentaries provide rich assessments of water treaty pracitce.

This section summarizes those treaties from the Transboundary Freshwater Dispute Database which explicitly delineate allocations between two or more nations. We exclude those which establish basin authorities or describe specific flood control or hydroelectricity projects if specific allocations are not described. For example, the 1957 accord which establishes the Mekong Committee is excluded, but a 1975 Declaration of Principles among the same riparians, which describes principles for water allocations, is included.

Of our collection of 145 treaties, 49 describe allocations for consumptive or non-consumptive uses. These treaties with water allocations generally come about in conjunction with boundary waters agreements, river development agreements, and/or single-project agreements. Our treaties are divided into those categories and summarized in Annex 1: International Treaties Which Delineate Water Allocations.

B. Water Conflicts and their Resolution: A Synopsis of Experience

What is noticeable in reading through the practice of water conflict prevention and resolution, as documented in these 49 treaties, is just how rarely the general principles are explicitly invoked, particularly the extreme principles of absolute sovereignty or absolute riverain integrity. Neither of these principles is encoded in a single one of the documents surveyed here. Some have pointed out that the fact that extreme principles are not invoked is precisely evidence that "equitable utilization" is the dominant underlying principle. While it may be true that, for an agreement to be reached, both sides have to see some degree of "equity" in an arrangement, its legal definition seems overly vague and relies too heavily on approval by the parties themselves. The argument that a normative principle needs be defined in the application of that principle feels somewhat circular. Furthermore, examination of the negotiating notes of our in-depth case studies reveals that these legal principles simply are not invoked in the process leading up to a treaty. (**20**) Rather than building from the legal

principles, technocrats generally enlist lawyers late in the process to help codify water management practices, based primarily on the hydrologic and political landscape.

In fact, each local setting is so diverse, both hydrologically and politically, that one is struck by the creativity of the negotiators in addressing specific code to each very specific situation. [See **Table 1 -- Unique Allocation Practices**.] As will be explored below, some divide waters equally between riparians; some divide the benefits derived from the waters equally -- not at all the same thing. Most favor existing uses, and/or guarantees to down-stream riparians; the upstream riparian is favored only rarely. But each has sections which address the specific setting and concerns of local geography. The trends found in our reading of these treaties are described in the sections which follow.

1. From Rights to Needs

As described above, many of the negotiations surveyed begin with parties basing their initial positions in terms of rights -- the sense that a riparian is entitled to a certain allocation based on hydrography or chronology of use. Up-stream riparians often invoke some variation of the Harmon Doctrine, claiming that water rights originate where the water falls. India claimed absolute sovereignty in the early phases of negotiations over the Indus Waters Treaty, as did France in the Lac Lanoux case, and Palestine over the West Bank aquifer. Down-stream riparians often claim absolute river integrity, claiming rights to an undisturbed system or, if on an exotic stream, historic rights based on their history of use. Spain insisted on absolute sovereignty regarding the Lac Lanoux project, while Egypt claimed historic rights against first Sudan, and later Ethiopia, on the Nile.

In almost all of the disputes which have been resolved, however, particularly on arid or exotic streams, the paradigms used for negotiations have not been 'rights-based' at all -- neither on relative hydrography nor specifically on chronology of use, but rather 'needs-based.' 'Needs' are defined by irrigable land, population, or the requirements of a specific project. **(21)** [See **Table 2 -- Examples of Needs-Based Allocations**.] In agreements between Egypt and Sudan signed in 1929 and in 1959, for example, allocations were arrived at on the basis of local needs, primarily of agriculture. Egypt argued for a greater share of the Nile because of its larger population and extensive irrigation works. In 1959, Sudan and Egypt then divided future water from development equally between the two. Current allocations of 55.5 BCM/yr. for Egypt and 18.5 BCM/yr. for Sudan reflect these relative needs (Waterbury 1979). **(22)**

Likewise along the Jordan River, the only water agreement for that basin ever negotiated (although not ratified) until very recently, the Johnston Accord, emphasized the needs rather than the inherent rights of each of the riparians. Johnston's approach, based on a report performed under the direction of the Tennessee Valley Authority, was to estimate, without regard to political boundaries, the water needs for all irrigable land within the Jordan Valley basin which could be irrigated by gravity flow (Main 1953). National allocations were then based on these in-basin agricultural needs, with the understanding that each country could then use the water as it wished, including to divert it out-of-basin. This was not only an acceptable formula to the parties at the time, but it allowed for a break-through in negotiations when a land survey of Jordan concluded that its future water needs were lower than previously thought. Years later, Israel and Palestine came back to needs in the Interim Agreement of 1995, where Israel first recognized Palestinian water rights on the West Bank -- a formula for agriculture and per capita consumption determined future Palestinian water needs at 70-80 MCM/yr. and Israel agreed to provide 28.6 MCM/yr. towards those needs.

Needs are the most-prevalent criteria for allocations along arid or exotic streams outside of the Middle East as well. Allocations of the Rio Grande/Rio Bravo and the Colorado between Mexico and the USA are based on Mexican irrigation requirements; Bangladeshi requirements determined the allocations of the Ganges, and Indus negotiations deferred to Pakistani projects (although estimates of needs are still disputed and changing, particularly in these latter two examples).

One might speculate as to why negotiations move from rights-based to needs-based criteria for

allocation. The first reason may have something to do with the psychology of negotiations. Rothman (1995), among others, points out that negotiations ideally move along three stages: the adversarial stage, where each side defines its positions, or rights; the reflexive stage, where the needs of each side bringing them to their positions is addressed; and finally, to the integrative stage, where negotiators brainstorm together to address each side's underlying interests. The negotiations here seem to follow this pattern from rights to needs and, occasionally, to interests. Where each negotiator may initially see him- or herself as Egyptian or Israeli or Indian, where the rights of one's own country are paramount, over time one must empathize to some degree to notice that even one's enemy, be he or she Sudanese, Palestinian, or Pakistani, requires the same amount of water for the same use with the same methods as oneself.

The second reason for the shift from rights to needs may simply be that rights are not quantifiable and needs are. We have seen the vague guidance that the 1997 Convention provide for allocations -- a series of occasionally conflicting parameters which are to be considered as a whole. If two nations insist on their respective rights of upstream versus down, for example, there is no spectrum along which to bargain; no common frame of reference. One can much more readily determine a needs-based criterion -- irrigable land or population, for example -- and quantify each nation's needs. Even with differing interpretations, once both sides feel comfortable that their minimum quantitative needs are being met, talks eventually turn to straightforward bargaining over numbers along a common spectrum.

Because of its relative success, needs-based allocations have been advocated in recent disputes as well, notably in and around the Jordan River watershed where riparian disputes exist not only along the river itself, but also over several shared groundwater aquifers. Gleick (1996) defines basic human needs, regardless of climate, as 50 liters per capita per day for personal use alone (18.25 m3/yr.) and, in earlier work (Gleick 1994) suggests 75 m3/yr. as appropriate minimum levels per capita for the Middle East. Shuval (1992) also argues for a minimum baseline allocation between Israel, West Bank Palestinians, and Jordan, based on a per capita allotment of 100 m3/yr. for domestic and industrial use plus 25 m3/yr. for agriculture. He adds 65% of urban uses for recycled wastewater, and advocates a series of water import schemes and desalination plants to provide the difference between regional supply and future demand.

Wolf (1993) likewise advocates a needs-based approach, but considers new sources such as recycled wastewater as separate issues. He plans for total urban needs of 100 m3/yr. per person, and extrapolates to the point in the future where all of the basin's 2,500 MCM/yr. has to be allocated first to these needs, in other words when the regional population reaches 25 million, expected in the early part of the next century.

2. Relative Hydrography versus Chronology of Use

As described above, generalized legal principles focus on some version of upstream versus downstream relations, whether defined in the extreme as absolute sovereignty versus absolute riverain integrity or versus historic rights, or more moderately as equitable use versus the obligation not to cause harm. In practice, the only situation in which there is still any ambiguity is along humid, under-developed rivers. Along arid or exotic streams, where some aspect of consumptive use is involved, there is very little debate -- prior uses are always protected in the treaties which describe them (with only one exception, described below) and, in general, downstream needs are favored. Nine treaties do not address the issue at all, simply basing their allocations equally between two riparians.

Absolute Principles

As noted above, the dispute which led to the disavowal of the legal principles of both absolute sovereignty and absolute riverain integrity was the Lac Lanoux case of 1957, which found, in short, that, "...the upstream State has a right of initiative...provided it takes into consideration in a

reasonable manner the interest of the downstream State" (cited in MacChesney 1959, 170).

The only situations in which absolute rights are codified in treaties are relating to some tributaries of international waterways in conjunction with broader boundary waters accords, always in a quid pro quo arrangement. Such is the case in only three of our case studies. Mexico and the USA each retain absolute sovereignty to some internal tributaries of the Rio Grande/Rio Bravo, for example. In a 1950 boundary waters agreement, of five tributaries of the Isar which flow from Austria to Bavaria, one is allowed to flow freely to Bavaria, two can be developed entirely by Austria, and two can be developed by Austria provided it allows minimum flows during winter months. Interestingly in this case, and perhaps adding incentive to a particularly creative agreement, Austria is upstream riparian on these tributaries to the Isar, then becomes a down-stream riparian to Bavaria (Germany) after the Isar flow into the Danube, which bends back into Austria. In contrast, a 1925 accord on the streams which form the boundaries between Finland and Norway allocates each state half the boundary streams, but absolute sovereignty to each state over all the tributaries to those streams in which both banks are within one country.

Prior Uses

In contrast to the extreme rarity with which absolute principles are codified, prior uses are regularly protected (with one major exception, described below), notably in every single boundary waters accord in our collection.

The entire focus of some treaties is on protecting existing uses. All of the six existing treaties regarding the Nile, for example, are about protecting Egyptian uses in early years, later those of Egypt and Sudan. More often, a clause is included in a broader treaty, whether the focus is boundary demarcations, boundary waters, or water resources development, which protects existing uses. Peru continues to supply water to Ecuadorian villages, for example, as part of their 1944 boundary demarcation. The boundary water accords between the USA and Canada, and between the USA and Mexico, all have prior use clauses included. A 1969 accord between Portugal, for Angola, and South Africa, for Southwest Africa, which describes an elaborate river development project, includes "humanitarian" allocations for human and animal requirements in South West Africa.

The supremacy of prior uses would not necessarily be surprising in those cases along arid or exotic streams, where investment in irrigation infrastructure has long relied on the knowledge of a stable supply, even on humid region rivers, and even as water is divided proportionally, prior uses are generally protected. The boundary agreement between Russia and China along the Horgos River divides the water equally, but protects the uses of existing canals and one Chinese outpost. The three boundary waters accords between Austria, Hungary, and Czechoslovakia, all allocate each two signatories half the natural flow of shared rivers, "without prejudice to acquired (or existing) rights."

The only treaty in which existing uses were relinquished is the 1995 Israel/Palestine accord on West Bank and Gaza aquifers. Israel began tapping into these aquifers as long ago as 1955; before the accord they made up as much as 40% of Israel's renewable freshwater supply (Wolf 1995). Because two of the three West Bank aquifers naturally flow to Israel, and because they had been using the water longer, Israelis had been claiming prior rights in peace negotiations. By recognizing and quantifying Palestinian needs, and by agreeing to provide 28.6 MCM/yr. towards those needs, the 1995 accord represents the only case in which prior rights are explicitly relinquished.

Again, we might speculate on the inherent supremacy of prior uses. First, we have noted the shift in thinking from rights to needs -- existing water use is a pretty clear expression of "needs." Second, treaties with clauses for water allocations generally come about in conjunction with a boundary delineation, a division of boundary waters, or an agreement over future river development. In each of these cases, those using the water are important constituents of those party to the negotiations. In the former two cases regarding boundary waters, negotiations would probably be carried in the political arena where the support of those living within a watershed would be vital to an accord's success. In

the case of river development, the technocrats who negotiate these treaties, usually from water agencies, are generally extremely aware of the needs of those in a basin. In all cases, existing uses represent existing constituents, in contrast to hypothetical users or future generations -- groups whose influence is particularly difficult to enlist.

Upstream/Downstream Relations

Rights inherent in an upstream or downstream position are not explicitly claimed in any of the treaties in our collection. This should not be understood to suggest that the upstream/downstream relationship is ignored; only that when it is addressed, it is done so implicitly.

In general, the downstream riparian is favored, or at least its allocations are protected, along arid and exotic streams. This is not to say that the down-stream riparian receives more water, since this is not always the case -- Mexico receives less water on both the Colorado and the Rio Grande/Rio Bravo than the USA -- only that it is the allocations of the downstream riparian which are generally delineated and protected. Mexico, Egypt, Bangladesh, and Pakistan all have their needs defined and guaranteed in their respective treaties. This precedence probably comes about as a consequence of two earlier observations -- that rights give way to needs and that prior uses are generally protected. Since there is more, and generally older, irrigated agriculture downstream on an arid or exotic stream, and since agricultural practices predate more recent hydroelectric needs -- the sites for which are in the headwater uplands -- the downstream riparian would have greater claim whether measured by needs or by prior uses of a stream system.

The only treaties in which upstream allocations are delineated (except for the internal tributaries granted absolute sovereignty noted above), are on boundary waters agreements in humid regions. The 1956 boundary waters accord between Austria and Hungary grants the upstream state up to one third of the water of any of the covered river systems. (This is an interesting exception, for which I have no explanation -- similar treaties between Austria and Czechoslovakia, and between Czechoslovakia and Hungary, have no such provision.) Three other humid boundary water agreements simply divide the waters equally -- Austria/Hungary, Czechoslovakia/Hungary, and Finland/Norway. In the only treaty which explicitly favors the upstream riparian, the 1925 accord on the Gash between Italy, for Eritrea, and the United Kingdom, for Sudan, not only grants upstream Eritrea all of the low flow and half of the moderate flow of the stream, Sudan also agreed to pay Eritrea a share of what was received for agricultural cultivation in the Gash Delta.

Prioritizing Use

The Helsinki Rules list eleven hydrographic and socio-political factors which ought to be taken into account as a whole in water allocations; the 1997 Convention lists seven, but does suggest that the "requirements of vital human needs" be given "special regard." Neither set of parameters have been explicitly used in any treaty to derive allocations. The Helsinki Rules are listed, verbatim, only in the 1975 Mekong Agreement -- and the criteria that a benefit-cost ratio for each proposed project be performed is added -- but no allocations are derived.

Four treaties do differentiate between types of use (other than existing uses, described above), but they use many less criteria and each list is prioritized. [See **Table 3 -- Prioritizing Use**.] After listing the criteria from the Helsinki Rules, for example, the Mekong Agreement gives domestic and urban uses a preference. The two sets of boundary waters agreements between the USA and Canada, and the USA and Mexico prioritize differently, probably due to the amount of water available along each border region: the former prioritizes by domestic and sanitary, navigation, and power and irrigation; the latter gives descending weight to domestic, agriculture, electric power, other industry, navigation, fishing, and other beneficial uses. The 1960 Indus Waters Treaty lists its order of priority as domestic, non-consumptive, agriculture, and hydro-power. Notably absent in all of these lists are any instream or other environmental requirements. (**23**)

3. Economic Criteria: Beneficial Uses and "Baskets" of Benefits

Beneficial Uses

As described above, economists suggest that water, like any scarce resource, should be allocated to its most efficient use. In practice, economic criteria have influenced water allocations only in the exception.

The one topic most affected by economic criteria is when principles of "beneficial" uses are specifically defined, notably in treaties describing hydropower or river development projects. Of the 28 treaties in these two categories, five allocate water equally. Two of the 28 refer not to equal allocations, but to equal allocations of benefits -- not at all the same thing. The boundary waters agreement between the USA and Canada, for example, allocates water according to equal benefits, usually defined by hydropower generation. This results in the odd arrangement that power may be exported out of basin for gain, but the water itself may not. In the 1964 treaty on the Columbia, an arrangement was worked out where the USA paid Canada for the benefits of flood control and Canada was granted rights to divert water between the Columbia and Kootenai for hydropower. Likewise, the 1975 Mekong accord defines "equality of right" not as equal shares of water, but as equal rights to use water on the basis of each riparian's economic and social needs. The relative nature of "beneficial" uses is exhibited in a 1950 agreement on the Niagara, which provides a greater flow over the famous falls during "show times" of summer daylight hours, when tourist dollars are worth more per cubic meter than the alternate use in hydropower generation.

While compensation for lost power generation or flooded land is fairly common, appearing in ten of the 28 development treaties, compensation for water itself is not -- only four of all 49 treaties have such provisions. In the first such accord, a 1910 agreement on Aden groundwater, Great Britain agreed to pay the Sultan of the Abdali 3,000 rupees a month if the proposed wells went unmolested; otherwise the price dropped to 15 rupees per 100,000 gallons. In a 1926 accord on the Cunene River, no charge was made for water diverted for subsistence, but South Africa would pay unspecified fees to Portugal if the water were used for "purposes of gain." South Africa not only paid much of the development costs of the Lesotho Highlands project, but it pays Lesotho outright for water delivered. In a slight twist, Great Britain agreed in 1926 to pay upstream Eritrea a share of its cultivation in the Gash delta -- 20% of any sales over £50,000. Payments were discontinued when Great Britain took control of Eritrea in WWII.

The treaty with the most economic influence is the 1995 groundwater agreement between Israel and Palestine. While no payments are made outright for water, provisions are included to consider water markets in the future, and the two sides agree not to subsidize marketed water -- moves long encouraged by economists to promote efficient use. (**24**)

"Baskets" of Benefits

In most of these treaties, water issues are dealt with alone, separate from any other political or resource issues between countries -- water qua water. By separating the two realms of "high" and "low" politics, or by ignoring other resources which might be included in an agreement, some have argued, the process is either likely to fail, as in the case of the 1955 Johnston accords on the Jordan, or more often to achieve a sub-optimum development arrangement, as is currently the case on the Indus agreement, signed in 1960. Increasingly, however, linkages are being made between water and politics, between water and other resources. These multi-resource linkages may offer more opportunities for creative solutions to be generated, allowing for greater economic efficiency through a "basket" of benefits. Some resources which have been included in water negotiations include:

Financial resources. An offer of financial incentives is occasionally able to circumvent impasses in negotiations. World Bank financing helped resolve the Indus dispute, while UN-led investments help

achieve the Mekong Agreement. Cooperation-inducing financing has not always come from outside of the region. Thailand helped finance a project in Laos, as did India in Pakistan, in conjunction with their respective watershed agreements. A provision of the Nile Waters Treaty has Egypt paying Sudan outright for water to which they both agreed Sudan had rights, but that it was not able to use.

Energy resources. One increasingly common linkage being made is that between water and energy resources. As noted above, in conjunction with the Mekong Agreement, Thailand helped fund a hydroelectric project in Laos in exchange for a proportion of the power to be generated. In the particularly elaborate 1986 Lesotho Highlands Treaty, South Africa agreed to help finance a hydroelectric/water diversion facility in Lesotho -- South Africa acquired rights to drinking water for Johannesburg, and Lesotho receives all of the power generated. Similar arrangements have been suggested in China on the Mekong, Nepal on the Ganges, and between Syria and Jordan on the Yarmuk.

Political linkages. Political capital, like investment capital, might likewise be linked to water negotiations, although no treaty to date includes such provisions. This linkage might be done implicitly, as for example the parallel but interrelated political and resource tracks of the Middle East peace talks, or explicitly, as talks between Turkish acquiescence on water issues have been linked in a quid pro quo with Syrian ties to Kurdish nationalists.

Data. As water management models become more sophisticated, water data is increasingly vital to management agencies. As such, data itself can be used as a form of negotiating capital. Data-sharing can lead to breakthroughs in negotiations -- an engineering study allowed circumvention of an impasse in the Johnston negotiations when it was found that Jordan's water needs were not as extensive as had been thought, allowing for more room in the bargaining mix. In contrast, the lack of agreed-to criteria for data in negotiations on the Ganges has hampered progress over the years.

Data issues, when managed effectively, can also allow a framework for developing patterns of cooperation in the absence of more contentious issues, particularly water allocations. For one, data gathering can be delegated to a trusted third party or, better, to a joint fact-finding body made up of representatives from the riparian states. Perhaps the best example of this internationally is on the Mekong, where the Mekong Committee's first five-year plan consisted almost entirely of data-gathering projects, effectively both precluding data disputes in the future, and allowing the riparians to get used to cooperation and trust.

Water-related "baskets." Some of the most complete "baskets" were negotiated between India and Nepal, in 1959 on the Bagmati and the Gandak, and in 1966 on the Kosi (all tributaries of the Ganges). These two treaties include provisions for a variety of water related projects, including irrigation/hydropower, navigation, fishing, related transportation, and even aforestation -- India plants trees in Nepal to contain downstream sedimentation. While Nepal has expressed recent bitterness to both these accords, the structures of these treaties are good examples of how broader "baskets" can allow for more creative solutions.

4. The Unique Local Setting

While most of the debate in the realm of customary law has been over trying to accommodate as many concerns as possible in an attempt to find generalized principles for all of the world's international water, riparians of these basins have in the meantime been negotiating agreements which focus on specifically local concerns and conditions. Further distinguishing the generalized principles from specific practices, while many of these treaties incorporate particularly local issues, they often include a clause which explicitly disavows the treaty as setting an international precedent. The 1950 accord on Austria/Bavaria boundary waters is typical: "Notwithstanding this agreement," it reads, each State maintains its "respective position regarding the legal principles of international waters." The most-recent agreement in our collection, the 1996 Ganges Agreement, includes the similar provision that the parties are "desirous of finding a fair and just solution without...establishing

any general principles of law or precedent."

The uniqueness of each basin, whether hydrological, political, or cultural, stands out in the creativity of many of the treaties. The 1969 accord on the Cunene River allows for "humanitarian" diversions solely for human and animal requirements in Southwest Africa as part of a larger project for hydropower. Water loans are made from Sudan to Egypt (1959), and from the USA to Mexico (1966). Jordan stores water in an Israeli lake while Israel leases Jordanian land and wells (1994), and India plants trees in Nepal to protect its own water (1966). In a 1964 agreement, Iraq "gives" water to Kuwait, "in brotherhood," without compensation. In contrast, a 1957 agreement between Iran and the USSR has a clause which allows for cooperation in identifying corpses found in their shared rivers.

The changes of local needs over time are seen in the boundary waters between Canada and the USA. Even as the boundary waters agreements of 1909 were modified in 1941 to allow for greater hydropower generation in both Canada and the United States along the Niagara to bolster the war effort, the two states nevertheless reaffirmed that protecting the "scenic beauty of this great heritage of the two countries" is their primary obligation. As noted above, the 1950 revision continued to allow hydropower generation, but allows a greater minimum flow over the falls during summer daylight hours, when tourism is at its peak.

Cultural geography can overwhelm the capacity of generalized principles as well. In 1997 discussions among the riparians of the Euphrates basin, Syrians objected strenuously to proposals for water pricing. This led to a temporary impasse until it was explained by an outside observer that some Islamic legal interpretation forbids charging money for water itself; the term was modified to "tariff," to represent costs only for storage, treatment, and delivery, and discussions were able to proceed.

In what will no doubt become a classic modification of the tenets of international law, Israelis and Jordanians invented legal terminology to suit particularly local requirements in their 1994 peace treaty. In negotiations leading up to the treaty, Israelis, arguing that the entire region was running out of water, insisted on discussing only water "allocations;" that is, the future needs of each riparian. Jordanians, in contrast, refused to discuss the future until past grievances had been addressed -- they would not negotiate "allocations" until the historic question of water "rights" had been resolved.

There is little room to bargain between the past and the future, between "rights" and "allocations." Negotiations reached an impasse until one of the mediators suggested the term "rightful allocations" to describe simultaneously historic claims and future goals for cooperative projects -- this new term is now immortalized in the water-related clauses of the Israel-Jordan Treaty of Peace.

CONCLUSIONS

The major barrier to water's role as an agent of peaceful relations is the lack of a widely accepted measure for equitably dividing shared water resources. This paper explored the generalized principles for delineating water allocations, as manifested in customary water law and the efficiency-based context of economic theory, as well as how allocations are delineated in practice, as exhibited in the 49 treaties of the Transboundary Freshwater Dispute Resolution Database which specify water allocations.

In describing the current state of international water law, most recently exhibited in the 1997 Convention, we found a history of attempts at generalizing principles for the roughly 300 international waterways of the world. Although the document has important components to fostering peaceful relations, it is somewhat vague and even contradictory in its guidelines for the process of allocating transboundary water resources. The document advises "reasonable and equitable" use, and offers a series of considerations which ought to be taken into account. But it also institutionalizes an inherent conflict between the "rights-based" positions of the upstream riparian -- the principle of

equitable use, sometimes argued in lieu of absolute sovereignty -- and the downstream riparian -- the obligation not to cause significant harm, a refined protection historic rights. Little room for bargaining is left between this rights-based opposition between hydrography and chronology.

Economic theory eschews both upstream and downstream views in favor of the concept of basinwide efficiency. Two economic approaches were described -- the social planner and the water market. Each, it has been argued, could contribute an effective measure to the most-efficient distribution either of water itself, or of the benefits brought about by its cooperative use. Objections have been raised, however, to the equity and justice of "efficient" distributions.

The latter part of the paper described the practice of transboundary water allocations as exemplified in 49 treaties which actually delineate transboundary water resources. In our reading of these treaties, we found surprisingly little explicit influence of the generalized principles, whether legal or economic. Rather, each treaty showed sometimes exquisite sensitivity to the unique setting and needs of each basin.

The trends we found generally included:

1) A shift in positions often occurs during negotiations from "rights-based" criteria, whether hydrography or chronology, in favor of "needs-based" values, based on irrigable land or population, for example. We speculated that this shift may be based on the psychology of negotiations, or simply because needs or easier to quantify than rights.

2) In the inherent disputes between upstream and downstream riparian and existing and future uses, we found that the needs of the down-stream riparian are more-often delineated -- upstream needs are mentioned only in boundary waters accords in humid regions -- and that existing uses are generally protected. We also found that specific uses are occasionally prioritized, although instream and environmental requirements are ignored in these priorities.

3) Economic benefits have not been explicitly used in allocating water, although economic principles have helped guide definitions of "beneficial" uses and have suggested "baskets" of benefits, including both water and non-water resources, for positive-sum solutions.

4) The uniqueness of each basin is repeatedly suggested, both implicitly and explicitly, in the treaty texts. The generalized guidelines offered for allocations, whether based on legal or economic equity, have difficulty capturing the geographic uniqueness of each of the world's international waterways, whether hydrological, political, or cultural aspects. As Gilbert White has been arguing for at least 40 years -- that "if there is any conclusion that springs from a comparative study of river systems, it is that no two rivers are the same" (White 1957, 160).

These conclusions suggest a middle ground between the absolute uniqueness of each basin (which implies the futility of searching for common principles) and the feasibility of delineating clear and authoritative guiding principles for allocations which would work like an algorithm for all of the transboundary waters of the world. What Wescoat (personal communications, 1998) refers to as "patterns of practice," suggest that, now that the Convention has been approved, it may be time to shift the emphasis from defining generalized principles to encouraging treaty negotiations for each transboundary basin -- there are "only" about 300 transboundary watersheds. Despite the inherent difficulties, treaties are not only the best representation of local needs and settings, but they also carry the highest priority in international law. By encouraging local negotiations, global political issues could also be better avoided. Why should China's concerns over sovereignty interfere with Belgium, France, and the Netherlands developing cooperative integrated management over the Schelde? And in turn, why should the Schelde be the model for the Euphrates, where the direction for international management seems to be toward each riparian being responsible for an agreed-to quantity and quality crossing each respective boundary at agreed-to times?

As Wescoat (1992, 329) has argued in his review of the ILC rules, "a searching examination of past agreements might have underscored the importance of historical and geographical perspectives on international water problems." We think it has.

TOP

TABLE 1: UNIQUE ALLOCATION PRACTICES

PRINCIPLE	PERCENT (NUMBER) OF TREATIES
Half of flow to each of two riparians	6% (9/149)
Absolute sovereignty on tributaries	2% (3/149)
Relinquish prior uses	0.6% (1/149)
Prioritize uses	3% (4/149)
Equal allocations of benefits	1% (2/149)
Compensation for lost benefits	7% (10/149)
Payments for water	3% (4/149)

TABLE 2: EXAMPLES OF NEEDS-BASED CRITERIA

Treaty	Criteria for Allocations
Egypt/Sudan (1929, 1959, Nile)	"Acquired" rights from existing uses, plus even division of any additional water resulting from development projects
Johnston Accord (1956, Jordan)	Amount of irrigable land within the watershed in each State
India/Pakistan (1960, Indus)	Historic and planned use (for Pakistan) plus geographic allocations (western vs. eastern rivers)
South Africa (Southwest Africa)/Portugal (Angola) (1969, Cunene)	Allocations for human and animal needs, and initial irrigation
Israel-Palestinian Interim Agreement (1995, shared aquifers)	Population patterns and irrigation needs

TABLE 3: PRIORITIZING USES

	USA/Mexico Boundary Waters (1906, 1944)	USA/Canada Boundary Waters (1910)	Indus Waters Treaty (1960)	Mekong Agreement (1975)
Order of priorities:	1) domestic	1) domestic and sanitary	1) domestic	1) domestic and urban uses
	2) agriculture	2) navigation	2) non-consumptive	2) other criteria from Helsinki Rules w/out priority
	3) electric power	3) power and irrigation	3) agriculture	

4) other industry	4) hydro-power
5) navigation	
6) fishing	
7) other beneficial uses	

TOP

FOOTNOTES

1. As will be argued below, this is true despite the 1997 Convention on the Law of the Non-Navigational Uses of International Watercourses, whose guidelines do not offer the specificity necessary for unequivocal allocations.

2. Some of the following discussion is drawn from Wolf, A. "International Water Conflict Resolution: Lessons from Comparative Analysis." Water Resources Development. Sept. 1997.

3. The factors include a basin's geography, hydrology, climate, past and existing water utilization, economic and social needs of the riparians, population, comparative costs of alternative sources, availability of other sources, avoidance of waste, practicability of compensation as a means of adjusting conflicts, and the degree to which a state's needs may be satisfied without causing substantial injury to a co-basin state.

4. While this is the sole case of the Helsinki Rules definitions being used explicitly in treaty text, the concept of "reasonable and equitable use" is quite common, as is described below.

5. In its reference to the ILC, the General Assembly excised all mention to the Helsinki Rules to allay political concerns over the drainage basin approach (Wescoat 1992, 307).

6. ILC Draft Articles on the Non-navigational Uses of International Watercourses, 1994. UN Doc. A/CN.4/L492 (1994). For history and commentary, see United Nations. Yearbook of the ILC from 1974-1991.

7. Much of the debate focused on issues such as the place of environmental sustainability, the degree to which the Convention affected past and future treaties, and the relationship between "reasonable and equitable use" and the "obligation not to commit harm," as will be explored below. See Tanzi (1997) for more detail.

8. These factors include: geographic, hydrographic, hydrological, climatic, ecological, and other natural factors; social and economic needs of each riparian state; population dependent on the watercourse; effects of use in one state on the uses of other states; existing and potential uses; conservation, protection, development and economy of use, and the costs of measures taken to that effect; and the availability of alternatives, of corresponding value, to a particular planned or existing use.

9. The eight factors for consideration are: hydrogeology and meteorology; existing and planned uses; environmental sensitivity; quality control requirements; socio-economic implications; water conservation practices; artificial recharge potential; and comparative costs and implications of alternative sources of supply. In separate comments, Hayton and Utton (1989) suggest that a Commission, established under treaty, should also consider the traditional rights of nomadic or tribal peoples of a border region.

10. Dellapenna (personal communication, 1997) points out that their are differences between these

two examples, in that the Palestinians do have some degree of autonomy and even sovereignty within their territory. He uses the term "national communities" for the riparians of the Jordan River to make this distinction.

11. The single ruling was a 1997 case on the Gabcikovo Dam on the Danube, between Hungary and Slovakia. The ICJ came into being in 1946, with the dissolution of its predecessor, the Permanent Court of International Justice. That earlier body did rule on four international water disputes during its existence from 1922-1946.

12. "The fundamental principle of international law is the absolute sovereignty of every nation, as against all others, within its own Territory" (cited in LeMarquand 1993, 63). Harmon was making the hydrologically preposterous argument that upstream water diversions within the territorial US would not legally affect downstream navigation on international stretches of the Rio Grande since the diversions were to be carried out by individuals, not States (McCaffrey 1997).

13. As far back as 1911, the Institut de Droit International had asserted that the dependence of riparian states on each other precludes the idea of absolute autonomy over shared waters (Laylin and Bianchi 1959, 46).

14. The inherant conflict between upstream and downstream riparian occurs in most settings and scales. Crawford (1988, 88-90) describes such disputes along the traditional acequia canal systems in New Mexico.

15. For examples of these respective positions, see the exchange between Jovanovic (1985, 1986) and Shahin (1986) in respective issues of Water International about the Nile; and the description of political claims along the Euphrates in Kolars and Mitchell (1991).

16. This is a concern which is raised regularly in negotiations, recently between Egypt and Ethiopia, and for a series of proposed canals from Turkey or Lebanon into the Jordan basin. It is primarily this concern which causes Israel to emphasize desalination over possibly less-expensive water import schemes.

17. Some of the following discussion is drawn from Wolf, A. and A. Dinar. "Middle East Hydropolitics and Equity Measures for Water-Sharing Agreements." Journal of Social, Political, and Economic Studies. Vol. 19 #4, Spring 1994.

18. We expect that both the full text of each treaty and the compilation of summaries will be up-loaded to the World Wide Web by the time this article is published. See the Home Page of the Oregon State University Department of Geosciences <**http://terra.geo.orst.edu/**> for more information.

19. These cases include nine watersheds (the Danube, Euphrates, Jordan, Ganges, Indus, Mekong, Nile, La Plata, and Salween); two sets of aquifer systems (US–Mexico shared systems and the West Bank Aquifers); two lake systems (the Aral Sea and the Great Lakes); and one engineering works (the Lesotho Highlands Project).

20. The exception in our case studies is the 1995 Mekong Agreement, probably because it is the only case where the mediator/facilitator, George Radosevich, is himself an international lawyer.

21. Here we distinguish between "rights" in terms of a sense of entitlement, and legal rights. Obviously, once negotiations lead to allocations, regardless of how they are determined, each riparian has legal "rights" to that water, even if the allocations were determined by "needs."

22. It should be pointed out that not everyone's needs were considered in the Nile Agreements,

which included only two of the ten riparian states -- Egypt and Sudan, both minor contributors to the river's flow. The notable exception to the treaty, and the one which might argue most adamantly for greater sovereignty, is Ethiopia, which contributes between 75-85% of the Nile's flow.

23. This may be changing: at a 1997 meeting on international waters of Latin America, a representative of the Global Environmental Facility suggested that watershed needs start with the environmental needs at the delta and work backwards.

24. Water subsidies within each party's territory are not covered by the agreement and will probably continue.

TOP