

International Water Conflict Resolution: Lessons from Comparative Analysis

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ABSTRACT *This paper offers lessons learned for the process of resolving international freshwater conflicts from the combined experience of treaty negotiations, process case studies, and a series of forums on international waters. The first section describes the current state of international water institutions and law, and discusses weaknesses in each structure. The second section describes recent attempts at the resolution of international water disputes as exemplified in 140 transboundary water treaties and 14 process case studies collected on the University of Alabama Transboundary Freshwater Dispute Database, and at the three Forums of the International Water Resources Association (IWRA) Committee on International Waters. Lessons learned are then described in the third section for the three stages of negotiation. During the pre-negotiation stage, lessons are to be found for involvement in advance of conflict, and indicators suggested both for possible water conflict and for the type and intensity of a pending dispute. During the negotiation stage, common obstacles to successful negotiations are suggested and the lessons of introducing multi-resource linkages to encourage positive sum solutions are offered. For the implementation stage, often ignored parameters are described—physical, economic and political—as are aspects unique to water resources that can encourage cooperation.*

Introduction

Water not only ignores our political boundaries, it evades institutional classification and eludes legal generalizations. Interdisciplinary by nature, water's natural management unit, the watershed—where quantity, quality, surface- and groundwater all interconnect—strains both institutional and legal capabilities often past capacity. Analyses of international water institutions find rampant lack of consideration of quality considerations in quantity decisions, a lack of specificity in rights allocations, disproportionate political power by special interest, and a general neglect of environmental concerns in water resources decision making. Very recently, these weaknesses are beginning to be addressed by, for example, the World Bank, the United Nations, and the new World Water Council.

Legal principles have been equally elusive. The 1994 International Law Commission Draft Articles reflect the difficulty of marrying legal and hydrologic intricacies: while the Articles provide many important principles for cooperation, including responsibility for cooperation and joint management, they also codify the inherent upstream/downstream conflict by calling for both equitable

use and the obligation not to cause appreciable harm. They also provide little practical guidelines for allocations—the heart of most water conflict. In contrast with general legal principles, site-specific treaties have shown great imagination and flexibility, moving from ‘rights-based’ to ‘needs-based’ agreements in order to circumvent the argument over use versus harm.

There are more than 200 international rivers, covering more than one half of the total land surface of the globe, and untold numbers of shared aquifers. Water has been a cause of political tensions between Arabs and Israelis; Indians and Bangladeshis, Americans and Mexicans; and all 10 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 neighbours. 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.

This work describes the lessons learned from recent attempts at the resolution of international water disputes as exemplified in 140 transboundary water treaties (see Table 1), 14 process case studies (see Table 2), and three Forums of the International Water Resources Association (IWRA) Committee on International Waters. Space limitations preclude detailed descriptions of the conflicts themselves, which can be found elsewhere in this issue.¹

International Water Institutions and Law

Water Negotiations and Institutional Capacity

Just as the flow of water totally ignores political boundaries, so too does its management strain the capabilities of institutional boundaries. While water managers generally understand and advocate the inherent power of the concept of a watershed as a unit of management, where surface- and groundwater, quantity and quality are all inexorably connected, the institutions we have developed to manage the resource follow these tenets only in the exception.

Frederiksen (1992) describes principles and practice of water resources institutions from around the world. He argues that while, ideally, water institutions should provide for ongoing evaluation, comprehensive review and consistency among actions, in practice this integrated foresight is rare. Rather, he finds rampant lack of consideration of quality considerations in quantity decisions, a lack of specificity in rights allocations, disproportionate political power by power companies, and a general neglect for environmental concerns in water resources decision making. Buck *et al.* (1993) describe an ‘institutional imperative’ in their comparison of transboundary water conflicts in the USA and the former Soviet Union. The particular institutional challenges of transboundary groundwater are taken up by Feitelson & Haddad (1995).

To address these deficiencies at the international level, some have argued that international agencies might take a greater institutional role. Lee & Dinar (1995) describe the importance of an integrated approach to river basin planning,

development and management. Young *et al.* (1994) provide guidelines for coordination between levels of management at the global, national, regional and local levels. Delli Priscoli (1989) describes the importance of public involvement in water conflict management, and, in other work (Delli Priscoli, 1992), makes a strong case for the potential of alternative dispute resolution (ADR) in the World Bank's handling of water resources issues. Trolldalen (1992), likewise chronicles environmental conflict resolution at the United Nations, including a chapter on international rivers. Most recently, the creation of a World Water Council includes among its four primary challenges a "global institutional framework for water" (WWC Bulletin, December 1995).

While remaining optimistic, it is worth explicitly noting the difficulties which may present themselves as dispute resolution principles techniques begin to be infused within the government and non-government agencies responsible for international resource negotiations. The first barrier which may preclude total reliance on ADR in its current state is that between science and policy analysis. As Ozawa & Susskind (1985) point out:

Scientific advice is [sometimes] reduced to an instrument for legitimating political demands. Scientific analysis, in turn, can distort policy disputes by masking, beneath a veneer of technical rationality, underlying concerns over the distribution of costs and benefits.

This problem of science's tenuous relationship with policy analysis is exacerbated by the fact that diplomats are often trained in political science or law, while those scientists most competent to evaluate resource conflicts are rarely skilled in either diplomacy or policy analysis.

The second, somewhat more subtle, barrier which diminishes ADR's usefulness in international water disputes is that between ADR practitioners and analysts. Zartman (1992) discusses a common practitioner's approach to environmental disputes either as a case of 'problem solving', where the disputants can dissociate themselves emotionally from the problem, considered to be a distinct entity, a 'game against nature'; or as a case of information dispute, where resolution becomes apparent in the process of clarifying the data. Zartman suggests that these views are incomplete, that they "assume away conflict, rather than explaining and confronting it" (p. 114). He suggests steps, based on the ADR analyst's experience, to recognize conflicts of nature also as conflicts of interest: "Inherent in the conflict with nature is conflict among different parties' interests; inherent in problem solving is a need for conflict management" (p. 114).

These barriers—between science and policy, between practice and analysis—can individually lead to a convoluted and incomplete process of conflict resolution and, together, can preclude arrival at the 'best' (Pareto-optimal or win-win) solution to a given problem. By concentrating on the process of conflict resolution, rather than the outcome, one can take on a much needed dynamic, and ideally predictive, component.

International Water Law

According to Cano (1989, p. 168), international water law did not substantially begin to be formulated until after the First World War. 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 developed by advisory bodies have no legal bearing, and are referred to as 'soft law'.) 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 IV of the Helsinki Rules describes the overriding principle:

Each basin State is entitled, within its territory, to a reasonable and equitable share in the beneficial uses of the waters of an international drainage basin.

Article V lists no fewer than 11 factors which must be taken into account in defining what is 'reasonable and equitable.'² 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 than to water *per se* (Housen-Couriel, 1994, p. 10). The Helsinki Rules have 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 agreements.

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 8 December 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*.

It is testimony to the difficulty of marrying legal and hydrologic intricacies that the ILC, despite an additional call for codification at the UN Water Conference at Mar de Plata in 1977, has only just completed its task. It took until 1984, for example, for the term 'international watercourse' to be adequately defined (Krishna, 1995, pp. 37–39). Problems both political and hydrological slowed the definition: in a 1974 questionnaire submitted to member states, about half the respondents (only 20% responded after eight years) supported the concept of a drainage basin (e.g. Argentina, Finland and The Netherlands), while half were strongly negative (e.g. Austria, Brazil and Spain) or ambivalent (Biswas, 1993); '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.³

The ILC draft articles include 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 ecosystems, and emergency situations. Allocations are dealt with through equally vague but positive language. "Reasonable and equitable use" within each watercourse state, "with a view to attaining optimal utilization thereof and benefits there-

from", is balanced with an obligation not to cause significant harm. Reasonable and equitable use is defined similar to the Helsinki Rules, to be based on seven relevant factors.⁴ The text of the ILC articles does not mention a hierarchy of these factors, although 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".

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 borders, 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.

Even once the details are worked through, the principles would not have the force of law until approved by the UN General Assembly (Solanes, 1987). Even then, cases are heard by the International Court of Justice (ICJ) only with the consent of the parties involved, and no practical enforcement mechanism exists to back up the court's findings, except in the most extreme cases. 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 never decided a single case regarding international water law.⁵

Hydrography vs. Chronology

Extreme principles. International water 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 19th-century US attorney-general who suggested this stance regarding a dispute with Mexico over the Rio Grande, argues that a state has absolute rights to water flowing through its territory. Considering this doctrine was eventually rejected by the USA (itself a downstream riparian of several rivers originating in Canada), never implemented in any water treaty, nor invoked as a source for judgement in any international water legal ruling, the Harmon Doctrine is wildly overemphasized as a principle of international law.

The downstream 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 downstream) 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 'prior appropriation', 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. Downstream riparians, such as Iraq and Egypt, often receive less rainfall than their upstream neighbours 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 favour of the doctrine of absolute sovereignty, with downstream riparians taking the position of prior appropriation.⁶

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 'doctrine of limited territorial sovereignty' reflects rights to reasonably use the waters of an international waterway, yet with the acknowledgement 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 'appreciable harm', is the more subtle manifestation of the argument between hydrography and chronology. As noted above, the ILC draft 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

Watercourse States shall in their respective territories utilize an international watercourse in an equitable and reasonable manner. In particular, an international watercourse shall be used and developed by watercourse States with a view to attaining optimal utilization thereof, as provided in the present articles.

Article 7: Obligation not to cause significant harm

Watercourse States shall exercise due diligence to utilize an international watercourse in such a way as not to cause significant harm to other watercourse States.

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, upstream 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, downstream riparians have pushed for emphasis on 'no significant harm', effectively

the equivalent of the doctrine of prior appropriation in protecting pre-existing use.

According to Khassawneh (1995, p. 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, along with Stephen MacCaffrey, the final rapporteur for the project, argued for the primacy of 'no appreciable harm'. Commentators have had the same problem reconciling the concepts as the rapporteurs: Khassawneh (1995, p. 24) suggests that the latter rapporteurs are correct that 'no appreciable harm' should take priority, while, in the same volume, Dellapenna (1995, p. 66) argues for 'equitable use'. 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, p. 120; and Krishna, 1995, pp. 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, and rests on the fundamental dispute between hydrography and chronology. In addition, defining concepts precisely which are inherently vague both for reasons of legal interpretation and for political expediency—'reasonable', 'equitable' and 'significant'—guarantees continued ambiguity in the legal realm.

Water Conflict Resolution Practice

The Transboundary Freshwater Dispute Database

The UN Food and Agriculture Organization has identified more than 3600 treaties relating to international water resources dating between 805 and 1984, the majority of which are about navigation. Since 1945, 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. Of these, the full text of 140 have been collected in a Transboundary Freshwater Dispute Database at the University of Alabama through an ongoing project of the Department of Geography and the Center for Freshwater Studies, in conjunction with projects funded by the World Bank and the US Institute of Peace. These treaties are listed chronologically in Table 1. Jesse Hamner, a graduate student in the Department of Geography, has developed 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. A series of forthcoming articles describes the lessons learned specifically from comparative analyses of these treaties.

Negotiating notes and published descriptions of many treaty negotiations are also being collected. Fourteen case studies have been described in some detail and in similar format for comparative purposes for forthcoming work. These cases include nine watersheds—the Danube, Euphrates, Jordan, Ganges, Indus, Mekong, Nile, La Plata and Salween; two aquifer systems—US–Mexico shared systems and the West Bank Aquifers; two lake systems—the Aral Sea and the

Table 1. Transboundary freshwater dispute database

7/20/1874	Articles of agreement between the Edur Durbar and the British government
2/26/1885	Act of Berlin
8/10/1889	Agreement between Great Britain and France
4/15/1891	Protocol between Great Britain and Italy for the Demarcation of their respective spheres ...
9/16/1892	Amended Terms of Agreement between the British Government and the State of Jind, for regulating the supply of water for irrigation ...
8/29/1893	Agreement between the British Government and the Patiala state regarding the Sirsa branch of the Western Jumna canal
2/4/1895	Exchange of letters between Great Britain and France
3/18/1902	Exchange of notes between Great Britain and Ethiopia
2/23/1904	Final working agreement relative to the Sirhind canal between Great Britain and Patiala, Jind and Nabha
5/9/1906	Agreement ... modifying the Agreement signed at Brussels 12 May 1894
10/19/1906	Agreement between Great Britain and France
4/11/1910	Convention regarding the Water Supply of Aden between Great Britain and the Sultan of Abdali
9/4/1913	Exchange of notes constituting an agreement ... respecting the boundary between Sierra Leone and French Guinea
1/1/1915	Murray river agreement
6/12/1915	Protocol ... for the delimitation of the frontier along the River Horgos
4/20/1921	Convention of Barcelona
10/28/1922	Convention between [Finland] and the [USSR] concerning the maintenance of river channels and the regulation of fishing on water courses ...
2/14/1925	Convention between [Norway] and [Finland] concerning the international legal regime of the waters of the Pasvik (Paatsjoki) and the Jakobselv ...
2/24/1925	Agreement between the United States of America and Canada to regulate the level of Lake of the Woods
6/15/1925	Notes exchanged ... respecting the regulation of the utilisation of the waters of the river Gash
12/20/1925	Exchange of Notes between Great Britain and Italy
7/1/1926	Agreement ... regulating the use of the water of the Cunene River
7/20/1927	Convention ... regarding various questions of economic interest ...
8/11/1927	Convention between Spain and Portugal to regulate the hydro-electric development of the international section of the River Douro
1/29/1928	Convention between the German Reich and the Lithuanian Republic regarding the maintenance and administration of the frontier waterways ...
5/7/1929	Exchange of Notes ... in regard to the use of ... the river Nile for irrigation purposes
4/29/1931	Exchange of Notes ... respecting the boundary between the mandated territory of South Africa and Angola
1/22/1934	Agreement ... regarding water rights on the boundary between Tanganyika and Ruanda-Urundi
5/11/1936	Exchange of notes ... regarding the boundary between Tanganyika Territory and Mozambique
11/7/1940	Exchange of notes between ... the United States of America and ... Canada constituting an Agreement regarding the development of certain portions ...
5/20/1941	Exchange of Notes between the government of the United States and the Government of Canada ... concerning temporary diversion for power ...
11/27/1941	Exchange of Notes constituting an agreement between the government of the United States and the Government of Canada relating to additional ...
5/22/1944	Declaration and Exchange of Notes concerning the Termination of the Process of Demarcation of the Peruvian-Ecuadorian Frontier
11/14/1944	Treaty Between the United States of America and Mexico Relating to the Waters of the Colorado and Tijuana Rivers, and of the Rio Grande ...

- 6/1/1945 Supplementary boundary treaty between [Argentina] and [Paraguay] on the river Pilcomayo
- 12/30/1946 Agreement concerning the utilization of the rapids of the Uruguay River in the Salto Grande area
- 2/3/1947 Treaty between the [USSR] and [Finland] on the transfer to the territory of the Soviet Union of part of the state territory of Finland in the region of ...
- 2/10/1947 Treaty of Peace with Italy, Signed at Paris, on 10 February 1947
- 5/4/1948 Inter-Dominion Agreement Between the Government of India and the Government of Pakistan, on the Canal Water Dispute Between ...
- 5/31/1949 Exchange of Notes ... regarding the construction of the Owen Falls Dam, Uganda
- 11/25/1949 Treaty concerning the Regime of the Soviet-Romanian State Frontier and Final Protocol
- 12/5/1949 Exchange of notes constituting an agreement between [Great Britain] ... and [Egypt] regarding the construction of the Owen Falls Dam, Uganda
- 1/19/1950 Exchange of notes constituting an agreement between [Great Britain] (on behalf of ... Uganda) and [Egypt] regarding cooperation in meteorological ...
- 2/24/1950 Treaty between the [USSR] and [Hungary] concerning the regime of the Soviet-Hungarian state frontier and final protocol
- 2/27/1950 Treaty between the United States of America and Canada relating to the uses of the waters of the Niagara River
- 4/25/1950 State Treaty concerning the construction of a hydro-electric power-plant on the Sauer at Rosport/Ralingen
- 6/9/1950 Convention between the [USSR] and [Hungary] concerning measures to prevent floods and to regulate the water regime in the area of the frontier ...
- 9/7/1950 Terms of reference of the Helmand River Delta Commission and an interpretive statement relative thereto, agreed by conferees of ...
- 10/16/1950 Agreement concerning the diversion of water in the Rissbach, Durrach and Walchen Districts
- 10/16/1950 Agreement between [Austria] and [Germany] concerning the Österreichisch-Bayerische Kraftwerke AG
- 4/18/1951 Letters between the irrigation adviser and director of irrigation, Sudan Government, and the controller of agriculture, Eritrea
- 4/25/1951 Agreement between [Finland] and [Norway] on the transfer from the course of the Näätämo (Neiden) river to the course of the Gandvik River ...
- 2/13/1952 Agreement concerning the Donaukraftwerk-Jochenstein Aktiengesellschaft
- 6/30/1952 Exchange of notes constituting an agreement between Canada and the United States of America relating to the St Lawrence Seaway Project
- 7/16/1952 Exchange of notes constituting an agreement between the [UK/Uganda] and [Egypt] regarding the construction of the Owen Falls Dam in Uganda
- 12/25/1952 Convention between the [USSR] and [Romania] concerning measures to prevent floods and to regulate the water regime of the river Prut
- 1/21/1953 Exchange of notes constituting an agreement between [Great Britain] and [Portugal] providing for the Portuguese participation in the Shiré valley ...
- 6/4/1953 Agreement between the Republic of Syria and the Hashemite Kingdom of Jordan concerning the utilization of the Yarmuk waters
- 11/12/1953 Exchange of notes constituting an agreement between the United States and Canada relating to the establishment of the St Lawrence River joint ...
- 4/16/1954 Agreement between [Czechoslovakia] and [Hungary] concerning the settlement of technical and economic questions relating to frontier water ...
- 4/25/1954 Agreement on the Kosi Project
- 5/25/1954 Convention between the Governments of [Yugoslavia] and [Austria] concerning water economy questions relating to the Drava
- 11/18/1954 Agreement between [Great Britain/Rhodesia-Nyasaland] with regard to certain ... natives living on the Kwando River
- 12/16/1954 Agreement between [Yugoslavia] and [Austria] concerning water economy questions in respect of the frontier sector of the Mura
- 4/7/1955 Exchange of notes between Peru and Bolivia establishing a joint commission for study of ... joint use of the waters of Lake Titicaca
- 4/20/1955 Agreement between [Yugoslavia] and [Romania] concerning questions of water control on water control systems and watercourses on or intersected ...
- 8/8/1955 Agreement between [Yugoslavia] and [Hungary] together with the statute of the Yugoslav-Hungarian water economy commission
- 12/31/1955 Johnston Negotiations
- 1/20/1956 Agreement concerning cooperation between [Brazil] and [Paraguay] in a study on the utilization of the water power of the Acaray and Monday ...
- 4/9/1956 Treaty between the Hungarian People's Republic and the Republic of Austria concerning the regulation of water economy questions

Table 1. (*Continued*)

8/18/1956	Agreement between the [USSR] and [China] on joint research operations to determine the natural resources of the Amur river basin and the prospects ...
10/13/1956	Treaty between [Czechoslovakia] and [Hungary] concerning the regime of state frontiers
12/5/1956	Agreement between [Yugoslavia] and [Albania] concerning water economy questions, together with the statue of the Yugoslav-Albanian Water ...
2/19/1957	Agreement between Bolivia and Peru concerning a preliminary economic study of the joint utilization of the waters of Lake Titicaca
5/14/1957	Treaty between the Government of the [USSR] and [Iran] concerning the regime of the Soviet-Iranian Frontier and the procedure for the settlement ...
8/11/1957	Agreement between Iran and the Soviet Union for the joint utilization of the frontier parts of the rivers Aras and Atrak for irrigation and power ...
12/18/1957	Agreement between Norway and the Union of Soviet Socialist Republics on the utilization of water power on the Pasvik (Paatso) River
1/23/1958	Agreement between [Argentina] and [Paraguay] concerning a study of the utilization of the water power of the Aripe Falls
3/21/1958	Agreement between [Czechoslovakia] and [Poland] concerning the use of water resources in frontier waters
4/4/1958	Agreement concerning water-economy questions between the government of [Yugoslavia] and [Bulgaria]
7/10/1958	State treaty between [Luxembourg] and [West Germany] concerning the construction of hydroelectric power-installations on the Our
7/12/1958	Agreement between the Government of the French Republic and the Spanish Government relating to Lake Lanoux
4/29/1959	Agreement between the [USSR], [Norway], and [Finland] concerning the regulation of Lake Inari by means of the Kaiakoski ... dam
10/23/1959	Indo-Pakistan agreement (with appendices) on East Pakistan border disputes
11/8/1959	Agreement between the Government of the United Arab Republic and the government of Sudan
12/4/1959	Agreement on the Gandak irrigation and power project
1/11/1960	Agreement between Pakistan and India on West Pakistan-India Border Disputes
4/8/1960	Treaty between the Kingdom of the Netherlands and the Federal Republic of Germany concerning the course of the common frontier, the boundary ...
9/19/1960	Indus Waters treaty
10/24/1960	Agreement relating to the construction of Amistad Dam on the Rio Grande to form part of the system of international storage dams provided for by the ...
1/17/1961	Treaty relating to cooperative development of the water resources of the Columbia River Basin (with annexes)
02/24/1961	Exchange of notes constituting an agreement concerning the treaty of 12 May 1863 to regulate the diversion of water from the River Meuse and the ...
4/26/1963	Exchange of notes constituting an agreement ... for the development of the Mirim Lagoon
7/26/1963	Convention of Bamako
10/26/1963	Act ... States of the Niger Basin
11/25/1963	Agreement ... relating to the Central African Power Corporation
11/30/1963	Convention between [Yugoslavia] and [Romania] concerning the operation of the Iron Gates water power and navigation ...
11/30/1963	Agreement between the Socialist Federal Republic of Yugoslavia and the Romanian People's Republic concerning the construction and operation ...
11/30/1963	Convention between the Socialist Federal Republic of Yugoslavia and the United States of America concerning the treaty relating to cooperative ...
1/22/1964	Exchange of notes constituting an agreement between Canada and the United States of America concerning the treaty relating to cooperative ...
1/22/1964	Exchange of notes constituting an agreement between Canada and the United States of America regarding sale of Canada's entitlement ...
2/11/1964	Agreement between Iraq and Kuwait concerning the supply of Kuwait with fresh water ...
5/22/1964	Convention and Statutes ... Lake Chad Basin
7/16/1964	Convenio entre España y Portugal para Regular el Aprovechamiento hidroeléctrico de los tramos internacionales de rio Duero y de sus afluentes

- 7/17/1964 Agreement between [Poland] and the [USSR] concerning the use of water resources in frontier waters
- 9/16/1964 Exchange of notes constituting an agreement between Canada and the United States of America authorizing the Canadian entitlement purchase ...
- 11/25/1964 Agreement concerning the river Niger commission and the navigation and transport on the river Niger
- 8/12/1965 Convention between Laos and Thailand for the supply of power
- 4/30/1966 Agreement between [West Germany], [Austria], and [Switzerland] relating to the withdrawal of water from Lake Constance
- 8/24/1966 Exchange of notes constituting an agreement concerning the loan of waters of the Colorado River for irrigation of lands in the Mexicali Valley
- 12/19/1966 Amended agreement between [Nepal] and [India] concerning the Kosi project ...
- 4/1/1967 Untitled: Agreement between South Africa and Portugal
- 9/28/1967 Franco-Italian convention concerning the supply of water to the Commune of Menton
- 12/7/1967 Treaty between [Austria] and [Czechoslovakia] concerning the regulation of water management questions relating to frontier waters
- 2/27/1968 Agreement between [Czechoslovakia] and [Hungary] concerning the establishment of a river administration in the Rajka-Gönyü Sector ...
- 5/29/1968 Convenio y Protocolo Adicional Para Regular el Uso y aprovechamiento hidraulico de los tramos internacionales de los ríos Miño, Limia, Tajo ...
- 10/23/1968 Agreement between the People's Republic of Bulgaria and the Republic of Turkey concerning cooperation ...
- 1/21/1969 Agreement between South Africa and Portugal
- 3/21/1969 Exchange of notes constituting an agreement for the construction of a temporary cofferdam at Niagara
- 3/21/1969 Exchange of Notes Constituting an Agreement between Canada and the United States of America for the temporary diversion for power purposes ...
- 7/4/1969 Convention concerning development of the Rhine between Strasbourg and Lauterbourg
- 1/30/1970 Convention of Dakar
- 12/16/1971 Agreement between [Romania] and the [USSR] on the joint construction of the Stinca-Costesti Hydraulic Engineering Scheme
- 7/12/1972 Agreement between [Finland] and the [USSR] concerning the production of electric power in the part of the Vuoksi river bounded by the Imatra ...
- 11/24/1972 Statute of the Indo-Bangladesh Joint Rivers Commission
- 4/26/1973 Treaty between [Brazil] and [Paraguay] concerning the hydroelectric utilization of the water resources of the Parana river ...
- 11/13/1973 Agreement between [Australia/Papua New Guinea] and [Indonesia] concerning administrative border arrangements
- 1/31/1975 Joint declaration of principles for utilization of the waters of the lower Mekong basin, signed by [Cambodia], [Laos], [Thailand], and [Vietnam]
- 3/6/1975 Agreement ... concerning the use of frontier watercourses
- 2/12/1976 Segundo protocolo
- 11/5/1977 Agreement between [Bangladesh] and [India] on sharing of the Ganges' waters at Farakka and on augmenting its flows
- 6/30/1978 Convention relating to the creation of the Gambia River Basin Development Organization
- 7/3/1978 Treaty for Amazonian Cooperation
- 10/19/1979 Agreement on Paraná River projects
- 11/21/1980 Convention creating the Niger Basin Authority
- 7/20/1983 Meeting of the Joint Rivers Commission
- 10/8/1990 Convention ... on the international commission for the protection of the Elbe
- 3/26/1993 Agreement on joint activities in addressing the Aral Sea ...
- 10/26/1994 Treaty of peace between [Israel] and [Jordan], done at Arava/Araba crossing point ...
- 3/3/1995 Resolution of the Heads of States of the Central Asia [sic] on work of the EC of ICAS on implementation ...

Great Lakes; and one engineering works—the Lesotho Highlands Project. These case studies are listed with some defining characteristics in Table 2.

IWRA's Committee on International Waters

The Committee on International Waters of the International Water Resources Association has taken the lead in organizing high-level meetings between riparians of especially contentious basins from around the world. Asit K. Biswas, in his capacity as chair of the Committee, has to date arranged forums on the international waters of the Middle East, Southeast Asia and Latin America. Each forum brought together about 30 policy makers, academics and representatives from funding agencies, each in his or her private capacity, for an open and frank exchange of information and ideas.

The Middle East Water Forum, with an emphasis on the Nile, Jordan and Tigris–Euphrates rivers, was convened in February 1993 in Cairo, and has had two subsequent meetings, in 1995 and 1997. Papers commissioned for the initial meeting were published in 1994 (Biswas, 1994), and the work of the Middle East Water Commission, established to continue work on on-going issues from the region, was summarized in 1995 (Middle East Water Commission, 1995) and published in its entirety in 1997 (Biswas *et al.*, 1997).

These three Middle Eastern rivers are characterized by high levels of water stress, exacerbated by extreme political tensions. The waters of the Middle East are regularly cited as worst-case scenarios for international waters—armies were mobilized along the Euphrates, and shots were fired over the headwaters of the Jordan—and, consequently, they are named as the most likely source of future ‘water wars’.⁷ Yet along with the crises associated with these contentious basins come intense political and financial support of the international community. The Israel–Jordan Treaty of Peace has an extensive water component, as does the ‘Oslo II’ Interim Agreement between Israel and Palestine. The Multilateral Working Group on Water Resources, working in conjunction with the Middle East bilateral peace negotiations, has been especially active (Wolf, 1995c).

The Asia Water Forum was held in Bangkok in January 1995, with an emphasis on the Mekong, the Ganges–Brahmaputra, and the Salween river systems. A summary of the meeting was published in 1995 (Wolf, 1995a), and the papers commissioned for the meeting were published in 1996 (Biswas & Hashimoto, 1996).

In contrast with the international waters of the Middle East, those of Southeast Asia elicit a much lower level of crisis. Even along the Ganges–Brahmaputra where, at the time of the meeting, a 1988 agreement on the flow from India to Bangladesh had lapsed with no renewal in sight (a new treaty was signed in late 1996) resulting in great ecological and human damage in Bangladesh, there was never a threat of violence. A new treaty had just been signed for cooperative management of the lower Mekong, while the earlier treaty had not resulted in any projects along the main stem of the river, it had allowed for joint dialogue and data-sharing among the riparians over the years, even amidst political tensions and outright warfare. Dialogue among the riparians of the Salween was an exercise in preventive diplomacy—the river is only now being examined for joint development and preliminary agreements are being negotiated.

The Latin American Water Forum was held in São Paulo in January 1997;

Table 2. Fourteen case studies and some defining characteristics

Name	Riparian States (w/% of nat'l available water being utilized)‡	Riparian relations (w/dates of most-recent agreements)	Average annual flow (km ³ /yr)*	Size of watershed (km ²)*	Climate	Special features
Danube	Albania (1.6) Austria (6.1) Bulgaria (7.1) Croatia (n/a) Czech Republic (n/a) Germany (43.8) Hungary (35.5) Italy (26.6) Moldavia (n/a) Poland (42.9) Romania (22.0) Slovakia (n/a) Slovenia (n/a) Switzerland (9.8) Ukraine (n/a) Yugoslavia (14.4)	Cold to warm (1994 Danube River Protection Convention)	206	810 000	Dry to humid	1994 Convention is first treaty developed through process of public participation
Euphrates	Iraq (86.3) Syria (102.0) Turkey (12.1)	Cool	46	1 050 000	Dry to Mediterranean	Ongoing tripartite dialogue but no international agreement
Jordan	Israel (95.6) Jordan (67.6) Lebanon (20.6) Palestine (100.0) Syria (102.0)	Cool to warm (1994 Treaty of Peace—Israel/Jordan; 1995 Interim Agreement—Israel/Palestine)	1.4	11 500	Dry to Mediterranean	Complex conflict and attempts at conflict resolution since 1919

Table 2. (Continued)

Name	Riparian States (w/% of nat'l available water being utilized)‡	Riparian relations (w/dates of most-recent agreements)	Average annual flow (km ³ /yr)*	Size of watershed (km ²)*	Climate	Special features
Ganges	China (19.3) Bangladesh (1.0) Bhutan (0.1) India (57.1) Nepal (14.8)	Cold to warm (1985 Agreement between India and Pakistan lapsed in 1988 and has not been renewed)	971	1 480 000	Humid to tropical	
Indus	Afghanistan (47.7) China (19.3) India (57.1) Pakistan (53.8)	Cool (1960 Indus Water Treaty between India and Pakistan)	238	970 000	Dry to humid sub-tropical	
Mekong	Cambodia (0.1) China (19.3) Laos (0.8) Myanmar (0.4) Thailand (32.1) Vietnam (2.8)	Cool to warm (1957 Mekong Committee re-ratified as 1995 Mekong Commission)	470	790 000	Humid to tropical	Good example of resilience of agreement
Nile	Burundi (3.1) Egypt (111.5) Eritrea (n/a) Ethiopia (7.5) Kenya (8.1) Rwanda (2.6) Sudan (37.3) Tanzania (1.3) Uganda (0.6) Zaire (0.2)	Cold to warm (1959 Nile Water Agreement only includes Egypt and Sudan)	30	2 960 000	Dry to tropical	

La Plata	Argentina (3.5) Bolivia (0.7) Brazil (0.5) Paraguay (0.2) Uruguay (0.6)	Warm (1995) Mercosur—Southern Common Market— adds impetus to 'hydrovia' canal project)	470	2 830 000	Tropical	Good example of inter-sectoral, plus international dispute
Saltween	China (19.3) Myanmar (0.4) Thailand (32.1)	Cool to warm	122	270 000	Humid to tropical	
US–Mexico Aquifers (groundwater)	Mexico (22.3) United States (21.7) (21.7)	Warm (1944 Water Treaty, modified in 1979)	n/a	n/a	Dry	Groundwater not included in original treaty leading to uncertainty in relations
West Bank Aquifers	Israel (95.6) Palestine (100.0)	Cool (1995 Interim Interim Agreement)	n/a	n/a	Dry	Interim Agreement Agreement relegates groundwater allocations to future negotiations
Aral	Afghanistan (47.7) Kazakhstan (n/a) Kyrgyzstan (n/a) Tajikistan (n/a) Turkmenistan (n/a) Uzbekistan (n/a)	Cool to warm (1993 and 1995 Agreements on Aral Action Plans)	1020†	1 618 000	Dry to humid continental	Case of lake management exacerbated by internationalization of basin
Great Lakes	Canada (1.4) United States (21.7)	Warm	22 500†	509 200	Humid continental	Case of small number of riparians with good relations
Lesotho Highlands	Lesotho (1.5) South Africa (28.4)	Warm	n/a	n/a	Humid marine	Interesting institutional arrangement exchanging water, financial considerations and energy resources

Notes: † Source: Kulshreshtha (1993).

* Sources: Gleick (1993); UN Register of International Rivers (1978).

† Values for lakes under 'Annual Flow' are for storage volumes.

discussion centred on the Amazon, La Plata and San Francisco systems. Results of the meeting will be published in 1998.

The three rivers are characterized by extremely large flows and the riparians have relatively cordial political relations. This combination of high flow and low tension results in a mixed blessing for the region. On the positive side, the riparians still have the 'luxury' of being able to save relatively healthy ecosystems—one never hears talk of the eco-system of the lower Jordan or Nile. In fact, this forum was the first of the three where much greater emphasis was on water quality issues than on those of quantity. On the negative side, one does not observe in these basins the same intense international attention, and resulting availability of resources, which tends to flow to regions in imminent crisis. While treaties and river commissions already exist along the Amazon and La Plata (the San Francisco lies entirely within Brazil), water management and water law (even national water law) are at much earlier stages than in either the Middle East or Southeast Asia—the Amazon and La Plata commissions had not even been in close contact prior to the forum.

Of the nine basins discussed at the three forums, three have new treaties for international cooperation—the Jordan (Israel–Jordan and Israel–Palestine), the Mekong (lower riparians), and the Ganges (India–Bangladesh). While the forums cannot be attributed with this achievement (for one, the Mekong was negotiated just prior to the Asia Water Forum), the open exchange of dialogue outside official negotiations certainly helped formulate some ideas which then became embedded in the treaties—some treaty text can be tracked directly back to presentations and discussions from the forums.

Lessons Learned

National vs. International Settings

It should be clear from the cases described in this study that both similarities and distinct differences are inherent between national and international water conflicts. The differences are more often stressed, but just how different the two settings are is open to debate. Assumptions which are common include:

Institutions and authority. National cases often are played out in relatively sophisticated institutional settings, particularly in the western USA, while international conflicts can be hampered by the lack even of an institutional capacity for conflict resolution.

It has been argued, though, that even sophisticated institutions have often not been amenable to relinquishing the traditional, usually legal, approaches to resolving water conflicts, effectively presenting the same challenges as the international setting.

Law and enforcement. The USA and other countries have over the years established intricate and elaborate legal structures to provide both guidance in cases of dispute, and a setting for clarifying conflicting interpretations of that guidance. International disputes, in contrast, rely on poorly defined water law, a court system in which the disputants themselves have to decide on jurisdiction and frames of reference before a case can be heard, and little in the way of enforcement mechanisms. One result is that international water conflicts are

rarely heard in the International Court of Justice. Likewise, of the international treaties listed here, only the Mekong Committee has used the legal definition of 'reasonable and equitable' use in its agreement.

In the legal realm too, it has been argued that the differences between national and international disputes are more apparent than real. Given the myriad of legal venues open to disputants, and ambiguities of court jurisdiction, creative lawyers can effectively hamstring legal challenges for years, essentially creating a *de facto* lack of legal authority.

Presumption of equal power. 'All are equal in the eyes of the law' is a common phrase describing national legal frameworks. No such presumption exists in international conflicts, where power inequities define regional relations. Each of the watersheds presented here includes a hegemonic power which brings its power to bear in regional negotiations, and which often sees agreements tilt in its favour as a consequence.

Here, too, it has been argued that unequal resources, usually financial or political, result in real-world inequities finding their way into the national settings of conflict resolution as well.

The BATNA. A difference commonly pointed out between national and international disputes is that, in national water conflicts, war is not usually a realistic best alternative to a negotiated agreement (BATNA).⁸ While it may be true that intra-national 'water wars' are not likely, the same is increasingly accepted as being true of the international setting. While shots have been fired, both nationally and internationally, and troops have been mobilized between countries, no all-out war has ever been caused by water resources alone. As one analyst familiar with both strategic issues and water resources has noted, "Why go to war over water? For the price of one week's fighting, you could build five desalination plants. No loss of life, no international pressure, and a reliable supply you don't have to defend in hostile territory."

While real differences do exist between the national and international settings for water conflict resolution, these distinctions may not be as great as is often thought. The fortunate corollary to this is that many of the successes of ADR in the national realm may be more applicable to the international setting than is commonly argued.

Lessons Learned: Pre-negotiation—Involvement in Advance of Conflict

Many international water disputes are defined by a flashpoint, a single action on the part of a riparian which led to impending conflict, which only then led to attempts at conflict resolution (see Table 3). It is worth noting that in the case of the exceptions to this pattern, the Mekong and La Plata commissions for example, an institutional framework for joint management and dispute resolution was established well in advance of any likely conflict. It is also worth noting the Mekong Committee's impressive record of continuing its work throughout intense political disputes between the riparian countries, as well as the fact that data conflicts, common and contentious in all of the other basins presented, have not been a factor in the Mekong.

In fact, the experience of the commission in cases such as those of the Amazon, La Plata or Mekong may suggest that when international institutions are

Table 3. Flashpoints

River	Flashpoint
Ganges	Farakka Barrage (India)
Indus	Diversion of tributaries (India)
Jordan	Development on border (Israel)
Mekong	None
Nile	Plans for high dam (Egypt)

established well in advance of water stress they help preclude such dangerous flashpoints. Other basins have equally resilient institutions, which have survived even when relations on other issues were strained. The Johnston negotiations, while never ratified, were more or less upheld for years through the 'Picnic Table Talks' between Israel and Jordan, despite the official state of war between the two countries.

Early intervention is also beneficial to the process of conflict resolution, helping to shift the mode of dispute from costly, impasse-oriented dynamics to less costly, problem-solving dynamics. In the heat of some flashpoints, such as the Nile, the Indus and the Jordan, as armed conflict seemed imminent, tremendous energy was spent just getting the parties to talk to each other. Hostilities were so pointed that negotiations inevitably began confrontationally, usually resulting in a distributive approach being the only one viable.

In contrast, discussions in the Mekong Committee, the multilateral working group in the Middle East and on the Danube, have all moved beyond the causes of immediate disputes to actual, practical projects which may be implemented in an integrative framework.

Of course, to be able to entice early cooperation, the incentives have to be made sufficiently clear to the riparians. In all of the cases mentioned above, not only was there strong third-party involvement in encouraging the parties to come together, but extensive funding was made available on the part of the international community to help finance projects which would come from the process.

Indicators for Possible Water Conflict

Given that the international community has neither the resources nor the time to help establish a basin-wide institution for integrated watershed management on each of the world's international rivers and aquifers, patterns do emerge which may be useful in allowing for anticipation of likely conflict.

In general, the pattern which emerges is as follows. Riparians of an international basin implement water development projects unilaterally first on water within their territory, in attempts to avoid the political intricacies of the shared resource. At some point, as water demand approaches supply, one of the riparians, generally the regional power,⁹ will implement a project which impacts on at least one of its neighbours (see Figure 1). This might be to continue to meet existing uses in the face of decreasing relative water availability, as for example Egypt's plans for a high dam on the Nile, or Indian diversions of the Ganges to protect the port of Calcutta, or to meet new needs reflecting new agricultural policy, such as Turkey's GAP project on the Euphrates.

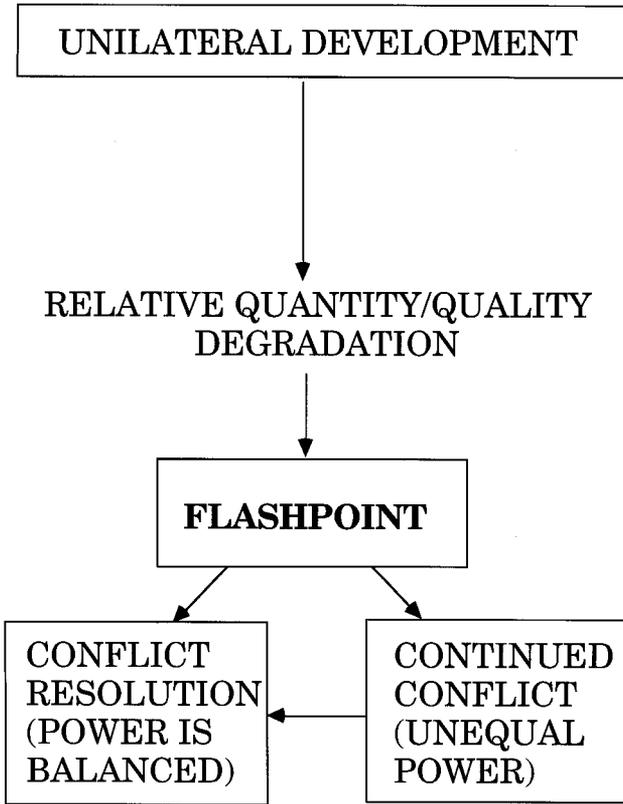


Figure 1. Chronology of international water disputes.

Any such project which impacts on one's neighbours can, in the absence of relations or institutions conducive to conflict resolution, become a flashpoint, as described above. Each of these projects is preceded by indicators of impending or likely water conflict, which might include the following.

Water quantity issues. Often, simply extrapolating water supply and demand curves will give an indication of when a conflict may occur, as the two curves approach each other. The mid-1960s, a period of water conflict in the Jordan basin, saw demand approaching supply in both Israel and Jordan. Also, major shifts in supply might indicate likely conflict, due to greater upstream use or, in the longer range, to global change. The former is currently the case both on the Mekong and on the Ganges. Likewise, shifts in demand, due to new agricultural policies or movements of refugees or immigrants can indicate problems. Water systems with a high degree of natural fluctuation can cause greater problems than relatively predictable systems.

Water quality issues. Any new source of point or non-point pollution, or any new extensive agricultural development resulting in saline return flow to the system, can indicate water conflict. Arizona return flow into the Colorado was

the issue over which Mexico sought to sue the USA in the 1960s through the International Court of Justice, and return flow is currently a point of contention on the lower Jordan between Israel, Jordanians and West Bank Palestinians.

Management for multiple use. Water is managed for a particular use, or a combination of uses. A dam might be managed for storage of irrigation water, power generation, recreation or a combination, for example. When the needs of riparians conflict, disputes are likely. Many upstream riparians, for instance, would manage the river within their territory primarily for hydropower where the primary needs of their downstream neighbours might be timely irrigation flows. Chinese plans for hydropower generation and/or Thai plans for irrigation diversions would have an impact on Vietnamese needs for both irrigation and better drainage in the Mekong Delta.

Political divisions. A common indicator of water conflict is shifting political divisions which reflect new riparian relations. Such is currently the case throughout Central Europe as national water bodies such as the Aral Sea, the Amu Dar'ya and the Syr Dar'ya become international. Many of the conflicts presented here, including those on the Ganges, the Indus and the Nile, took on international complications as the central authority of a hegemon, in these cases the British empire, dissipated.

Indicators for Type and Intensity of Conflict

Along with clues useful in anticipating whether or not water conflicts might occur, patterns based on past disputes may provide lessons for determining both the type and intensity of impending conflicts. These indicators might include the following:

Geopolitical setting. As mentioned above, relative power relationships, including riparian position, determine how a conflict unfolds. A regional power which also has an upstream riparian position is in a greater situation to implement projects which may become flashpoints for regional conflict. Turkey and India have been in such positions on the Euphrates and the Ganges, respectively. In contrast, the development plans of an upstream riparian may be held in check by a downstream power as, for example, have Ethiopia's plans for Nile development by Egypt.

The perception of unresolved issues with one's neighbours, both water-related and otherwise, is also an exacerbating factor in water conflicts. Israel, Syria and Turkey, each and respectively have difficult political issues outstanding, which makes discussions on the Jordan and Euphrates more intricate.

Level of national development. Relative development can inform the nature of water disputes in a number of ways. For example, a more developed region may have better options to alternative sources of water, or to different water management schemes, than less developed regions, resulting in more options once

negotiations begin. In the Middle East multilateral working group on water, for instance, a variety of technical and management options, such as desalination, drip irrigation and moving water from agriculture to industry, have all been presented, which in turn supplement discussions over allocations of international water resources.

Different levels of development within a watershed, however, can exacerbate the hydropolitical setting. As a country develops, personal and industrial water demand tends to rise, as does demand for previously marginal agricultural areas. While this can be somewhat balanced by more access to water-saving technology, a developing country often will be the first to develop an international resource to meet its growing needs. Thailand has been making these needs clear with its relatively greater emphasis on Mekong development.

The hydropolitical issue at stake. In a survey of 14 river basin conflicts, Mandel (1991) offers interesting insight relating the issue at stake to the intensity of a water conflict. He suggests that issues which include a border dispute in conjunction with a water dispute, such as the Shatt-al-Arab waterway between Iran and Iraq and the Rio Grande between the USA and Mexico, can induce more severe conflicts than issues of water quality, such as the Colorado, Danube and La Plata rivers. Likewise, conflicts triggered by human-initiated technological disruptions—dams and diversions—such as the Euphrates, Ganges, Indus and Nile, are more severe than those triggered by natural flooding, such as the Columbia and Senegal rivers.

One interesting lack of correlation is also found in Mandel's study—that between the number of disputants and intensity of conflict. He suggests that this challenges the common notion that the more limited river disputes, in terms of number of parties involved, are easier to resolve.

Institutional control of water resources. An important aspect of international water conflicts is how water is controlled *within* each of the countries involved. Whether control of the resource is vested at the national level, as in the Middle East, the state level, as in India, or at the sub-state level, as in the USA, informs the complication of international dialogue. Also, *where* control is vested institutionally is important. In Israel, for example, the Water Commissioner is under the authority of the Ministry of Agriculture, whereas Jordanian control is at the ministerial level, with the Ministry of Water. These respective institutional settings can make internal political dynamics quite different for similar issues.

National water ethos. This term incorporates several somewhat ambiguous parameters that together determine how a nation 'feels' about its water resources, which in turn can help determine how much it 'cares' about a water conflict. Some factors of a water ethos might include:

- 'mythology' of water in national history, e.g. has water been the 'lifeblood of the nation?' Was the country built up around the heroic *fellah*? Is 'making the desert bloom' a national aspiration? In most countries, in contrast, water plays little role in the national history;
- importance of water/food security in political rhetoric;
- relative importance of agriculture versus industry in the national economy.

Lessons Learned: Negotiation—Obstacles to Successful Negotiations

In addition to helping anticipate water conflicts, the patterns which begin to emerge from past conflicts also suggest that there are common barriers to successful negotiations. Identification of these barriers early naturally helps to overcome them more easily. Such barriers to success include the following.

Lack of willingness to recognize parties with ability to block implementation. One limiting aspect of the International Court of Justice is that only states may be parties to cases. This excludes minority political or ethnic groups, as well as a whole range of political, environmental and special interest groups who may have a stake in an international agreement. When the Middle East peace talks began, Palestinians were represented only as part of a joint delegation with the Jordanians. Currently, Kurdish interests are not represented by any of the parties to the Euphrates dispute. All of these exclusions result in the interests of at least one party being ignored as disputes are being resolved, parties who may be able to block implementation of a final agreement.

Scientific uncertainty/disputes. With the exception of the Mekong, all of the basins included within this study had data disputes as a major component of the overall water conflict. In many of the countries, at least some water data are secret. Calling for more study of necessary data has also been used as a stalling tactic in some negotiations. The Mekong Committee, as the notable exception, used joint data gathering as the first major cooperative task, precluding these kinds of problems.

Multi-resource Linkages

Another recurring topic in international water disputes is the question of multi-resource linkages. Occasionally, water issues are dealt with alone, separate from any other political issues between countries—water *qua* water. This was initially the case, for example, in the early stages of both the Johnston negotiations and negotiations between India and Pakistan on the Indus. By separating the two realms of 'high' and 'low' politics, some have argued, the process was either doomed to fail, as in the case of the Johnston accords, or to achieve a sub-optimum development arrangement, as is currently the case on the Indus.¹⁰ In addition, water negotiations are usually separate from any other resource disputes, which may preclude some creative trade-offs. In fact, in a quest to generate creative options in water negotiations, the best solution may involve other resources entirely. Some possible multi-resource linkages may include the following.

Financial resources. Time and again in the cases presented here, an offer of financial incentives was able to circumvent impasses in negotiations. World Bank financing helped resolve the Indus dispute, while UN-led investments help preclude conflict on the Mekong. Cooperation-inducing financing has not always come from outside the region. Thailand helped finance a project in Laos, as did India in Pakistan, in conjunction with their respective watershed agreements. Egypt paid Sudan outright for water to which they both agreed Sudan had rights, but that it was not able to use.

It should be noted that financial incentives have often not been sufficient to overcome hostilities. The World Bank has offered to help finance the Unity Dam on the Yarmuk River since the late 1970s, and is currently offering help with a variety of projects in conjunction with the Middle East multilateral working group. The Bank provision that all riparians agree has so far been enough to preclude any large-scale development project.

Energy resources. One increasingly common linkage being made is that between water and energy resources. As noted above, Thailand helped fund a hydroelectric project in Laos in exchange for a proportion of the power to be generated. In a particularly elaborate agreement, 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.

Aside from hydroelectricity projects, energy and water resources can be linked in other ways as well. It has been suggested, for example, that a possible Saudi contribution to the Middle East peace process might come in the form of oil or natural gas to help lower the cost of desalination in the region. Another link might come in the form of energy infrastructure. The Trans-Arabian Pipeline from the Gulf to Lebanon has been unused since the early 1970s. While the pipe itself is corroded, the parallel access road still exists and, it has been suggested, might be used to reduce the costs of piping water in the opposite direction, from Lebanon towards the Gulf.

One policy question, which is inevitably raised with the question of linkages, is whether increased integration of infrastructure between nations leads to increased potential for political conflict or, rather, to greater impetus for cooperation. In support of the latter interpretation, it might be noted that the flow of electricity between Laos and Thailand and of water between Lesotho and South Africa was never interrupted, despite dramatic political changes in both regions.

Political linkages. Political capital, like investment capital, might likewise be linked to water negotiations. 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 are increasingly vital to management agencies. As such, data 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 criteria for data in negotiations on the Ganges has hampered progress over the years.

Data issues, when management 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 representa-

tives 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.

Increasingly, linkages are being made between water and other resources. Awareness of options outside the specific water issues being discussed may offer more opportunities for creative solutions to be generated.

Lessons Learned: Implementation—Often Ignored Parameters

While including resources in the bargaining mix other than water may help achieve an agreement, it is perhaps more important to be aware of some aspects particular to water which, if excluded, could impede the durability of understanding. For an agreement to be viable over time, it must incorporate mechanisms for any future misunderstandings to be resolved. This is a final, but crucial, step which has to be taken for a negotiated arrangement to last beyond the signing ceremony. The circumstances that brought about a conflict to begin with are seldom static, nor are the conditions of agreement. This is particularly true for hydrologic conflicts, where supply, demand and understanding of existing hydrologic conditions all change from season to season, from year to year.

Water managers in general are relied upon to implement national policy within the limits imposed by:

- normal seasonal and annual variability;
- dramatic fluctuations in quantity (droughts and floods);
- groundwater pumping and recharge rates within 'safe yield';
- delivery system capability;
- adequate water quality for each use;
- economic efficiency;
- political considerations.

While the international agreements which have been reached often include some understanding of these parameters, including mechanisms explicitly dealing with aspects of hydrologic variability, most are weaker in considering other ways in which a basin may change over time. The Nile Waters Agreement, for example, has sections concerning natural variability of the river, as well as guidelines for allocating unanticipated gains and losses between Egypt and Sudan. The Agreement, however, also counts on the gains of implementing a canal through the Sudd wetlands—the negotiators could not have foreseen years of civil strife in Sudan, and new concerns about possible environmental impact, precluding such an extensive development.

Some parameters of water resources which are commonly excluded in international agreements include those listed below.

(1) *Physical parameters.* These include the following.

Fluctuations in seasonal, annual, and long-term water supply: This aspect of water resources often is included in international agreements, to varying degrees of success. One method of dealing with quantity fluctuations is to assign one state

the 'remainder', or 'residue' flow, after other states have received a set quantity. This method, used in the Johnston agreement which assigned Israel the 'residue' flow, has the drawback of assigning all of the stochastic risk to one riparian. A variation is to allow for fluctuation, but to assign each riparian a minimum absolute amount—important in arid and monsoon regions, both of which are particularly susceptible to seasonal fluctuations. Minimum quantities are guaranteed on the Yarmuk, and, unofficially, on the Euphrates. An alternative is to divide quantity by a percentage of actual flow, which effectively spreads risk among riparians, but which puts downstream users at particular risk if changes occur upstream. Such is the case on the Ganges, where Bangladesh sees decreasing flows due to greater upstream use by India.

The Colorado compact between upper and lower riparians provides an example of the consequences of *not* incorporating quantity fluctuations—the agreement calls for a set amount to each of the two parts of the basin, but overestimating the quantity to be divided, as well as initially neglecting Mexico's claims, together resulting in shortfalls in more years than not.

Groundwater: The relationship between groundwater and surface water is rarely codified into law or international agreements. The results of excluding groundwater can include strains on existing relations between riparians—planned deep wells in the West Bank strained relations between Israelis, who undertook the project, and Palestinians, who thought the wells would undercut their own water supplies—or strains on existing agreements—Israel and Jordan got into a brief 'pumping war' in competition over two sides of an aquifer which underlies the Yarmuk. An illustrative example of the interrelationship between groundwater, surface water and international relations can be found in the Rio Grande/Rio Bravo basin, on the border of the USA and Mexico.

Fossil aquifers which straddle borders are likewise poorly dealt with. Fossil aquifers underlie joint borders throughout the Middle East; for example between Israel and Jordan, Jordan and Saudi Arabia, and Israel and Egypt. As they are increasingly turned to as alternative sources of water supply, they may create increased friction between states. Complicating factors is the fact that surface- and groundwater watersheds are not necessarily identical.

Water quality: While much focus in agreements is often placed on the amount due to each riparian, less attention is usually paid to the quality that water should have. The Colorado agreement between the USA and Mexico provides a good example of initially ignoring quality issues, when, after formal Mexican protest, the USA agreed to build one of the most extensive desalination plants in the world to meet Mexican quality needs. In contrast, water quality is explicitly delineated in the Johnston accord, which defines salinity standards, in parts per million, for each branch of the Jordan.

The physical environment: This vital parameter is almost invariably given perfunctory treatment in international agreements, if it is dealt with at all. Treaties often allocate the entire average flows of river systems between users, leaving no water at all for in-stream needs. Development projects such as the Jonglei Canal on the Nile tributaries, and the cascade dams on the Mekong, have historically paid little attention to the potential impact on the physical environment. If only because international agencies increasingly use environmental impact as a measure of development viability, rather than because of a 'land ethic' in a Leopoldian sense,¹¹ riparians will need to be more sensitive to the environmental consequences of their water resource agreements.

Changes in understanding of the physical system: With greater modelling precision and more statistical information, physical systems are being better understood over time. This can result in easing negotiations, as was the case when Jordan found it needed less water for its future needs than was thought, allowing for a break in the Johnston negotiations, or in strains on an agreement, as is the case in the Colorado compact's allocation of less water than usually exists.

Technical breakthroughs: One interesting question in light of potential technical breakthroughs is how each might affect an international agreement for water resources development. For example, who would have borne the cost of implementing and maintaining extensive water projects had the early promise of nuclear desalination or cold fusion resulted in dramatically inexpensive water?

It is as common to ignore the link between these physical parameters as it is to exclude them separately. To do so ignores hydrologic reality.

(2) *Economic parameters.* It has been shown, by Wishart (1989), among others, that cooperative water resources development within an international watershed is usually more efficient, in the economic sense, than conflicting unilateral development. And while the economic incentives of cooperation alone have rarely been responsible for overcoming other, usually political, obstacles, the paradigm of economics is increasingly being used as a framework for defining terms of conflict resolution. As mentioned above, for example, one study is attempting to monetize the water dispute on the Jordan River, while international water markets have been mentioned as a method of increasing regional efficiency.

Some considerations which have been used in the past to enhance the potential for economic cooperation between riparians include:

- It has been recognized that while water itself is a finite commodity, and therefore conducive only to zero-sum solutions ('distributive' or 'win-lose'), the benefits, or welfare, derived from water are variable, and therefore tradable for non-zero-sum ('integrative' or 'win-win') solutions.
- Welfare can be measured basin-wide and among all the players participating in cooperation, so that even when one player's individual welfare is not immediately enhanced by the loss of the resource, the resulting pay-offs of trade should result in the region as a whole being better off.
- Infrastructure considerations can enhance the argument for cooperation, especially when considering the variable aspects inherent to water resources. One or another of the riparians may have better resources to deal with fluctuating quantity or quality—more storage potential, or better developed water treatment for example—which can help encourage an alliance.

As economics becomes more dominant as a paradigm in conflict resolution, it is also worth recognizing the sometimes overpowering non-economic values water users occasionally attribute to their water. These might include:

- political attributes of water, e.g. perceived past injustice or national pride;
- cooperation *per se* (e.g. the World Bank and other funding agencies do not include international cooperation as a benefit in benefit/cost analyses);
- physical security;
- perceptions of beauty in the environment;
- inherent value of 'non-economic' species and a healthy ecosystem;

- food or water security—the psychological value of control;
- open space (water is now being subsidized in some countries to help keep agricultural land open against encroaching urban development).

While the absence of economic considerations in international agreements can condemn the riparians to ‘inefficient’ development, hazards exist, too, in relying solely on economics to guide negotiations.

(3) *Political parameters.* These include the following.

General hydropolitics: While some international agreements make some provision for dealing with hydrologic variation, none surveyed here deals explicitly with the possibility of any political variation whatsoever. What is interesting in this exclusion is that this survey suggests that political change is a major catalyst in either provoking disputes or in bringing about their resolution. Political change has already been mentioned as an indicator of possible water conflict, as many of the conflicts presented here, including those on the Ganges, the Indus, and the Nile, took on international complications as the British empire gave way to local rule. The Mekong Committee became an ‘interim’ committee when the Khmer Rouge gained control in Cambodia. In contrast, other agreements were hastened when new governments resulted in friendlier relations within basins. Such was the case with Sudan on the Nile, India on the Ganges, and Bangladesh on the Ganges.

Along with changes in government, other political considerations can be taken into account in international negotiations. These might include:

- changing levels of hostility between riparians;
- changing power relationships, including:
 - (a) riparian position (e.g. Israel and Pakistan have each shifted riparian relations with their neighbours);
 - (b) military power shifts;
 - (c) legal changes (e.g. clarity of water rights);
 - (d) economic growth and stability;
- the social environment, e.g. population movements (refugees, immigrants, resettlement because of water developments).

Enforcement mechanisms: Most of the agreements presented have some description of a feedback mechanism for ongoing conflict resolution. Many of these are innocuous—requiring little more than meetings at progressively higher political levels—and, probably as a consequence, ineffectual. What is notably lacking in all of the agreements is any real mechanism for enforcing the terms which were negotiated. While abrogated agreements can be brought before the International Court of Justice, this venue has practical limitations, mentioned earlier, which preclude it as a common method for resolving contracts.

Aspects of Water Resources that Can Encourage Cooperation

Just as there are difficulties inherent in water resource conflicts brought on by the qualities particular to the resource, so too does water resource planning and development offer specific aspects which can encourage cooperation between riparians. A comparatively recent sub-field in ADR, ‘dispute systems design’, is a process of integrating the potential for ADR in public institutions and other

organizations which deal with conflict. Described by Ury *et al.* (1988), 'dispute systems design' may offer lessons to cooperation enhancement in water systems as well. Although most of the work in this field describes incorporating cooperation inducement within organizations, some of the same lessons for 'enhancing cooperation capacity', or 'design considerations and guidelines', might be applicable to technical or policy systems as well. A water-sharing agreement, or even a regional water development project, for example, might be designed specifically to induce cooperation in ever-increasing integration from the beginning.

In a study of the history of conflict and cooperation over water resources in the Jordan basin, Wolf (1995b) described two issues at the heart of resolving water quantity conflicts: an equitable allocation of existing resources, and control of one's own major water sources. Only when these two issues of equity and control are addressed, it is argued, can the riparians move forward to build increasingly integrated infrastructure. The lessons of that particular basin may be applicable to other contentious watersheds as well. That is, that cooperation-inducing water resources implementation be pursued along the following general guidelines:

- (1) *'Dis-integrating' control of water resources.* Equitable allocations and control of one's major water sources are of primary concern to each riparian entity, are usually necessary to address past and present grievances, and are prerequisites for market-driven solutions. As such, an initial separation of resources within the basin might be advisable. Since these steps involve a separation of control as a precondition to 'integration', the process might be referred to as 'dis-integration'.
- (2) *Examining the details of initial positions for options to induce cooperation.* Each party to negotiations usually has its own interests uppermost in mind. The initial claims, or 'starting points' in the language of ADR, often seek to maximize those interests. By closely examining the assumptions and beliefs behind the starting points, one might be able to glean clues for inducing some movement within the 'bargaining mix' of each party. These underlying beliefs may also provide indications for the creative solutions necessary to move from distributive bargaining over the amount of water each entity should receive, to integrative bargaining—inventing options for mutual gain.
- (3) *Designing a plan or project, starting with small-scale implicit cooperation and building towards ever-increasing integration, always 'leading' political relations.* Building on the first two steps, a watershed whose riparians have clear water rights and control of enough water for their immediate needs might begin to work slowly towards increasing cooperation on projects or planning. Even hostile riparians, it has been shown, can cooperate if the scale is small and the cooperation is secret. Building on that small-scale cooperation, and keeping the concerns of equity and control firmly in mind, projects might be developed to increase integration within the watershed, or even between watersheds, over time.

The 'cooperation-inducing design' process described here, moving from small and doable projects to ever-increasing cooperation and integration, remaining always on the cutting edge of political relations, has been applied to water rights negotiations, as is currently the case between Palestinians and Israelis; to watershed planning, such as the incremental steps of the Mekong Committee, or

to cooperative projects for watershed development, such as the Middle East multilateral working group on water.

Ironically, many of the same aspects of water resources which make them conducive to conflict also allow their management to induce cooperation. These characteristics include:

- *physical parameters*—the fluctuations inherent in the hydrologic cycle result in countries having disparate quantities at differing times, allowing options for trade, as explored earlier;
- *'wheeling'*—water resources, like energy resources, can be traded step-wise over great distances. Any addition to the water budget in the Jordan watershed, for example, can be 'wheeled' anywhere else. Litani or Turkish water diverted into the Jordan headwaters in Israel, for instance, can be 'credited' for Yarmuk water to Jordan, which in turn might allow more water in the lower Jordan for the West Bank, which might result in surplus West Bank groundwater being diverted to Gaza, and so on. This cost-saving practice of 'wheeling' can only be achieved, however, when infrastructure is designed for future cooperation from the beginning;
- *structural considerations*—not only can water resources infrastructure be designed for possible future cooperation but topographic and hydrographic differences between countries can also be taken advantage of for trade between countries. Upstream riparians like China, Nepal and Ethiopia might have better access to good dam sites, for example, which might be developed cooperatively with downstream riparians. The Sea of Galilee has likewise been suggested as a storage facility for the Jordan riparians in the absence of a Unity Dam;
- *economic factors*—water is worth different things to different people, again allowing incentives for trade once, as discussed previously, property rights to the resource have been established;
- *training of water managers*—perhaps more than the managers of any other resource, water managers think regionally, beyond their borders, by training and practice. It is not surprising therefore, that water managers have been able to reach agreements often well in advance of their political counterparts;
- *water science*—countries within a watershed develop different levels of water technology, often with different emphasis. While Israel has emphasized drip irrigation and genetic engineering, Gulf states have invested heavily in desalination. Trade of existing technologies and joint research and development projects provide ideal venues to enhance regional cooperation.

Many aspects particular to water resources provide properties which can both provoke conflict and induce cooperation. The water conflicts presented here suggest that, with early planning, one can help guide riparians along the latter path. To do so, however, takes foresight and awareness of the options throughout the negotiating process.

Summary and Conclusions

Many descriptions of international water disputes begin and end with an assessment of the nascent state of international water law. Others focus on the conflict aspect of these disputes, playing up past political and military tensions, and warning of future 'water wars'. As we have seen here, there is a vast

experience of international water conflict resolution which has little to do with legal theory, and a creativity which, when combined with characteristics of water which tend to induce cooperation, help preclude these worst-case scenarios.

This paper focuses on the lessons learned from the experience of international water conflict resolution as seen in 140 transboundary water treaties, 14 process case studies and three forums of the IWRA's Committee on International Waters which covered nine basins. These lessons learned were divided into the three stages of negotiation: pre-negotiation, negotiation and implementation.

During the pre-negotiation stage, inherent differences have been described between the national and international settings regarding institutions and authority, law and enforcement, a presumption of equal power, and alternatives for a best alternative to a negotiated agreement (BATNA), but it was found that the differences are not necessarily as great as are commonly thought. The occurrence of 'flashpoints' on international rivers have been described, and lessons suggested for involvement in advance of conflict not only to preclude the flashpoint, but because these institutions have shown tremendous resilience over time, surviving and providing outlets for tensions even in the presence of tremendous political hostility.

Lesson: Integrated, international water management is best implemented *before* conflicts arise within a watershed. Such an institutional framework for conflict resolution helps preclude data disputes and provides a pattern of cooperation in the absence of the intense political tensions of a flashpoint.

These institutions are not implemented in a vacuum. All of the successful international water authorities described here were implemented as a result of strong third-party support, both political and financial.

Lesson: Not only is third-party involvement vital in bringing about international water conflict resolution, that involvement must be active and backed by both the financial and political support of the international community.

It was found that indicators of possible conflict exist, including water quantity and quality issues, management for multiple use and political divisions. Indicators for the type and intensity of conflict were also described, including the geopolitical setting, the level of national development, the hydropolitical issue at stake institutional control and the national water 'ethos'.

During the negotiation stage, common obstacles to successful negotiations were suggested—particularly unwillingness to recognize parties who would block an agreement, and scientific disputes—and the lessons of introducing multi-resource linkages were offered—financial resources, energy resources, political linkages and data—to encourage positive-sum solutions.

Lesson: Creating incentives for voluntary resolution of water resource conflicts is key. While international institutions may not have the laws and authorities to enforce solutions, they often have access to other carrots and sticks—some of which may be resources other than water—which can help induce agreement by capitalizing on differences, and creating trades or linkages.

For the implementation stage, often ignored parameters are described—physical, economic and political—as are aspects unique to water resources that can encourage cooperation.

Lesson: The issue is *watershed* management, not river management. This links quality and quantity, surface- and groundwater, water and people. Everything is connected to everything else.

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Notes

1. Details of the 14 case studies listed in Table 1 can be found in Bingham, G., Wolf, A. & Wohlgemant, T. (1994) *Resolving Water Disputes: Conflict and Cooperation in the US, the Near East, and Asia* (Washington, DC, US Agency for International Development, November). (Publication No. ANE-0289-C-00-7044-00.) A one-page summary of each of the 140 treaties in the University of Alabama Transboundary Freshwater Dispute Database is available on disk from the author upon request.
2. 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.
3. 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 to 1991.
4. 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.
5. The ICJ came into being in 1946, with the dissolution of its predecessor, the Permanent Court of International Justice. That body did rule on four international water disputes during its existence from 1922 to 1946. Furthermore, the ICJ has recently heard one case on the Gabčíkovo Dam on the Danube. As of this writing, that case has not been resolved.
6. 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 & Mitchell (1991).
7. The concept of 'water wars' should be examined with great scepticism. In other work (Wolf, 1995b), I argue that water had no role in the strategic thinking of past wars in the region, nor has any war ever been fought over water. Beaumont (1994) argues quite effectively that such wars in the Middle East would be economically irrational.
8. Amy (1987) points out that a party should not even be at a negotiating table if their BATNA is better than what they can achieve through negotiations.
9. 'Power' in regional hydrogeopolitics can include riparian position, with an upstream riparian having more relative strength *vis-à-vis* the water resources than its downstream riparian, in addition to the more conventional measures of military, political and economic strength. Nevertheless, when

- a project is implemented which impacts on one's neighbours, it is generally undertaken by the regional power, as defined by traditional terms, *regardless* of its riparian position.
10. For particularly cogent presentations of this argument, see Lowi, Miriam (1993) *Water and Power: The Politics of a Scarce Resource in the Jordan River Basin* (Cambridge: Cambridge University Press) and Waterbury, John (1993) 'Transboundary water and the challenge of international cooperation in the Middle East, presented at a symposium on Water in the Arab World, Harvard University, 1–3 October.
 11. Leopold Aldo (1949) *A Sand County Almanac* (Oxford: Oxford University Press).

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