Sources of International River Basin Disputes

by
Robert Mandel

INTRODUCTION

In the twentieth century the world has experienced substantial growth in the demand for fresh water for agriculture and industry along with a decline in the uncontaminated supply of this resource. Rather than seeing the geopolitical concern of water access recede as technology diversifies our means of consumption and substitution, we have witnessed unprecedented attention focused on this most traditional natural resource. International river basins, historically cradles of modern civilization, have been transformed into tense arenas for competitive exploitation by neighboring nations. As a result, it has become increasingly difficult to distinguish between water as an environmental issue and water as a national security issue, and international disputes have arisen almost everywhere among the users of the world's waterways.

Given that water is the most vital resource needed to sustain human life, it is perhaps not surprising that over forty percent of the world's population lives in river basins shared by more than two nations.[1] No other natural resource has as many uses as a river:[2] these include hydroelectric power generation, navigation, drinking water, fishing, irrigation, recreation and tourism, preservation of nature, waste disposal, flood prevention, and demarcating political or ethnic boundaries. Because river water is continuously in motion, issues of control, jurisdiction, and sovereignty are much more complicated than when dealing with static land resources.[3] Unlike most other natural resources, these water needs are generally such that a local source is critical, eliminating the option of supplementing immediate supply with water imports from outside the region. Due to differences in national perspectives, international rivers with shared freshwater resources pose particular problems and tend to suffer greater environmental damage and to experience less productive utilization than comparable exclusively national water resources.[4] Thus the characteristics of international river basins combine to create the most complex challenge for effective resource management.

While extensive probing has occurred into the nature of water conflict involving particular rivers or within particular regions, relatively little overarching insight has emerged concerning the theoretical roots and global patterns of international river basin conflict. As Frederick Frey and Thomas Naff[5] point out, "because of its sheer complexity in practical, ideological, and symbolic terms, the issue of water is more difficult for policy makers and scholars to grasp in its entirety and tends to be dealt with piecemeal both domestically and internation-

ally." Furthermore, David LeMarquand[6] notes that even when general research has emerged concerning international rivers, it has focused more on legal and administrative aspects of management than on the reasons for the relative lack of success in achieving international cooperation on this issue. This study attempts to begin to fulfill that conceptual and empirical void. It presents as a background context a new general model tying together the explanatory elements involved in precipitating such disputes, introduces some hypotheses distinguishing distinctive patterns of international river basin conflict, and then analyzes a series of case studies to explore the validity of the hypotheses.

THEORETICAL MODEL

The sources of disputes over international river basins encompass considerations from fields as diverse as ecology, economics, political psychology, religion, cultural anthropology and geopolitics. Certain precipitants come logically to the forefront, however, and this study specifically suggests a three-stage explanatory process involving a non-cooperative setting, environmental imbalance, and power asymmetry. Figure 1 shows the sequence involved in the model as a whole.

As the figure indicates, the three elements of this causal model have their impact on the potential for conflict roughly in the specified time sequence. The first element — a non-cooperative setting — is a key background irritant fostering conflict because this condition induces a predisposition to perceive the river basin predicament and other riparian[7] states' motivations in a hostile way and thus to impede resolution of contentious issues. The second element — environmental imbalance — is a major source of frustration promoting conflict by building on pre-existing antagonisms caused by the gap between aspirations and reality in water access. This leads both to an inability to meet domestic needs and to a sense that the distribution of this resource is unfair and degrading. The third element — power asymmetry — is an immediate trigger for conflict once the other two elements are in place. This condition provides the means for the existing tensions identified above to be translated into unrestrained confidence on the part of one or more riparian states to initiate and carry through conflict successfully. While the first two elements explain the motives and intentions of conflict-prone riparian states, this last element emphasizes the facilitating or limiting impact of national capabilities. From a conceptual perspective, each of the three elements appears equally important — with no ranking or weighting scheme warranted — and mutually reinforcing over time.

More specifically, looking at the first component — a non-cooperative setting — the most important facet is the existence of ongoing ethnic, religious, or ideological antagonisms in the river region. The river itself may: split geographically key ethnic, religious, or ideological groups; function as a tangible resource support for the distinctive lifestyles of these groups; or simply serve as

a symbolic psychological focus for pre-existing hostility. In the first case, the roots of this antagonism are often geopolitical sphere-of-influence concerns, in which issues of sovereignty and territoriality impede efforts to move toward sound international river management; in the second case, ecological impediments relating to usable water allocation; in the third case, a mixture of both. Moreover, if past efforts on the part of the riparian nations had yielded little progress in settling differences about river use in a mutually satisfactory way, a sense of cynicism and frustration would seem likely to dominate consideration of possible future moves. In other words, if there is a combination of pre-existing hostility and a defeatist attitude about the likely success of any river management structure, tension would seem to escalate. Regarding riparian antagonism, Evan Vlachos[8] confirms the importance of these concerns when he notes the frequent tendency of differences in the historical and cultural practices of riparian nations to create problems for international river management; Sandra Postel[9] emphasizes specifically the central importance of "contentious political relations" and "religious and ethnic tensions" in global water management; and LeMarquand[10] contends that "a history of mistrust and ill will" aggravate river management problems. Regarding previous progress in river negotiations, Naff and Ruth Matson[11] point out that the inadequacy of pre-existing legal structures and water management plans leaves a void in which conflict can easily develop.

Turning to environmental imbalance, scarcity is at the core of the problem. On the supply side, the contamination of river water may be growing — and thus the amount of usable water contracting — due to exposure to increasing amounts of both human/animal (organic) waste and industrial (largely inorganic) waste; and decreasing ecological diversity in the water system as a consequence of the waste and over-exploitation. On the demand side, the use of river water may be growing due to increasing human population, generated internally or externally through migration; and increasing urbanization, industrialization (including the use of hydroelectric power), and agriculture (especially through irrigation efforts). While the bottlenecks engendered by this supply/demand squeeze seem quite real and heavily influenced by long-term ecological trends, the potential certainly exists for riparian nations to exaggerate the level of scarcity and to indulge in finger-pointing about blame for the pressured predicament. General studies[12] of the link between resource scarcity and conflict emphasize that frustration may emerge as a result of such scarcity when expectations from the past exceed current achievements; that this frustration may be most acute if existing scarcity represents a dramatic change from previous resource abundance; and that perceived and real vulnerability to resource disruption may be the result. With specific respect to international river basins, Frey and Naff[13] rather sweepingly assert that the scarcity of water "is always a zero-sum security issue and thus creates a constant potential for conflict." Philip Quigg[14] notes that when competition for limited water exists under scarcity, a pernicious conflict-enhancing process occurs in which "users

outdo one another in consumption in order to sustain their claim into the future." Joyce Starr and Daniel Stoll[15] indicate that for both the supply and demand ends of scarcity, inefficient maintenance and improper operation of water facilities may be a key cause of international river crises.

Compounding the scarcity dilemma may be a second environmental imbalance reflected in the uneven distribution of international river water. A substantial part of this inequality results from a geographical "luck-of-the-draw" as to how human population disperses near a major river basin. But, even more specifically, the distribution of water can be the product of the extent to which upstream river users need to care about the needs of downstream users. Often the difference in water availability or water quality is dramatic, and the sense of distributional inequality is usually associated with feelings of inequity and the need for redress. Most general analyses[16] find that growing resource inequality promotes conflict because no safety net exists at the bottom and the intolerable discrepancies in resource consumption and living standards may entice those without needed resources to become desperate. Dealing more specifically with water, Richard Barnet[17] points out that "the global maldistribution of water is even more pronounced than the maldistribution of energy or food," and that the "enormous" escalation of water use in developed nations along with recurring drought conditions in the developing world increase the potential for tension and resentment. With particular reference to international river basin issues, LeMarquand[18] contends that "the uneven distribution of positive and negative impacts from the use of resources and differing demands among the basin countries for the water obscure a basin-wide perspective and frustrate cooperative action to manage and develop the resource efficiently."

Moving to the final component of the model, power asymmetries, calculation of the power ratio among riparian states involves three elements: the states' overall political/military/economic power levels; the states' technological power to disrupt or alter the river basin; and the states' geographical power reflected in a more advantageous upstream or less advantageous downstream position with respect to the river. These last two components frequently interrelate with one another in enhancing power asymmetries: for example, the escalating industrial waste of a technologically oriented upstream nation may create downstream pollution in a shared river basin; or the construction of dams by upstream nations can introduce downstream difficulties because of the diversion of water (and water resources like fish) from downstream users, and the creation of stagnant water that may become contaminated, salty, and/or promote diseases. However, many riparian nations in the superior power position refrain from exercising that power because of ecological and political repercussions. Thus, restraining the exercise of power by stronger upon weaker nations is the extent of reciprocal interdependence between them (as well as their web of alliances), with the underlying assumptions that such interdependence can broaden mutual concerns and that the less evident such interdependence the

higher the chances of riparian conflict. In light of Robert Keohane and Joseph Nye's[19] two critical dimensions of interdependence — sensitivity (the size and speed of the impact of one nation's changes on another) and vulnerability (the extent of the availability and cost of alternatives given these changes) — river basin conflict could result from either asymmetrical sensitivities and vulnerabilities among riparian nations, or mutually high sensitivities and vulnerabilities with asymmetrical overall power. With respect to resources in general, Mandel[20] contends that skewed (rather than reciprocal) interdependence seems particularly likely to generate international resource conflict (especially when dealing with renewables viewed as basic human needs such as water) because one nation is probably taking a lot more than it is giving, fostering frustration and perceptions of unfairness in the other nation, and the first nation might become increasingly unreasonable in its demands. With specific reference to international river basins, Joanne Linnerooth-Bayer[21] points out that the "power asymmetry" of "upstream-downstream geopolitics of international rivers," in which "the upper riparians have distinct advantages in such policy areas as flood control and apportionment of water supplies, and especially in river water contamination," impedes the chances of successful cooperative bargaining outcomes and increases the conflict potential (in contrast to situations where the distribution of power is even and/or all parties contribute to a common goal without which each would equally suffer). LeMarquand[22] reinforces this point in noting that "there is no economic incentive for cooperation when an upstream country uses an international river to the detriment of a downstream country and that country has no reciprocal power over the upstream country." However, as Frey and Naff[23] contend, conflict over international river basins requires "blockage" or resistance of the interests of another, so that even with power asymmetry downstream nations must possess some ability to thwart the aims of upstream nations in order to create tension.

HYPOTHESES AND METHODOLOGY

In the context of the preceding theoretical model, this study examines more specific hypotheses relating to significant controversies on the topic. Out of a wide range of possibilities these particular hypotheses emerged as central for scrutiny on the basis of their importance in linking up with crucial aspects of general debates over resource conflict.

The first hypothesis relates to the nature of the disputed issue in a river basin. LeMarquand[24] notes that river disputes focusing on border definition issues, with a river forming a shared boundary between nations, are quite different from river disputes focusing on water consumption issues, with a river cutting across two or more nations. The first type of issue often reflects geopolitical sphere-of-influence concerns, while the second frequently reflects ecological water quality concerns. More specifically, the first seems to be more symptomatic of intractable zero-sum tradeoffs among contending parties (typi-

cal of the general pattern of international border disputes),[25] with each side desiring control of a larger share of the river bed leaving less for anyone else; while the second — especially when dealing with "common pool" pollution control issues — appears to be more symptomatic of potentially resolvable non-zero-sum tradeoffs among relevant parties, with solutions possible that improve the plight of everyone involved in use of a river. Viewed from a security standpoint, shared environmental degradation in the form of water pollution seems to pose a much more long-term, indirect, and subtle threat than does mutual disagreement about how a river defines one's border. On the basis of this logic the following hypothesis emerges:

> International river basin disputes over border definition issues tend to exhibit more severe conflict than disputes over pollution control issues.

The controversy inherent in this contention is evident through the opposite argument that in today's world, with growing usable water scarcity and the end of Cold War machinations, practical life-threatening water quality issues might generate more urgent need and national passion than the more symbolic power-related sphere-of-influence concerns.

The second hypothesis deals with whether human action or natural forces trigger any disruption in a river basin. More specifically, there appears to be a considerable distinction between water apportionment concerns initiated by the technological intrusion of dams or other forms of river flow alteration, and those concerns initiated by the natural intrusion of flooding. The underlying assumption is that the human-initiated disruptions would generate greater hostility and more intractable disputes than natural disruptions because of the lower sense of legitimacy and inevitability involved. Barnet[26] supports this claim with the more general assertion that when nations perceive resource pressures as resulting from intentional human manipulation rather than unintended and/or natural forces, the resentment is greater and the conflict potential is higher. From a security perspective, premeditated and intentional intrusions in a wide variety of contexts traditionally elicit more belligerent responses than accidental or uncontrollable disruptions. The following hypothesis thus emerges:

> Among international river basin disputes over water apportionment, human-initiated technological disruptions involving dam construction or other river flow alterations tend to exhibit more severe conflict than natural disruptions involving flooding.

The controversy here is the possibility that since flooding may cause more chaotic and widespread damage than controlled technological intrusions, friction among affected parties could — contrary to the hypothesis — be more intense for those natural disasters than for human-initiated alterations in a river basin.

Both of the hypotheses address the severity of conflict (the dependent variable), which requires further delineation in the context of international river basins. This study attempts to distinguish among three levels of conflict (low, medium, and high) based on how protracted disputes are over time; how close disputes are to breaking out into tangible military confrontations (and, if such confrontations do emerge, how destructive they are); and how much progress occurs in resolving issues of disagreement. Thus a low-severity river dispute may be one where the problem is simply the absence of a functioning and integrated management system for an international river basin and where progress has been relatively smooth and cooperative, while a high-severity river dispute may involve seemingly permanently unresolved issues and heated verbal recriminations from all sides and/or violent clashes. In some cases a conference among riparian nations may signify the beginning of a dispute since they recognize for the first time which issues divide them, while in others it may signify the end of a dispute as they finally reach agreement on key contentious issues. Unlike many other conflict arenas, in the river basin context the likelihood or level of violence seems less crucial in determining the severity of conflict than the degree of contentiousness and acrimonious stalemate.

Brief case studies of major international river basin disputes serve as the basis for assessing the hypotheses. The selection of these case studies involved careful scanning of existing comparative assessments, and of the most crucial river basins in the world to ensure inclusion of those cases exhibiting significant international river management problems. The cases chosen are from the twentieth century because this is the period when technology has been most available for altering river basins (particularly for purposes of hydroelectric power and large systemic irrigation); pollution concerns have gradually moved to the forefront of national resource agendas; and the supply-demand squeeze has been most acute for river water use. In order to explore fairly the validity of the hypotheses, cases considered vary considerably in the level of friction they exhibit. While by necessity the coverage does not include every major international river basin — the earth contains over two hundred river basins shared by two or more nations — the sample encompasses a representative and relatively broad selection: the fourteen cases include three apiece from North America and the Middle East, two each from Europe, South Asia, and Africa, and one from East Asia and South America. Figure 2 displays general background information on these cases. The case name is of the principal waterway involved, the case dates are those of the most recent phase of dispute (in some cases these are approximate), and the primary participants are the major riparian antagonists in the dispute. Because the sample size is small and the sources for the case studies are by necessity secondary ones, the examination of the model and hypotheses through the cases is more in the category of illustration than of proof or disproof.

CASE STUDIES

The treatment of each case is parallel in order to maximize both comparability and generalizability of findings. Case analyses include brief histories of the river basin disputes and key relevant issues, application to the cases of the three components of the theoretical model (non-cooperative setting, environmental imbalance, and power asymmetry), and assessment of the existing level of (and potential for) international river basin conflict. Although the sparse and secondary nature of the source materials for the cases places a limit on the reliability and validity of assessments made, the information needed to test the hypotheses is generally both readily attainable and not subject to major controversy.

Colorado River

After a sustained period of conflict over water apportionment needed to serve the competing demands of the southwest region of the United States and the northwest region of Mexico, in 1961 the dispute focused on water quality because the Wellton-Mohawk irrigation project in southern Arizona began to discharge highly saline drainage waters into the Colorado River. These saline deposits from the irrigation project compounded the river's already growing salt levels due to increased American upstream diversion of water for hydroelectric power and to associated rising pollution. As a consequence, the water severely damaged croplands in the Mexicali Valley, and the Mexican government formally protested the decline in water quality. While the American State Department had initially denied any responsibility for water quality deterioration, it later decided "a settlement was imperative to improve binomial relations, defuse domestic dissent in Mexico, and forestall a Mexican motion to take the matter to the World Court."[27] After over a decade of intense and complex negotiations, in 1973 the United States and Mexico reached an agreement in which the United States pledged to provide Mexico with low-salinity water through the American construction of a desalinization plant, and the Mexicans in turn were willing to accept less-than-perfect parity with the United States in water quality.

Turning to the application of the theoretical model in this case, the setting was only mildly non-cooperative. Mexico and the United States, while having significant cultural and economic differences, have maintained an overall political alliance that the Colorado River issue did not break down. However, Richard Bath[28] points out that this dispute "became an increasingly emotional issue tied to Mexican nationalism." Some previous progress had occurred in international management of the river, most significantly through the water treaty in 1944 between the two nations. Secondly, a severe environmental imbalance existed in this case. Barnet[29] substantiates the Colorado River's scarcity of usable water by noting that this has been the most "water short" river basin in the United States, serving fifteen million people and containing large

storehouses of energy resources like coal, oil, natural gas and uranium (which accelerate the rate of exploitation and pollution). Furthermore, the Mexican-American inequality in usable water during the dispute was severe:[30] "farmers in the United States were receiving good quality water a few miles upstream, while the water Mexico was forced to accept was unusable." Thirdly, the power asymmetry in this case was mild, with the United States having overwhelming technological power to disrupt the river basin and Mexico having little reciprocal political, economic, or military power to resist, but also with a restraining interdependence forcing mutuality of concern. Although the real power disparity between the United States and Mexico has been huge, LeMarquand[31] points out that the restraints on the Americans were "the desire by the United States to be seen by the world, and especially the developing countries, as a responsible riparian, the lingering doubt over the validity of its legal position, and the need to maintain good relations with Mexico for the resolution of other important bilateral issues." Especially important were the international image of the United States as "a superpower less than generous in dealing with the consequences of its domestic activities in Mexico," and the potential linkage of river dispute resolution to other bilateral contentious security issues, such as illegal immigration and drug trafficking.

This case centered on ecological, usable water apportionment issues, and the disruption (in this case an irrigation project and accelerated exploitation and pollution) resulted from human-initiated actions on the part of the upstream nation. Despite this tension-enhancing context, the conflict was somewhat muted (although sustained for a time) because the setting was reasonably cooperative and the bilateral interdependence was reasonably restraining. The environmental imbalance alone was not sufficient to generate severe conflict in this case.

Columbia River

In March 1944 both the United States and Canada recognized a mutual need to develop further the potential of the Columbia River basin, which has more hydroelectric power capacity than any other river system in North America.[32] The American motives were to even out the peak flow and achieve flood control (through the construction of Canadian storage facilities) so as to enhance power generation, while the Canadian motives were to supplement benefits from domestic exploitation with revenue from American downstream use.[33] The resulting International Joint Commission did not reach its conclusions until 1959, primarily because of differences of opinion on how to define and assess the costs and benefits involved. Controversies about management structures further delayed negotiations: in the United States, the unresolved issue of public versus private ownership of electric power projects caused complications;[34] and in Canada, the lack of clear jurisdictional supremacy between the provinces and the federal government resulted in conflicting objectives between British Columbia

and the Canadian federal government.[35] Finally, in January 1961 Canada and the United States signed a treaty (not fully ratified until September 1964) calling for Canada to construct at its own expense storage facilities in three dams, and in return for Canada to receive a huge increase in hydroelectric power production and a significant lump sum payment from the United States for the resulting flood control benefits.

With regard to the application of the theoretical model, the setting was devoid of significant cross-national antagonism because of the long history of Canadian-American cooperation (despite some Canadian resentment of American economic domination). As Neil Swainson[36] notes, the river basin seemed "ideally suited" to integrated international management because of the long tradition of mutually friendly relations and similar political systems. Prior joint success in international river management had also occurred, exemplified by the 1909 Canada-United States Boundary Waters Treaty that was the basis for the establishment of the International Joint Commission. Moreover, there appeared to be no significant environmental imbalance in this case: neither scarcity in terms of inadequate quantity and quality of usable water nor maldistribution of usable water was an issue here. Two opposite (and mutually canceling) power asymmetries existed, as Canada was in the superior upstream river position but the United States possessed vastly more aggregate power; in any case a restraining reciprocal interdependence fostered cooperation, for example, the United States wished to reach agreement on this issue in order to create a "good image" of the United States in Canada.[37]

The key issue in this case was not ecological usable water apportionment, and the upstream nation did not engage in human-initiated disruption of the river basin; Swainson[38] emphasizes that the Columbia basin was not one "in which viable consumptive use by an upstream riparian produces threats to the very existence of the downstream watercourse." Instead, natural flooding concerns and hydroelectric power needs were at the core. The severity of conflict in this case was quite low, with key disagreements being resolved relatively smoothly and few verbal recriminations occurring on the international level. However, there was "often acrimonious debate" characterized by "a good deal of dissonance"[39] on the issue within Canada (between British Columbia and the federal government), particularly during the post-1954 period.

Danube River

The Danube is the world's most international river with eight riparian nations — Austria, Bulgaria, Czechoslovakia, Germany, Hungary, Romania, the former Soviet Union, and the former Yugoslavia. Originally oriented strictly toward navigation disagreements, the Danube Commission was first established in 1878 but revitalized itself after World War II in 1948. More recently, issues of concern have expanded beyond navigation to include hydroelectric power

generation and toxic pollution management. Because of the concern about this last issue, in 1985 representatives from the eight European nations bordering the river signed a non-binding Danube Declaration announcing their broad willingness to cooperate on waterway management issues, although this harmonious impulse has yet to experience successful implementation.

Application of the theoretical model to this case is complicated because of the large number of parties involved. The river basin setting has been full of historical national antagonisms, many of which related to broader East-West tensions that impeded cooperation: for example, Austria and Yugoslavia attempted — for political reasons linked to Cold War competition — to prevent the Soviet Union from expanding its influence beyond navigation.[40] While there was a solid backdrop of previous cooperation among the riparian nations, successful agreements were largely bilateral rather than multilateral in nature and thus did not approach integrated river basin management. As to environmental imbalances, despite the worsening water quality there has been no significant scarcity of usable water, as riparian nations have not extensively used the Danube's water supply for agricultural purposes and industrial uses have not yet reached limits.[41] However, inequality has been stark in the waterway:[42] "the benefit from the development of the Danube and the pollution costs are not evenly distributed among the riparian countries," as "the more prosperous upper riparians depend on the Danube mostly for industrial and waste disposal purposes and benefit disproportionately from the water power potential, while the less-developed lower riparians are more dependent on the river for drinking water, irrigation, fisheries, and on a large tourist industry at the Black Sea." Lastly, the power asymmetry among the riparian states has been extreme:[43] the upper riparians — Germany, Austria, and Czechoslovakia — are overall more politically and economically powerful, have less direct interest in improving water quality because of the nature of their uses of the river, possess greater control of the river's energy potential, and are more responsible for significant discharges in the river; while the lower riparians have been weaker but have had much more to gain through cooperative policies especially with regard to water quality. Interdependence has acted, however, as a somewhat constraining force in dealing with this disparity.[44]

This river basin case has centered neither on ecological usable water apportionment issues nor on geopolitical sphere-of-influence issues, and it has not concerned itself primarily with either human-initiated or natural disruption in the waterway. Instead, gradually intensifying concerns about pollution and hydroelectric power have been the focus. The conflict level has been quite low, to the point where Albert Lepawsky[45] calls it one of the "best managed traffic channels in the world" run by "one of the most effective international bodies of its kind."

De La Plata River

The De La Plata River basin, formed by the confluence of the Parana and Uruguay Rivers, encompasses parts of Argentina, Bolivia, Brazil, Paraguay, and Uruguay. Although disputes over the river trace back into the nineteenth century, the most recent round of tensions began in 1966 when Argentina invited Bolivia, Brazil, Paraguay, and Uruguay to discuss issues of basin development. In February 1967 the first conference of foreign ministers from the five riparian states took place and led to a joint declaration of intentions and to the establishment of the Intergovernmental Coordination Committee of the De La Plata Basin Countries. However, inefficiency and friction have resulted from this structure[46] because the range of subjects discussed included such non-water topics as education, railroads, and communications, and the primary negotiators were diplomats who lacked the professional training to understand the problem's intricacies fully rather than technical experts. The most important issues of dispute and uses of the river were first and foremost hydroelectric power generation and secondarily navigation; other concerns/uses included waste disposal, industrial applications, and irrigation.[47] Turning to the theoretical model, the river basin setting has generally been an antagonistic one, with Argentina and Brazil vying for regional hegemony.[48] Complicating these interactions, by providing different levels of perceived legitimacy and representativeness to government positions and increasing resentment is the exception of Paraguay to democratic rule in the region. However, some progress had occurred prior to 1966 in resolving bilateral (though usually not multilateral) conflicts in the basin: for example, Argentina and Uruguay resolved their differences concerning boundary-setting on the Uruguay River in 1961. In terms of environmental imbalances, there has been no usable water scarcity in the river basin, but there certainly has been an unequal use of (and reliance on) hydroelectric power, with Brazil by far the dominant user. This inequality and high rate of Brazilian exploitation has led to conflict and resentment, particularly with regard to Argentina.[49] As to power asymmetry, Argentina and Brazil have dominated in terms of size, natural and economic resources, and population, but the reciprocal power of the three smaller nations of Bolivia, Paraguay, and Uruguay has enabled them to play a "pendular game" between the two large nations on river issues, alternatively bestowing favors on one or the other.[50]

In this case no human or natural disruption triggered conflict; rather it has been the product of incremental changes in river basin management and utilization. The focus of existing disputes has been neither ecological usable water apportionment nor geopolitical sphere-of-influence concerns. The severity of conflict exclusively over river issues has been low, constrained to some extent by the perceived benefits of mutual cooperation.

Euphrates River

For centuries Turkey, Syria, and Iraq have used the Euphrates River to irrigate surrounding lands, but early in the twentieth century these three riparian states developed plans to expand the management of the river's resources for purposes of flood control, hydroelectric power generation, and very large-scale irrigation. Throughout most of this century, the absence of integrated planning did not result in conflict among these nations. However, the construction in 1973 by Turkey of the Keban dam and by Syria of the Tabqa dam (later renamed the ath-Thawrah dam) precipitated a major Syria-Iraq water crisis that brought the two nations to the brink of war. Iraq claimed in April 1975 that Syria had reduced the river's flow to an intolerably low level (indeed the flow had decreased by seventy-five percent), endangering the livelihood of Iraqi farmers whose agricultural land is almost fifty percent irrigated.[51] Syria and Iraq then exchanged threats, and Iraq indicated readiness to take any action necessary to restore the flow of Euphrates water while Syria claimed it was passing on to Iraq most of the water received from Turkey.[52] As the situation worsened through May and troops allegedly massed on both sides of the frontier, Saudi Arabia attempted to mediate (along with reputed Soviet mediation behind the scenes), and in June Syria and Turkey reached an understanding in which Syria released substantially larger amounts of Euphrates waters to Iraq. After this resolution the threat of war receded, although relations between the two nations remained quite strained. While water issues have not caused significant conflict among the riparian states since that time, tensions seem likely to occur now that Turkey's massive Ataturk Dam began operating in 1992 depriving Syria of vital water supplies.[53] Turkey's motive in this construction has been the perceived need to develop her relatively neglected eastern provinces.[54]

Addressing the theoretical model, the river basin setting was ripe with pre-existing antagonisms. As Naff and Matson[55] point out, "the spring 1975 crisis was prompted by long-standing Syrian-Iraqi tensions and by rising Syrian fears of Iraqi subversion in Syria." Furthermore, negotiations prior to 1974 among Turkey, Syria, and Iraq had proven to be largely ineffective.[56] A complicated set of environmental imbalances characterize the Euphrates River Basin. With regard to scarcity, the river basin has contained "a marked surplus of water" and "neither Turkey, Syria, nor Iraq is facing an imminent water shortage."[57] But the Turkish and Syrian dams created a potential scarcity of water for agriculture, and with future dam projects in the works there could be "severe shortages in dry spells of more than three to four years duration."[58] Moreover, there has been significant inequality in the distribution of water, with the most upstream nation — Turkey — having the greatest access and the most downstream nation — Iraq — having the smallest access. In terms of power asymmetry, Turkey has been not only in "the commanding riparian position" but also has had the greatest military power, with Iraq and Syria about equal at a lower level. Despite this gap the relatively positive relations,

including trade interdependence, between Turkey and Syria have served to restrain to some degree Syrian-Iraqi tensions.[59]

In this case the contentious concerns focused on ecological issues of usable water apportionment, and the disruption was human-initiated dam construction. The level of conflict involved here was severe, given the heightened tensions of the 1974-75 water crisis, and as Ewan Anderson[60] points out, "tensions may also escalate" in the future, "given the extensive irrigation and hydroelectric power projects in hand."

Ganges River

The dispute over the Ganges River began in 1951, when Bangladesh was still eastern Pakistan. The issues at stake with India in this conflict were from the beginning the uses of the river for irrigation, hydroelectric power, flood control, navigation, and drinking water.[61] Indian construction of the Farakka barrage in 1975 intensified the conflict, and in 1976 Bangladesh lodged an angry formal protest with India against continued operation of the barrage because the diversion of the Ganges dry season flow "disrupted fishing and navigation, put irrigation pumps out of action, brought unwanted salt deposits into rich and valuable farming soil, and thus created a chain of adverse reactions" in this downstream nation.[62] Although negotiations since that time have continued, both nations have come up with concrete proposals for resolution, third party mediators have received invitations, and the India-Bangladesh Joint Rivers Commission has attempted to satisfy both nations' minimal requirements, no settlement has as yet emerged.

Applying the theoretical model, it becomes apparent that South Asia has traditionally been a setting for antagonism between India and Pakistan due to religious differences and sphere-of-influence concerns, although relations between India and Bangladesh (after its independence in 1971) admittedly have been considerably more cordial; and there was no record of success in joint Ganges management before 1951. The environmental imbalances seemed to be quite significant. Both Bangladesh and India agreed that the scarcity was severe — reflected by the insufficient supply of Ganges water during the dry season required to meet their needs[63] — and this inadequate supply combined with growing demand due to rapid population increases has transformed a once prosperous region into one of the poorest areas in the world.[64] Furthermore, inequality in usable water availability is evident by the squeeze negatively affecting Bangladesh (the downstream nation) much more than India (the upstream nation). This inequality is linked to a power asymmetry: India is much more powerful overall than Bangladesh and also is in the superior riparian position; and without significant restraining interdependence, India appears to have few incentives to make significant concessions in order to resolve the dispute.

In this case ecological usable water apportionment was at the core, and a human-initiated disruption (the Farakka dam) intensified the dispute. The severity of the conflict appears to be medium, given the protracted length of the dispute and the extent of Bangladesh frustration.

Indus River

Home to one of the world's oldest and largest irrigation networks, the Indus River basin was the object of serious dispute even before the partition of the subcontinent. After partition in 1947, the most recent conflict erupted in April 1948 when India, in order to establish territorial claims, stopped the flow of water to Pakistan through the Indian canals. Although India resumed the flow from the canals in May, Pakistan had become alarmed because "it suddenly realized that India, as the upper riparian, had the capacity to turn West Punjab in to a desert."[65] After an innovative proposal by the former chair of the American Tennessee Valley Authority and interest in financial support for this proposal from the World Bank, negotiations began on the Indus dispute in Washington in 1952. Concerns about irrigation for agriculture and hydroelectric power dominated the discussions. Although there were "wide divergences among the disputants,"[66] India and Pakistan finally agreed to a complicated settlement of the issue in 1960. This agreement has been hailed as a "triumph" of international river basin management and has been "scrupulously observed" even during the two India-Pakistani Wars of 1965 and 1971.[67]

Turning to the theoretical model, as the Ganges case noted, India and Pakistan have had a tradition of antagonism since their independence, and with specific respect to Indus River basin issues a mutual atmosphere of "suspicion and bitterness" prevailed in which separate sovereignty rather than shared interdependence was the norm.[68] Prior to 1948 no progress had occurred in regional river management because of the recency of the partition of the subcontinent. Environmental imbalances with respect to the Indus were only mild, as the scarcity of usable water in the region was not severe and the inequality of access between India and Pakistan was not huge. However, the riparian power asymmetry was significant — as Lepawsky[69] notes, India was "in a position to appropriate much of the river's crucial water supply and starve out downstream Pakistan." Furthermore, there was little restraining reciprocal interdependence between India and Pakistan, although their allies encouraged settlement out of "the fear of consequences of an Indo-Pakistani war precipitated around the Indus waters dispute."[70]

This dispute involved tension over ecological water issues due to a human-initiated disruption — the Indian stoppage of the flow to Pakistan. The conflict level was medium because, although the antagonism and differences of opinion were significant, the outside mediation by the World Bank helped to mute existing hostility.

Jordan River

The Jordan River basin has by widespread agreement presented the most intractable water management problems in the Middle East. Four hostile riparian states — Israel, Jordan, Lebanon, and Syria — share the basin, and the main problems have emerged between Israel and Jordan, who are the most dependent on the Jordan River for their water. Prior to World War II, numerous utilization schemes emerged primarily for irrigation purposes, but all failed due to regional antagonisms. When Israel became an independent state and the Arab-Israeli war broke out in 1948, the difficulties of water management worsened. After the war ended, each of the riparian states attempted on its own in a piecemeal fashion to manage the water problems it faced. Naff and Matson[71] contend that the increase in water-related Arab-Israeli hostility was a major factor leading to the 1967 June War, and John Cooley[72] more specifically asserts that Israel went to war "partly because the Arabs had unsuccessfully tried to divert into Arab rivers Jordan River headwaters that fed Israel." The aftermath of the 1967 war had direct implications for the management of the basin: Israel's occupation of the Golan Heights prevented the Arab states from diverting the headwaters of the Jordan, and Israeli occupation of the West Bank, through extensive irrigation efforts, has had a critical impact on the entire nation's water supply. Attacks by the Palestine Liberation Organization in 1968-69 included raids against water installations, and Israeli responses included putting a Jordanian canal out of commission to pressure that state into opposing the PLO. Meanwhile, throughout the 1970s Israel expanded its water use and water efficiency, and to a lesser extent Jordan followed the same course. However, no regional solution has emerged, and unilateral efforts increasingly raise the specter of conflict.

Applying the theoretical model, few settings have experienced the intensity of antagonism as has the Jordan basin. As Anderson[73] points out, although the basin is clearly well suited to integrated development, "all schemes proposed so far have failed as a result of the extreme enmity between the Arabs and Israel" rooted in, though not limited to, religious differences. The absence of past success in multilateral management efforts has only reinforced the non-cooperative atmosphere. The environmental imbalances in the basin have been exceptionally high. As Selig Taubenblatt[74] notes, "the scarcity of water has weighed upon the region's day-to-day life since prehistoric times," and "in Israel, Jordan, and the West Bank the demand for water continues to grow well in excess of availability." Naff and Matson[75] assert the dire prediction that "by 1995, Israel, Jordan, and the West Bank will have depleted virtually all of their renewable sources of fresh water if current patterns of consumption are not quickly and radically altered." Moreover, there has been a highly skewed distribution of Jordan basin water: "equitable apportionment among riparian countries in the basin has always been difficult,"[76] for "Israel still consumes roughly five times as much water per capita as each of its less industrialized and less intensively farmed neighbors."[77] As to power asymmetries, Frey and Naff[78] point out that

"Israel enjoys an upper riparian position and overpowering military advantage with respect to Jordan," with little reciprocal interdependence having restrained adversarial interests.

The Jordan River basin dispute has focused on extremely bitter usable water apportionment issues, and the conflict stems from human-initiated disruption (diversion of water flow) and over-exploitation of the river's resources. The level of conflict involved appears to be the highest in this study. Anderson[79] concludes that "the Jordan River has been the scene of more severe international conflicts over water than the other two systems of the Middle East, and it remains by far the most likely flash point for the future."

Mekong River

Flowing down from China and Burma into Laos, Cambodia, Vietnam, and Thailand, the Mekong River basin has traditionally been one of the most underdeveloped in the world, with few dams or effective irrigation systems in place. In response to United Nations initiatives to help one of the poorest regions in the world, the Committee for Coordination of Investigations of the Lower Mekong Basin (the Mekong Committee) emerged in September 1957 composed of Cambodia, Laos, Thailand, and Vietnam. The goal of the group was the comprehensive management and development of the water resource of the lower Mekong basin for hydroelectric power, irrigation, flood control, drainage, navigation improvement, and drinking water supply.[80] The Mekong Committee has been since its inception quite effective in collecting basic needed data and in providing an institutional framework for managing integrated development of the basin.[81]

Taking into account the theoretical model, the Mekong River basin has been a relatively tense setting, where antagonisms have recently surfaced, particularly between Vietnam and Cambodia over both cultural and territorial issues. Prior to the establishment of the Mekong Committee, no significant cooperative management of the river had occurred. Environmental imbalances, however, have not been central to this river basin, as there has been no scarcity of usable water and the Committee has formulated a distribution program for "the equitable sharing of the resources of this international river."[82] In terms of power asymmetry, while Vietnam has been by far the most militarily powerful state in the region, there has been a growing sense of reciprocal interdependence and regional perspectives among the lower riparians over river issues even during times of temporary military hostilities.[83]

The Mekong basin case has focused less on ecological usable water apportionment and more on hydroelectric power and navigation issues; and negotiations resulted not from human-initiated disruption of the basin but rather from natural disruptions like floods. The conflict level has been quite low: Prachoom Chomchai[84] notes that on river management issues a "close and

genuine regional cooperation" among riparian states has developed; Hart Schaaf and Russell Fifield[85] comment that Mekong Committee members "have developed marked confidence in one another's judgment and fairness, and work as a friendly and cooperative group;" and Lepawsky[86] remarks that the Mekong Committee bears watching as a "model for the first stage of international river administration, possibly suited for developing regions of the world."

Nile River

Although the Nile River's drainage area spans Burundi, the Central African Republic, Egypt, Ethiopia, Rwanda, Sudan, Tanzania, Uganda, and Zaire, the principal users of the waterway are Egypt and Sudan, and these two nations have experienced the most intense river disputes. Egypt traditionally had dominant control of the waterway until the end of the nineteenth century. In the early part of the twentieth century, tensions surfaced between Egypt and Sudan because of Egypt's growing water demand, but in May 1929 the two nations reached the Nile Waters Agreement reaffirming Egypt's advantageous position. After World War II, a power struggle in Sudan began between two major political parties, and due to population growth and water demand cooperation began to break down between these two agricultural irrigation-dependent economies.[87] To cope with these pressures, Egypt increased its irrigation efforts and, after its 1952 revolution, proceeded with construction of the Aswan dam. New friction then arose over the extent to which the dam would be a cooperative venture and to which a more equitable water apportionment system would result. More specifically, Sudan resented not being consulted about the dam and reacted with "alarm and protest" to some of the consequences for its people.[88] Negotiations began between the two states in 1954 but soon failed, and in 1958 a military confrontation erupted (not directly triggered by water issues) when Egypt dispatched a military force to attempt to reclaim disputed border territory. However, in that same year a more sympathetic military regime took control in Sudan, and this development combined with Soviet influence — the Soviet Union was the key to funding the Aswan Dam project — softened Egypt's position. In November 1959 Egypt and Sudan signed the Agreement for the Full Utilization of the Nile Waters, which established a Permanent Joint Technical Commission and made the water apportionment between the two states somewhat more equitable. Prospects for future cooperation are more ominous because, as Starr and Stoll[89] note, water shortfalls currently exist in Egypt and by the turn of the century the situation could become critical given escalating pollution and seemingly unstoppable population growth.

Turning to the theoretical model, the case involved a history of sporadic though not intense antagonism between Egypt and Sudan, and there had been some evidence of significant progress toward integrated river management — shown by the 1929 accord — prior to the later dispute. Environmental imbalances in the river basin have been severe: while both countries have faced

usable water scarcity, particularly in drought conditions, in Egypt the squeeze is particularly tight because of the uniquely "complete control of the river over the economy" in this desert nation;[90] and the inequality of the distribution of usable water has been perhaps best demonstrated by the significant disparity established even by the more equitable 1959 accord, "one of the very few international river agreements which has promoted cooperative development despite disproportionate quota ratios favoring one riparian party."[91] The overall power asymmetry between the two states was significant, with Egypt being vastly stronger militarily and politically even though Sudan possessed the advantageous upper riparian position with respect to Egypt; and restraining reciprocal interdependence between the two states has not been high, although Britain — Sudan's ally at the time — and the Soviet Union have played an international restraining role. However, Egypt's position may change in the future,[92] "owing to a proliferation of small upstream projects, Egypt faces the possibility that its technological dominance among the riparians and its controlling political power will decline while its vulnerability and dependence as a downstream user increase."

This case emphasized that usable water apportionment issues, and a human-initiated disruption — the Aswan Dam project — was at the root of the dispute. The conflict level in this case seemed medium, as it was intense for a brief time but then was effectively resolved.

Rhine River

The origin of the attempts to deal with coordinated international action over the Rhine River was the Rhine Commission's establishment after the Napoleonic Wars at the 1815 Congress of Vienna. At that time the primary concern was navigation, as the river has carried a larger volume of freight than any other in the world.[93] Later the attention of the Commission turned more to pollution control, as the common nickname for the Rhine has been the "sewer of Europe."[94] Key issues have included oxygen depletion problems, thermal discharges, oil wastes, high salt concentrations, and toxic substances, including pesticides and heavy metals. The International Commission for the Protection of the Rhine Against Pollution emerged in 1950 on a temporary basis and in 1963 became more permanent. Of the pollution difficulties solving the salt concentration problem has been "a major diplomatic priority within the basin;" however, even on this issue the Rhine ministers "have had difficulty reaching conclusive agreement."[95] The recent "catastrophic poisoning" of the Rhine river after the Chernobyl nuclear disaster[96] has heightened the level of concern among the riparian states. Four nations bordering the major stem of the river have been most critical in these discussions — France, Germany, the Netherlands, and Switzerland.

In terms of the theoretical model, the setting during the time period of the case has been relatively cooperative (French-German tensions receded some-

what after World War II), and previous progress on navigation issues has provided hope for pollution cooperation. In terms of environmental imbalances, the riparian states have differed markedly in terms of how victimized they are by river pollution and thus are deprived of usable water — Switzerland being the uppermost riparian has suffered the least, while the Netherlands being the lowest has suffered the most. Yet inequities in terms of willingness to pay the costs of pollution abatement have followed a different pattern:[97] for example, Switzerland has contributed only a tiny proportion of the salt that enters the Rhine — about two percent — but has paid six percent of the storage costs for dealing with salt waste in France; and the Netherlands has paid a significantly higher proportion of the pollution abatement costs than either of the two major polluters — France and Germany. As to power asymmetry, the pre-eminent political, military, and economic power of France and Germany clearly has reinforced the imbalance in pollution abatement payments; but there has been some sense of regional interdependence and "a desire for 'solidarity' within co-basin countries," despite continuing emphasis on national sovereignty, desires "to shift environmental pressure to other Rhine basin countries," and mixed internal support for pollution abatement expenditures.[98]

The Rhine dispute has emphasized usable water apportionment, and a gradual growth of pollution levels (as opposed to a sudden disruption) triggered the riparian concerns. The severity of the dispute has been quite mild, however, with little enmity among riparians over most water-related issues and the main obstacle being failure to discover a workable general solution rather than contentious friction among states.

Rio Grande River

The longest case considered in this study is the American-Mexican dispute over the Chamizal area (near El Paso) of the Rio Grande. In 1864 a flood moved six-hundred acres of land from the Mexican side of the river to the United States side, changing the boundary between the two countries. The International Boundary Commission (later the International Boundary and Water Commission) emerged in 1889 to help resolve the issue, but it was unsuccessful. After Canadian arbitration, in 1911 the Commission awarded Mexico the greater part of the disputed land, but the United States, under pressure from Texas, refused to accept the settlement. Mexico angrily charged that the United States was unwilling to negotiate in good faith and violated principles of international law.[99] After several unsuccessful efforts to reach agreement over the years, finally in July 1963 the two nations settled the dispute, with the American government willing to cover the costs because of President Kennedy's desire to use the settlement as a sign of the administration's good faith toward Latin America and as a way of undermining leftist charges in Mexico that Americans do not live up to their treaties.[100] However, "thorny questions of resource utilization and pollution remain" concerning the Rio Grande,[101] and the extensive American

withdrawal of water for irrigation and both nations' hydroelectric power development have complicated riparian issues.[102]

As to the theoretical model, the setting — somewhat different from the Colorado River case — was antagonistic, with relations between the United States and Mexico poisoned by this issue to the point of "vehement denunciations" by Mexico of the United States.[103] Having just fought a war in 1848, there was not a backdrop of progress in river management issues. With regard to environmental imbalances, neither scarcity of usable water nor maldistribution of this resource was a key issue. Instead it was a fight over land triggered by a change in the river's course. In terms of power asymmetry, the United States clearly held a huge overall power advantage, but significant interdependence and regional image issues constrained its action.

This dispute was clearly boundary-oriented, with the Rio Grande forming the border between the United States and Mexico. Rather than being over ecological water apportionment issues resulting from human disruption, the case centered on geopolitical sphere-of-influence issues raised by the change in a boundary line caused by a natural flood: as Lepawsky[104] remarks colorfully, the central impediments to settlement were "pressures from powerful property owners reluctant to relinquish the patriotic privilege of flying the American flag over this disputed piece of real estate." The conflict was quite severe, given the extraordinary length of time needed to settle and the heated passions at stake.

Senegal River

Located in one of the world's poorest areas, the Senegal River has been the focus recently of concerted management efforts by the riparian states of Guinea, Mali, Mauritania, and Senegal. Because "the development of the Senegal River offers for the moment the only hope for solving or at least alleviating some of the problems of the region,"[105] these basin states have attempted since their independence to further joint development of the river's resources. Originally used primarily for navigation from the coast, attempts began in the twentieth century to exploit the agricultural potential of the basin through irrigation and after World War II to harness the river's hydroelectric power. In January 1962 the four basin states came together and formed the Inter-State Committee, and with United Nations help began to explore concrete plans for using the waterway's resources. Later in March 1968 the Organization of the Senegal River States emerged. However, political friction continued throughout these efforts, as Senegal and Mauritania disagreed on the partitioning of the river waters forming the border between them, and Senegal and Guinea experienced ideological differences and personal animosity between their political leaders. Finally, in March 1972, Mali, Mauritania, and Senegal founded the Organization for the Management of the Senegal River, and since that time "the political turmoil that embroiled efforts to develop the Senegal River eased" and "the

dramatic upheavals of the 1960's no longer characterized the new period."[106] Afterwards some significant progress occurred in the development of the river, including the construction of two dams, with substantial financing assistance from Arab states as well as some Western nations.[107]

Turning to the theoretical model, the setting was mildly antagonistic — while the riparian states shared a common French colonial experience, some were much more preoccupied with pan-African anti-colonialist sentiment than others. Although prior to these states' independence some moves emerged in the direction of international river basin development, none was particularly successful or set a standard for post-independence cooperation.[108] The environmental imbalance has been stark in terms of scarcity due to the unpredictable pattern of floods and droughts, and food production in the river basin has thus "declined relative to the needs and the area is less self-sufficient than it was in the 1960's."[109] On the other hand, maldistribution of water benefits within the region has not been a significant problem. In a similar fashion, major power asymmetries were absent among these extremely poor nations, with upstream nations not enjoying special resource advantages, and the reciprocal interdependence was high.

The Senegal basin case has focused on ecological usable water apportionment issues, but the disruptive element was natural — climate-induced — rather than human-initiated. The level of conflict involved has been low: LeMarquand[110] points out that "reliance on assistance from the international community has had the effect of muting much of the interstate conflict," and that since 1972 truly internationally integrated river development has begun.

Shatt al-Arab River

The Shatt al-Arab waterway, formed by the confluence of the Tigris and Euphrates Rivers as they flow into the Persian Gulf, has been a site of continuing dispute since the seventeenth century. The central issue in the twentieth century has been how the waterway delineates the Iraqi-Iranian frontier. The most recent wave of conflict began in April 1969, when Iraq announced, in an attempt to assert hegemonic control, that the Shatt al-Arab was a part of its territory. Iran responded by abrogating a 1937 boundary treaty with Iraq concerning the channel. Hostile actions quickly ensued:[111] later in April Iran mined the waterway, in May Iran complained to the United Nations about Iraqi mistreatment of its citizens, and by June military units from both sides massed along the frontier. Border clashes erupted in April 1971 and continued for years. After Iraq brought the issue to the United Nations Security Council in February 1974 and much third party mediation occurred, Iraq and Iran finally reached agreement in March 1975 about the Shatt al-Arab border. However, after the Shah's rule in Iran ended in 1979, Iraq demanded the abrogation of the 1975 treaty, and in the spring and summer border incidents began to erupt again. Finally, in September

1980 Saddam Hussein again claimed Iraqi sovereignty over the entire Shatt al-Arab and initiated the full-scale Iran-Iraq War. This latest phase of conflict finally ended when the war ended in August 1988 and a United Nations Peacekeeping Force positioned itself on the Iran-Iraq border.

Addressing the theoretical model, the setting could not have been more antagonistic: simultaneously ethnic (Persian versus Arab), religious (Shi'ite versus Sunni Moslems), and ideological (modern Arab nationalism versus traditional Islamic fundamentalism) differences split the two states, as well as the common desire for hegemony in the Gulf. Although Iraq and Iran had signed previous agreements regarding the Shatt al-Arab waterway, none was particularly effective. Environmental imbalances were totally absent here, both in terms of scarcity and inequality of access to water: as Naff and Matson[112] note, "none of the common riparian issues related to consumptive water use or water quality has ever arisen in connection with the waterway." In terms of power asymmetry, over the period of conflict the overall power ratio between the two states varied, with Iran more powerful in the early 1970s but Iraq more powerful by the end of the decade.[113] Restrained interdependence between the two states was non-existent during the conflict period.

The Shatt al-Arab dispute was a classic boundary conflict emerging over a border-defining waterway for geopolitical sphere-of-influence reasons. As Naff and Matson[114] contend, the conflict over the waterway in recent times has been "purely and simply a symptom of the struggle of Iraq and Iran for regional supremacy." The dispute could not have been more severe, given that it was involved in triggering a major war.

OVERALL ANALYSIS AND CONCLUSIONS

A review of the fourteen international river basin disputes shows that both hypotheses receive considerable support. Figure 3 summarizes the overall pattern of the relevant findings concerning the primary issues of dispute, the nature of the disruption (if a major disruption occurred in the case), and the severity of conflict. Regarding the first hypothesis, the two cases focusing on border definition issues — the Rio Grande and Shatt al-Arab Rivers — both involved more severe conflict than the four cases dealing with pollution — the Colorado, Danube, De La Plata, and Rhine Rivers. Turning to the second hypothesis, the six cases triggered by human-initiated technological disruptions (dams and water flow diversions) — the Colorado, Euphrates, Ganges, Indus, Jordan, and Nile — displayed more severe conflict than the three cases (dealing only with those focusing on ecological water apportionment) triggered by natural flooding — the Columbia, Mekong, and Senegal Rivers. Despite the extreme limitations of the data and the inescapable subjectivity of the judgments involved, these two patterns seem reasonably clear-cut.

Beyond the hypothesized relationships, interesting insights emerge from this comparative assessment concerning the general explanatory model of international river basin conflict. In terms of a non-cooperative setting, it is no surprise that all of the cases with high mutual antagonism prior to the time of the river disputes among riparian nations — the Euphrates, Ganges, Indus, Jordan, and Shatt al-Arab rivers — exhibited medium or high levels of conflict once the river disputes began. Dealing with environmental imbalances, all of the cases with severe overall imbalances — the Colorado, Euphrates, Ganges, Jordan, and Nile Rivers — displayed medium or high levels of conflict. However, those cases with mixed environmental imbalances exhibited low levels of conflict: the Danube and De La Plata cases had high inequality of access to water but low scarcity, while the Senegal case had high water scarcity but no significant maldistribution of access. Thus both of the imbalances appear necessary for conflict to be high, as water scarcity or inequality alone can become tolerable or easier to rationalize. Turning to power asymmetries, it is noteworthy that the three cases involving equal power ratios among the contending sides — the Columbia, Mekong, and Senegal rivers — also display reciprocal interdependence and low levels of conflict.

Some relatively expectable patterns, however, are not apparent. There is no overarching distinction in terms of the level or type of conflict between river disputes involving developed and those involving developing nations, as the American dispute over the Rio Grande was in many ways just as severe as the Middle Eastern river conflicts, dispelling the notion that Third World riparian conflict is somehow more uncontrollable. Bilateral river basin disputes similarly do not display a different conflict pattern from multilateral disputes, challenging the notion that more limited (in terms of number of parties involved) river disputes are easier to resolve. Finally, the more recent (post-1960) river disputes do not differ in conflict intensity from the earlier ones, casting doubt on the notion that cooperative resource management is increasing as an international norm.

Although the more peaceful cases provide a useful interpretive context, those river basin disputes exhibiting the most severe conflict — the Euphrates, Jordan, Rio Grande, and Shatt al-Arab cases — deserve separate comment. Of the three explanatory elements in the model, the most salient in these cases was decidedly the non-cooperative setting, with deep long-standing antagonisms in each. Full-scale war either preceded or followed the river basin disputes in three of the cases, and in the fourth (the Euphrates River) the riparian nations came to the brink of war. However, in none of these cases were water concerns the exclusive source of tension. Thus while it may be misleading to suggest that water disputes can produce only low-intensity conflict, it would be equally misleading to claim that river basin disagreements alone can lead to major war among riparian states.

Taking a security perspective on the entire set of cases, the question that seems to emerge most centrally is what level of conflict resulting from international river basin disputes is tolerable. While major war is clearly not the dominant outcome, the substantial proportion of cases that are still unresolved and/or that display medium or high conflict severity raises crucial military defense concerns. As environmental and resource security issues move to higher positions on the foreign policy agenda — due to growing public awareness, resource scarcity and environmental deterioration, and impact on national power — water-related concerns are likely to be at the forefront. These trends link up with the growing realization by policy makers that the gap between the survival needs of the society and the power needs of the state is dramatically narrowing in the resource arena, and that the essence of national security can no longer be simply defense against foreign military attack.[115]

The policy implications from this study's findings are two-fold. First, scarce monitoring and development assistance resources by concerned nations and international organizations ought to focus more on those international river basins where the conflict potential is greatest — basins with non-cooperative settings, environmental imbalances, and power asymmetries, perhaps particularly those involving boundary definition issues or human-initiated technological disruptions. Second, attempts to achieve integrated international river basin management, effective resource security, and peaceful resolution of differences need to emphasize just as much the intangibles — symbolic perceptual status issues — as they do on the tangibles — the practical improvement of water access. Without such renewed and redirected efforts, water war may be just around the bend.

FIGURE 1:

THEORETICAL MODEL OF THE SOURCES OF CONFLICT OVER INTERNATIONAL RIVER BASINS

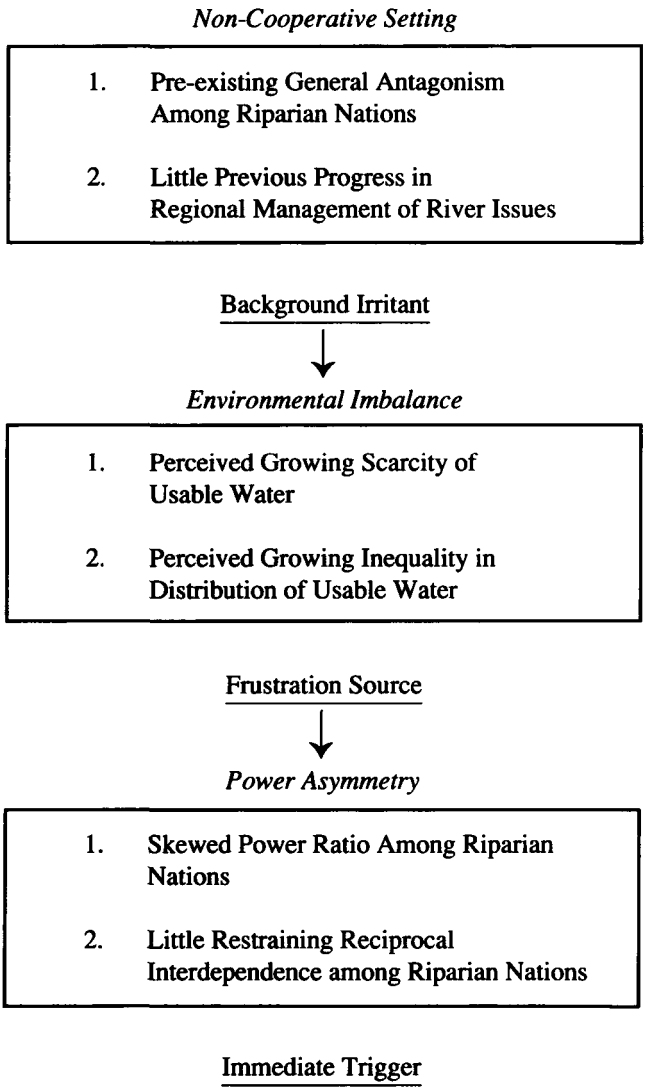

FIGURE 2:
BACKGROUND OF INTERNATIONAL RIVER BASIN DISPUTES

River Name	***Case Dates***	***Primary Participants***
Colorado	1961 - 1973	Mexico - US
Columbia	1944 - 1964	Canada - US
Danube	1948 - present	Austria - Bulgaria - Czechoslovakia - Germany - Hungary - Romania - Soviet Union - Yugoslavia
De La Plata	1966 - present	Argentina - Bolivia - Brazil - Paraguay - Uruguay
Euphrates	1974 - present	Iraq - Syria - Turkey
Ganges	1951 - present	Bangladesh - India
Indus	1948 - 1960	India - Pakistan
Jordan	1948 - present	Israel - Jordan
Mekong	1957 - present	Laos - Cambodia - Vietnam - Thailand
Nile	1945 - 1959	Egypt - Sudan
Rhine	1950 - present	France - Germany - Netherlands - Switzerland
Rio Grande	1864 - 1963	Mexico - US
Senegal	1962 - 1972	Mali - Mauritania - Senegal - Guinea
Shatt al-Arab	1969 - 1988	Iran - Iraq

FIGURE 3:

HYPOTHESIS EVIDENCE ON INTERNATIONAL RIVER BASIN DISPUTES

River Name	*Issues of Dispute*	*Nature of Disruption*	*Severeity of Conflict*
Colorado	Pollution	Human-Initiated: Dam	Medium
Columbia	Hydroelectric Power	Nature-Induced: Flood	Low
Danube	Navigation Hydroelectric Power Pollution	None	Low
De La Plata	Hydroelectric Power Navigation Pollution Irrigation	None	Low
Euphrates	Irrigation Hydroelectric Power	Human-Initiated: Dam	High
Ganges	Hydroelectric Power Irrigation & Drinking Water Navigation	Human-Initiated	Medium
Indus	Hydroelectric Power Irrigation	Human-Initiated: Water Flow Stoppage	Medium
Jordan	Irrigation & Drinking Water	Human-Initiated: Water Flow Diversion	High
Mekong	Hydroelectric Power Irrigation & Drinking Navigation	Nature-Induced: Flood	Low
Nile	Irrigation	Human-Initiated: Dam	Medium
Rhine	Pollution	None	Low
Rio Grande	Boundary Definition	Nature-Induced: Flood	High
Senegal	Irrigation Hydroelectric Power	Nature-Induced: Flood	Low
Shatt al-Arab	Boundary Definition	None	High

Endnotes

This article is based on a paper presented at the annual meeting of the International Studies Association, Vancouver, British Columbia, March 1991.

1. Evan Vlachos, Anne C. Webb, and Irene L. Murphy, eds., *The Management of International River Basin Conflicts* (Washington, DC: Graduate Program in Science, Technology, and Public Policy, George Washington University, 1986), p. i.
2. Joanne Linnerooth-Bayer, "Negotiated River Basin Management," in Vlachos, Webb, and Murphy, pp. 4-5; Sandra Postel, *Water: Rethinking Management in an Age of Scarcity* (Washington, DC: Worldwatch Institute Paper #62, 1984), pp. 6, 11.
3. Bonaya Adhi Godana, *Africa's Shared Water Resources* (London: Frances Pinter, 1985), p. 3.
4. David G. LeMarquand, *International Rivers: The Politics of Cooperation* (Vancouver, BC: University of British Columbia, Westwater Research Centre, 1977), p. 1.
5. Frederick W. Frey and Thomas Naff, "Water: An Emerging Issue in the Middle East?," *Annals of the American Association of Political and Social Science*, 482 (November 1985), p. 67.
6. LeMarquand, p. 2.
7. A state situated on the banks of a river.
8. Evan Vlachos, "The Challenge of Transboundary River Basins," in Vlachos, Webb, and Murphy, p. 1.
9. Sandra Postel, "Trouble on Tap," *World Watch*, 2 (September/October 1989), pp. 12-13.
10. LeMarquand, p. 131.
11. Thomas Naff and Ruth C. Matson, eds., *Water in the Middle East: Conflict or Cooperation?* (Boulder, CO: Westview, 1984), pp. 4-7.
12. See, for example, Robert C. North, "Toward a Framework for the Analysis of Scarcity and Conflict," *International Studies Quarterly*, 21 (December 1977), pp. 569-91; and Robert Mandel, *Conflict Over the World's Resources* (Westport, CT: Greenwood, 1988), pp. 17-22.
13. Frey and Naff, p. 67.
14. Philip Quigg, "A Water Agenda to the Year 2000," *Common Ground*, 3 (October 1977), p. 15.
15. Joyce R. Starr and Daniel C. Stoll, "Water for the Year 2000," in Joyce R. Starr and Daniel C. Stoll, eds., *The Politics of Scarcity: Water in the Middle East* (Boulder, CO: Westview, 1988), p. 150.
16. Mandel, p. 28; and Arthur H. Westing, ed., *Global Resources and International Conflict* (New York: Oxford University Press, 1986), p. 195.
17. Richard J. Barnet, *The Lean Years: Politics in the Age of Scarcity* (New York: Simon and Schuster, 1980), p. 193.
18. LeMarquand, p. 1.
19. Robert Keohane and Joseph Nye, *Power and Interdependence*, 2nd edition (Glenview, IL: Scott, Foresman, 1989), pp. 12-13.
20. Mandel, pp. 29-32.
21. Linnerooth-Bayer, pp. 13-14.
22. LeMarquand, p. 10.
23. Frey and Naff, pp. 78-79.
24. LeMarquand, p. 7.

25. Robert Mandel, "Roots of the Modern Interstate Border Dispute," *Journal of Conflict Resolution*, 24 (September 1980), p. 429.
26. Barnet, chapter 6.
27. Stephen R. Mumme, "State Influence in Foreign Policymaking: Water Related Disputes Along the United States-Mexico Border," *Western Political Quarterly*, 38 (December 1985), pp. 628-29.
28. C. Richard Bath, "Resolving Water Disputes," *Proceedings of the Academy of Political Science*, 34 (1981), p. 183.
29. Barnet, p. 208.
30. LeMarquand, pp. 30-32.
31. Ibid., pp. 42, 46.
32. Neil A. Swainson, *Conflict Over the Columbia* (Montreal: McGill-Queen's University Press, 1979), p. 27.
33. LeMarquand, pp. 36-56.
34. Albert Lepawsky, "International Development of River Resources," *International Affairs*, 39 (October 1963), pp. 541-42.
35. LeMarquand, pp. 54, 69; and Swainson, p. 14.
36. Swainson, p. 4.
37. LeMarquand, p. 68.
38. Swainson, p. 4.
39. Ibid., pp. 2, 10.
40. Linnerooth-Bayer, p. 22.
41. Ibid., p. 5.
42. Ibid., p. 8.
43. Ibid., pp. 14-15.
44. Ibid., p. 15.
45. Lepawsky, pp. 536-37.
46. Guillermo J. Cano, "Argentina, Brazil, and the De La Plata Basin: A Summary Review of Their Legal Relationship," in Albert E. Utton and Ludwik A. Teclaff, eds., *Water in a Developing World: The Management of a Critical Resource* (Boulder, CO: Westview, 1978), p. 142.
47. Ibid., p. 129.
48. Guillermo J. Cano, "The 'Del Plata' Basin: Summary Chronicle of its Development Process and Related Conflicts," in Vlachos, Webb, and Murphy, p. 14.
49. Ibid., pp. 6-7.
50. Ibid., pp. 3-4.
51. Ewan W. Anderson, "Water: The Next Strategic Resource," in Starr and Stoll, p. 12.
52. Naff and Matson, pp. 93-4.
53. Postel, "Trouble on Tap," p. 25.
54. Naff and Matson, p. 96.
55. Ibid., p. 95.
56. Ibid., p. 92.

57. Anderson, p. 22.
58. Naff and Matson, p. 98.
59. Ibid., pp. 93-99, 233.
60. Anderson, p. 11.
61. M.C. Chaturvedi, "Systems Studies for the Ganges Basin," in Vlachos, Webb, and Murphy, pp. 2-3.
62. M. Rafiqul Islam, "The Ganges Water Dispute: An Appraisal of Third Party Settlement," *Asian Survey*, 27 (August 1987), pp. 920-21.
63. Ibid., p. 922.
64. Chaturvedi, p. 1.
65. J.S. Mehta, "The Indus River Treaty," in Vlachos, Webb, and Murphy, p. 9.
66. Ibid., p. 12.
67. Ibid., p. 2.
68. Ibid., p. 11.
69. Lepawsky, p. 543.
70. Mehta, p. 13.
71. Naff and Matson, p. 44.
72. John K. Cooley, "The War Over Water," *Foreign Policy*, no. 54 (Spring 1984), p. 3.
73. Anderson, p. 9.
74. Selig A. Taubenblatt, "Jordan River Basin Water: A Challenge in the 1990's," in Starr and Stoll, p. 41.
75. Naff and Matson, p. 3.
76. Taubenblatt, p. 41.
77. Cooley, p. 3.
78. Frey and Naff, p. 68.
79. Anderson, p. 10.
80. Prachoom Chomchai, "The Mekong Committee: An Exercise in Regional Cooperation to Develop the Lower Mekong Basin," in Vlachos, Webb, and Murphy, p. 3.
81. Ibid., pp. 5-6.
82. Ibid., p. 5.
83. Lepawsky, pp. 546-47.
84. Chomchai, p. 7.
85. C. Hart Schaaf and Russell H. Fifield, *The Lower Mekong: Challenge to Cooperation in Southeast Asia* (Princeton, NJ: Van Nostrand, 1963), p. 91.
86. Lepawsky, p. 546.
87. Naff and Matson, pp. 144-45.
88. Godana, p. 183.
89. Starr and Stoll, p. 150.
90. Godana, p. 83.
91. Naff and Matson, p. 150.

92. Ibid., p. 140.
93. Lepawsky, p. 537.
94. LeMarquand, p. 95.
95. LeMarquand, p. 118.
96. Linnerooth-Bayer, p. 1.
97. LeMarquand, p. 119.
98. Ibid., pp. 119-22.
99. Mumme, p. 627; and Bath, pp. 181-82.
100. Bath, p. 182.
101. Ibid.
102. Lepawsky, p. 539.
103. Bath, p. 182.
104. Lepawsky, p. 542.
105. Godana, p. 96.
106. David G. LeMarquand, "International Development of the Senegal River," in Vlachos, Webb, and Murphy, p. 15.
107. Ibid., p. 32.
108. Godana, p. 120.
109. LeMarquand, "International Development of the Senegal River," p. 7.
110. Ibid., p. 1.
111. J.M. Abdulghani, *Iraq and Iran: The Years of Crisis* (Baltimore, MD: The Johns Hopkins University Press, 1984), pp. 121-22.
112. Naff and Matson, p. 102.
113. Abdulghani, p. 121; and Naff and Matson, p. 109.
114. Naff and Matson, p. 110.
115. For elaboration on these points, see Robert Mandel, *The Changing Face of National Security: A Conceptual Analysis* (Westport, CT: Greenwood, forthcoming).