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Conclusions and summary

This compilation of literature reviews was selected to show the direct link between the fields of dispute resolution and economics in the application of theory and techniques to conflicts over freshwater resources. The literature surveyed indicates that, in many areas, much study and analysis has taken place. However, even with the vast amount of literature available, there continues to be a need for more research on why conflicts over water and other environmental resources occur. A deeper understanding of the similarities among all conflicts over natural resources may provide applications for predicting and preventing these conflicts in the future.

In summary, Chapter 2 (Organizational theory) showed us that 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 for environmental concerns in water-resources decision-making. The World Bank, United Nations, and the new World Water Council are now beginning to address these weaknesses.

Legal principles have been equally elusive. The 1997 Convention reflects the difficulty of merging legal and hydrologic intricacies. While

the articles provide many important principles, 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 conflicts. In contrast to 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.

The section on negotiation theory indicated in this preliminary review shows a great effort to provide solutions to the TWD. A great part of the work on CR stresses institutional and technical arrangements; CR is perceived as mechanisms that need to be incorporated once the agreement is reached, but few relate to the incorporation of CR as instrumental to the process of reaching such agreements.

In retrospect, one of the most serious obstacles for resolution is insufficient information about a situation of imminent scarcity. Hence the problem is how to transform this knowledge and use it to look for shared innovative solutions.

Economics is one discipline that is used independently or jointly with other disciplines in explaining scarce resource disputes and indicating a set of possible and agreeable arrangements between the parties. Optimization models provide solutions offered by economic approaches that may look promising, but it is always necessary to identify the set of assumptions leading to such solutions. Even with this identification in mind, one can still argue that economic principles are among the sufficient, but not the necessary, conditions for a dispute to be solved.

Using economic terms, for a solution to a dispute to be attractive to the participants and to be economically sustainable, it needs to fulfil the requirements for individual and group rationality. In other words, the resolution of a dispute must be perceived for each participant as preferable to the status quo outcome, and to participation in any partial arrangement that includes a subset of the regional participants. The regional arrangement also fulfils requirements that all costs or gains are allocated.

As we well know, economics and politics play interactive roles in the evaluation of dispute resolution. Just as political considerations can effectively veto a joint project with an otherwise favourable economic outcome, a project with potential regional-welfare improvements might influence the political decision-making process to allow the necessary cooperation. Therefore, both economic and political considerations should be incorporated into evaluations of dispute resolution arrangements.

Game theory provides a vehicle through mathematics and the social sciences to engineer improvements in policy and understanding of many market and non-market events. In the jargon of the theory, we say that a

game's outcome depends upon the set of feasible outcomes, participants' choices, and the rules of the game. To solve the problem of water allocations within an international water basin cooperatively, a number of problems can be analysed using game theory:

– In international contexts, each sovereign party is free to break any agreement at little cost. Hence any engineered solution must be sensitive to the stability aspects of the proposed outcomes.
– For cooperation to occur, the parties must have some incentive that can justify the cooperation.

This latter point implies that for a cooperative solution to be accepted by the parties involved, it is required that the partitioned cost or benefit to any subset of participants is preferred by the subset to any other possible outcome they can guarantee themselves. Of course, in the real world of international relations, it must also be that all the costs are allocated.

As the amount of water surplus decreases over time, however, the impetus towards conflict or cooperation (pay-offs) might change, depending on such political factors as relative power, level of hostility, legal arrangements, and form and stability of government.

The study of treaties has not yet occupied a significant portion of published literature, and therefore the useful information contained in international agreements remains largely undiscovered. More information is necessary regarding the success of treaties and whether the advisory/arbitration councils provide useful services in maintaining just and peaceful relations. The study of successes in some states may yield new ideas for negotiation in more tenuous regions. Hopefully the people responsible for the successful treaties can also provide input into the discussions for less successful or less amicable agreements. A hardcopy preview of a systematic computer compilation of international water treaties can be found in Chapter 8.

Environmental disputes (Chapter 5) serves to further our understanding of conflicts over resources other than water. A concept being utilized by some to examine the whole spectrum of natural resources conflict is environmental security. Even though environmental security is an evolving concept, there are already some common trends emerging. First, most recognize the relevance of studying how environmental change and degradation impacts upon humans, whether or not caused by humans, and at all levels, local, national, and global. Second, the general consensus appears to be that there is a need for understanding how to resolve natural resource disputes through both traditional and alternative dispute-resolution techniques. Third, whether one wants to change the traditional paradigm of security or merely examine the environment as a contributor that can threaten one's security, there is an underlying theme that resource scarcity will probably lead to conflict in the future.

A clear understanding of the details of how water conflicts have been resolved historically is vital in discerning patterns that may be useful in resolving or precluding future conflict. Our investigations of 14 disputes suggest that, generally, the following pattern tends to emerge: 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, will implement a project that impacts on at least one of its neighbours. This project can, in the absence of relations or institutions conducive to conflict resolution, become a flashpoint, resulting in conflict. The comparative analysis also suggests indicators of impending or likely water conflict, obstacles to successful negotiations, and observations regarding national versus international settings. These 14 disputes are highlighted in detail in Chapter 7 (Case studies).

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