

BASINS AT RISK: CONFLICT AND COOPERATION OVER INTERNATIONAL FRESHWATER RESOURCES

CHAPTER 1 INTRODUCTION

In the policy literature and popular press, issues of water and international conflict are linked with increasing frequency (Westing 1986; Elliott 1991; Gleick 1993; Homer-Dixon 1994; Remans 1995; Butts 1997; Elhance 1999). In particular, the past few decades have seen an increase in geopolitical, international relations, and environmental security literature on water's role in international conflict. This literature often stresses various indicators for conflict, including proximity, government type, aridity and rapid population growth. Yet despite the number of case studies analyzing and comparing water-related conflict in various international river basins, little global-scale or quantitative evidence has been compiled. Existing work often consists of case studies from the most volatile basins and excludes examination of cooperation, spatial variability and precise definitions of conflict.

My dissertation research, the Basins at Risk project (BAR), addresses a series of overarching gaps in research on freshwater resources and international conflict by providing a quantitative, global scale exploration of the relationship between freshwater resources and conflict – in essence, asking whether the theories and claims hold true. I also incorporate a spatial perspective and consider the full spectrum of interactions, using precise definitions of conflict and cooperation.

The specific purpose of my dissertation research was threefold:

- To identify historical indicators of international freshwater conflict and cooperation;
- To use these indicators to create a framework to identify and evaluate international river basins at potential risk for future freshwater conflict;
- To enhance understanding of the driving forces that may cause water to become a focus of conflict or cooperation.

It is hoped such information can contribute to the development of international management approaches designed to mitigate the potential for international water conflict.

To accomplish these goals required three main elements: creation of an event database documenting historical water relations, including a methodology for identifying and classifying events by their intensity of cooperation and conflict; construction of a geographic information system (GIS)¹ of countries and international basins, both current and historical; and the collection or creation of indicator variables (biophysical, socioeconomic, and geopolitical) for testing of hypotheses about factors associated with water conflict.

The accompanying chapters describe the methods and findings of my dissertation research. Chapter 2, “Basins at Risk: Water Event Database Methodology,” describes the backbone of my dissertation research – the water-event database. This database catalogs historical incidents of international water cooperation and conflict for all countries from 1948-1999. For the purposes of the Basins at Risk Project, water events were defined as instances of conflict and cooperation that occur within an international river basin, involve the nations riparian to that basin, and concern freshwater as a scarce or consumable resource or as a quantity to be managed. These events were classified by the international river basin in which they occurred, the countries involved in the event, the date, level of intensity of conflict or cooperation, and the main issue associated with each event. All the event information collected and coded was compiled in a relational database to allow for analyses at an array of spatial and temporal scales. The database methodology is described in detail in order to facilitate evaluations of the project’s findings, to facilitate others’ use of the data in further research, and to offer a model for those interested in following a similar methodology for exploration of other issues. The chapter concludes with a detailed picture of patterns of historical conflict and cooperation over international freshwater resources.

This water event database represents a unique resource that allows evaluation of historical incidents of water conflict and cooperation and exploration of relationships

¹ A GIS is a computerized system that enables storage, management, analysis, modeling, and display of spatial and associated data.

between these incidents and a wide range of biophysical, socioeconomic, and political data. Chapter 3, “Use of GIS for Analysis of Indicators of Conflict and Cooperation Over International Freshwater Resources” describes the spatial complement to the water event database – the creation of an historical GIS that delineates all current and historical international basins and their riparian countries, from 1948-1999, and the use of this GIS to calculate variables for statistical analysis.

Because not all basins were international across the entire time period of the study and many events researched for the event database (Chapter 2) turned out to be related to intra-national, rather than international water resources, the GIS had to account for all changes in international river basins and national political boundaries from 1948 to the present, both spatially and temporally. Creating these temporal GIS layers facilitated our ability to associate events with basins that were international at the time the event occurred. More importantly, the historical GIS allowed the linkage of the incidents of international water conflict and cooperation with socioeconomic, biophysical, and political indicators specific to the year in which the event occurred.

While the GIS allowed analyses at a range of spatial scales, including country, region, and basin-country polygon,² the key unit of analysis considered was the international river basin. An international river basin comprises all the land that drains through that river and its tributaries into the ocean or an internal lake or sea and that includes territory of more than one country. Most of the broad analyses of international water conflict have examined data compiled at the country level. The historical GIS allowed questions to be framed in terms of river basins and provided some accountability of within-country variation. Geomorphologists have long considered the river basin to be a natural framework of study when considering the physical aspects of water resources (Leopold, Wolman et al. 1964). The same consideration holds true when considering the relationship of freshwater to international conflict and cooperation.

BAR’s GIS includes 263 current international basins and two historical basins. This historical GIS enabled incorporation of both temporal and spatial variability into our analyses. It allowed us to derive data, including population, climate, or water

² A basin-country polygon refers to a country’s territorial share of an international basin. It is the smallest spatial grain used in the BAR study.

availability, at the basin level or other scales and to explore correlations between these variables and the event data. This ability to explore why an event occurred is integral to the power of the BAR Event Database, and the lack of such an ability has been a major criticism of the utility of event datasets in the past (Lanphier 1975; Andriole and Hopple 1984; Laurance 1990).

Exploring the question of why an event occurred is a key part of Chapter 4, “Cooperation and Conflict Over International Freshwater Resources: Indicators and Findings of the Basins at Risk Project”. After describing the project’s methodology and statistics, Chapter 4 discusses the commonly cited theories and indicators linking water to conflict and our own hypothesis, which concerns infrastructural development and institutional mechanisms. Based on the results obtained, I present a framework for identifying and evaluating basins at potential risk for future international conflict over freshwater resources. I identify three categories of basins at risk. The first are basins negotiating current conflicts, well known “hot spots” where the potential for continued dispute, at least in the near term, is therefore considered likely. The second category are basins in which factors point to the potential for future conflict and in which up-coming development projects or other stresses upon the water system have raised protests among the riparians. The third category is similar to the second in that there is a confluence of factors which indicate the potential for future conflict. Unlike category 2 basins, however, there is no evidence of existing tensions in public policy or media fora. When all the categories are viewed together, what stands out is that the majority of basins at risk fall in southern Asia and central and southern Africa.

Categorizing a basin as “at risk” does not presume to identify basins in which acute conflict *will* occur, but to point to basins worth more detailed investigation. Assessing basins at risk is as much art as science and requires a mix of quantitative and qualitative research approaches.

Chapter 5 provides an overview and conclusion to this dissertation. Further details of the statistical methodologies and data sources associated with the indicators used and BAR findings may be found in the Appendices. These data and methodological information, in addition to that contained in the previous chapters, will become part of the

TFDD website (<http://www.transboundarywaters.orst.edu>), where the Basins at Risk project data and findings will be made publicly available.