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THE RIVER-BORDER COMPLEX: GOVERNING FLOWS IN SOUTH ASIA

By

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ABSTRACT OF THE DISSERTATION

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International rivers are conventionally understood as watercourses that cross national boundaries, while borders themselves are taken to be static and given—passive features over and across which riparian processes play out. Employing such straightforward framings of international rivers and borders, academic studies and policy analyses of transboundary water governance perpetuate problematic ideas about the relevant scales and actors involved in international river conflicts and crises. In contrast, I integrate the insights of recent scholarship that regards borders as contingent, contested, semi-permeable and mobile with analyses of historical records, *non-water river flows* (e.g. pollution, energy, fish, cargo), hydrological data, and international development programs to argue that the Ganges River and Indo-Bangladeshi border function synergistically to surprising effect. I introduce the concept of the “river-border complex” to distinguish international rivers (as defined above) from this multifaceted interaction of rivers and borders. The river-border complex encompasses the individual agents (e.g. World Bank, hydraulic engineers), discrete actions (e.g. border demarcation, treaty ratification), and ongoing activities (e.g. data collection, aquaculture) that interact to structure water use and resource access within transboundary river contexts. By challenging commonsense conceptions of international rivers, I make four interrelated

arguments based on the case of the Ganges River and Indo-Bangladeshi border: 1) international rivers do not preexist national borders but must be continually made and remade through bordering processes (*e.g.* fencing, patrolling, exclusion); 2) border-mediated flows along rivers reinforce uneven power relationships between upstream and downstream riparians; 3) cooperation between riparian states simultaneously resolves transboundary water conflicts while engendering new ones; and, 4) non-riparian actors (those who hail from outside the transboundary water region) dramatically shape the combined social-hydrological landscape but are overwhelmingly excluded from prevailing analyses of transboundary water conflicts and crises. In demonstrating multiple ways to operationalize the river-border complex framework, I exhibit its utility as a method for identifying what entities and processes structure transboundary water access, use, conflicts, and crises.

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Chapter 1 – Introducing the River-Border Complex

Understandings of water have changed markedly over the past few decades. In the 1980s and 1990s, water was widely anticipated to be a catalyst for war between arid states (Cooley 1984, Kliot 1993). Water attained new status as a human right with the 1992 Dublin Statement that established water as an economic good (Bluemel 2004). Soon after, water was further abstracted as “virtual water,” referring to the water embedded in grain and other food commodities that can be transported to water scarce regions at a fraction of the cost of bulk water distribution or water desalination (Allan 1998). At the turn of the millennium, as researchers documented a tendency for states to sign treaties rather than raise arms, water was defined anew, this time as a catalyst for peace and cooperation (Grey and Sadoff 2003, Mostert 2003). Ever changing with the times, water has most recently been described as a “defining issue” (McKinney 2014), the “chief commodity” (Marshall 2012), and even as the “oil” (Sonenshine 2014) of the 21st century.

Despite the changing views of water over this time period, one perspective on water has endured: its obstinate disrespect for political or administrative borders (Figure 1.1). This observation makes intuitive sense given that water’s dynamic phases (glaciers, water vapor, rivers, oceans, lakes, etc.) do not correspond with socio-political entities. As the quotes in Figure 1.1 suggest, this incongruence has been problematic for groups who depend on water resources that overlap jurisdictions. Therefore, while many resources pose management challenges within polities, transboundary water (rivers, aquifers, and lakes that cross national borders) further complicates already thorny issues of access, use, and allocation (Schmeier 2010, Subramanian *et al.* 2012).

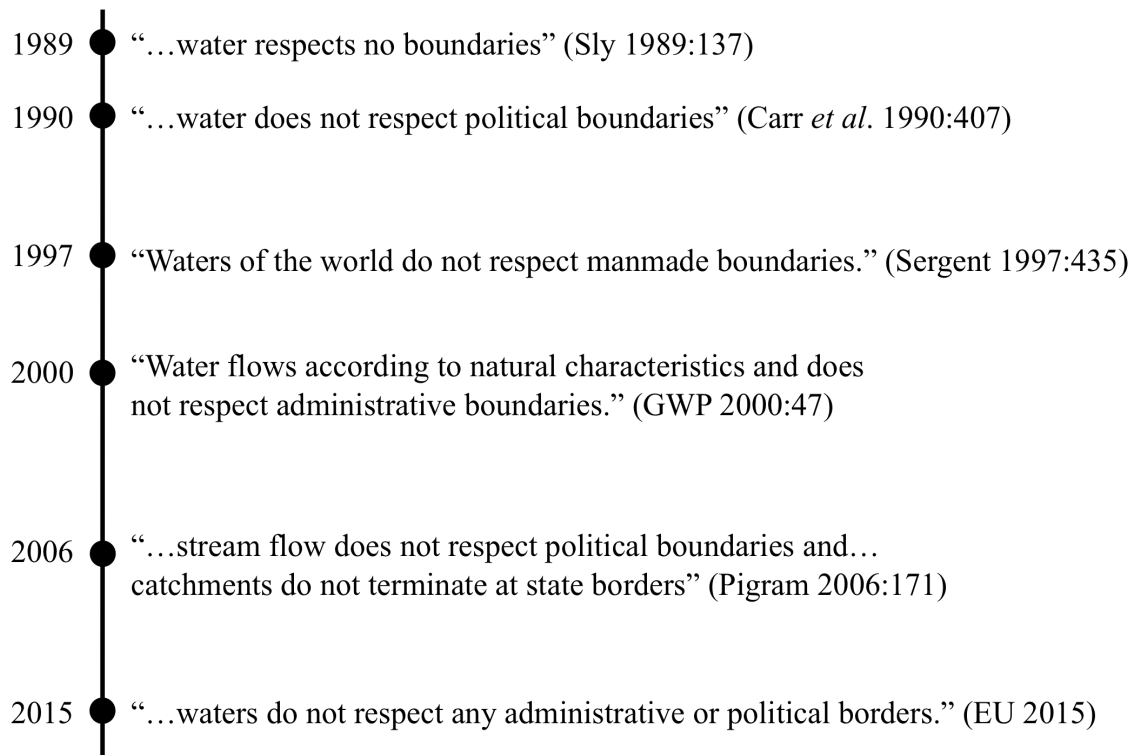


Figure 1.1 Timeline of perceptions of water in relation to political and administrative borders.

In addition to highlighting the ubiquitous challenges inherent to transboundary water governance, multiple iterations of the truism “water does not respect borders” also reveals at least two underlying assumptions. The first is that transboundary waters and borders are distinct from one another. This idea ignores the many cases in which international rivers function as borders and as such are co-constitutive (Sadoff and Grey 2002, Alatout 2014). A second assumption is that political borders are an established fact. The issue, therefore, is not considered to be with the border itself but with the inconvenient truth that landscape features do not confine themselves to spatially bounded political units, such as domestic and international states. Indeed, a recent review of transboundary river basin management identified “reconciling political borders and basin boundaries” as the greatest challenge facing the field (Zeitoun *et al.* 2013:331).

Despite decades of robust scholarly engagement with international rivers and aquifers, few studies have questioned the nature or existence of the borders that define and structure these hydrological features. Some recent projects imaginatively interrogate scenarios such as “water without borders” (Norman *et al.* 2013), “water beyond borders” (WBB 2013), and “water after borders” (UIC 2015), but explicit examination of borders remains a minority voice in the realm of transboundary water governance.¹ A parallel assertion has been made about the insufficient attention afforded to the broader relationship between nature and borders:

“The history of territorial borders is replete with examples of how nature was invoked or appropriated to justify the determination, use and functions of borders, yet this complex relationship between nature and borders has not received adequate attention in border studies and research on society and nature.” (Ramutsindela 2015:135)

With this project, I seek to contribute to a small but growing body of human-environment scholarship that critically engages borders by addressing two overarching questions: where do borders and international rivers intersect; and, how do they interact?

The river-border complex

Rather than situating this project within a single framework or body of literature, I discovered that the multi-faceted nature of rivers and borders required that I integrate and juxtapose multiple literatures. I refer to the result of this process as the “river-border complex,” a new concept that synthesizes theories and methods drawn from five fields of scholarship. These comprise political ecology (social construction of scale, anti-politics machine), border studies (semi-permeability and mobility of borders), transboundary water governance (hydro-hegemony, international water law), critical water geography

¹ Transboundary water governance literatures include perspectives from international relations, hydrology, international water law, environmental economics, geography (nature-society, political), and political science.

(critical hydropolitics, hydrosocial cycle) and critical geopolitics (territorial trap, construction of states).² I will not describe the particulars of these concepts and theories here, as I elaborate on them within each chapter. However, I will take a moment to introduce the river-border complex.

I define river-border complex as the constellation of individual agents (*e.g.* World Bank, hydraulic engineers), discrete events (*e.g.* border demarcation, treaty ratification), and ongoing activities (*e.g.* data collection, aquaculture) that interact to structure water use and resource access within transboundary river contexts. Defined as such, the river-border complex provides a flexible framework for approaching transboundary river problems without presupposing the relevant scales, actors, or processes for examination. It will soon become clear that the distinction between events and activities is an important one in the context of the Ganges River (see Chapter 4), but I do not presume that this is always the case. Rather than serving as a hard and fast rule, the river-border complex is a malleable concept for facilitating analyses of international rivers not as watercourses that cross national borders but as synergistic interactions of rivers and borders. Recognizing that rivers may intersect borders once, multiple times, or even coincide, this concept applies equally to transboundary rivers in all their forms.

The river-border complex approach thus serves several useful functions. By accounting for individual agents and on-going activities perceived to lie outside the realm of transboundary water governance, it denaturalizes several taken-for-granted

² The frameworks, theories, and methods listed here informed my conceptualization of the river-border complex, but future applications of the river-border complex concept need not be limited to these ideas or literatures. I deliberately defined the concept in broad terms in order to allow for full accounting of the individuals and factors relevant to a particular hydrological/socioecological system.

assumptions that prevail in the field, which regards, for example, international borders and rivers as separate (see above), the state as the locus of power (see Sneddon 2002, Norman and Bakker 2009), and the river basin or watershed as the undisputed scale of analysis (Warner *et al.* 2008, Orlove and Caton 2010). In so doing, it opens up new apertures for researchers “to theorize and empirically substantiate the processes through which particular socio-hydrological configurations become produced that generate inequitable socio-hydrological conditions” (Swyngedouw 2009:57). Additionally, within international hydropolitics, there has been a singular focus on conflict and cooperation between riparian states (those co-located along a watercourse) (*e.g.* LeMarquand 1976, Frey 1993, Toset *et al.* 2000, Hensel *et al.* 2006, de Stefano *et al.* 2010, Berardo and Gerlak 2012, Wouters 2013, Leb 2014, Pak *et al.* 2014). Without diminishing the importance of these concerns, the river-border complex allows for analysis of factors beyond state-state interactions over water (*e.g.* border controls, foreign development aid) that measurably influence social relations and hydrological dynamics within transboundary water contexts.

While I have found the river-border complex to be instrumental in making sense of the complex dynamics at play in the Ganges river system, it is also my hope that this framework is useful to others striving to resolve paradoxes within and advance our understanding of other water and border systems. Over the course of this dissertation, I will elaborate several ways that I have used the river-border complex to elucidate riparian dynamics in the Ganges river network, thereby illustrating how it may be applied to other populations, places, and times. Before I embark on that task, I will first take a moment to describe my trajectory with this project.

Familiar waters

I opened this discussion by highlighting one persistent idea in the literature, but there are several other dominant ways that scholars have come to understand transboundary rivers. In the same way that “water does not respect borders” has become axiomatic, the ideas that water is a source of conflict *and* cooperation (e.g. Grey and Sadoff 2003, Wolf *et al.* 2003, Mostert 2003, Sivakumar 2011, Swain 2012), that there are 263 transboundary river basins in the world (e.g. Giordano and Wolf 2003, Yoffe *et al.* 2004, Rieu-Clarke 2010, Schmeier 2010, Swain 2012, Wouters 2013), that conflict and cooperation can coexist (e.g. Mack and Snyder 1957, Craig 1993, Mirumachi and Allan 2007, Schmeier 2010), and that conflict is not necessarily bad (e.g. Mack and Snyder 1957, Homer-Dixon 1994, Barnett 2000, Zeitoun and Mirumachi 2008) have been reproduced to the point of perplexity. It is this sense of perplexity that drives my research. What are the intended and unintended effects of such repetition? How do these ideas structure and constrain how we think about transboundary water problems? A recent report on transboundary water cooperation noted that “Despite an abundance of academic writings and expert reports on transboundary water issues critical knowledge gaps remain” (Wouters 2013:12). I contend that these gaps cannot be addressed by retracing well-worn paths but by examining where these paths take us and, when needed, striking out on new ones.

Engaging familiar ideas about international rivers, upstream-downstream dynamics, and cooperation, I make four claims about transboundary water dynamics that elucidate different aspects of the river-border complex:

1. Like borders and states, international rivers are socially, historically, and physically contingent entities.
2. Border-mediated flows along rivers reinforce uneven power relationships between upstream and downstream riparians.
3. Cooperation between riparian states is insufficient to address transboundary water conflicts.
4. Non-riparian actors (those who hail from outside the transboundary water region) dramatically alter the hydrological landscape but are problematically omitted from prevailing analyses of transboundary water governance.

As I mentioned earlier, I intend for each of these claims to have theoretical import beyond South Asia; however, each of these four claims are rooted in the particular circumstances of the Ganges basin. I will return to these four arguments after I have introduced the context in which they were developed.

Research area

I began my research with an interest in understanding how international water management might be affected by irreversible, climate change driven alterations to glaciers. Glacial meltwater constitutes a critical water resource for one-sixth of the human population, but as a result of climate change, glaciers are melting without replacement at an accelerated rate (*e.g.* Xu *et al.* 2009). Concern about long-term water supply to glacially-fed rivers drew my attention to the Gangotri Glacier in Uttar Pradesh, India, which provides only 3–4% of the total volume of the Ganges River but supplies up to 70% of the river's flow during the dry season (Barnett *et al.* 2005, Mall *et al.* 2006, Bagla 2009). Although glacial retreat remains a critical concern for transboundary water

management, the social and historical dimensions of water governance in the region consumed my attention as soon as I arrived in South Asia in 2011.

A shared cultural and political history, reification of the Indo-Bangladeshi border, numerous international rivers, and large-scale in-stream infrastructure combine to make Bengal an ideal site for interrogating relationships between rivers and borders.³ India and present-day Bangladesh had once been governed as a single colony, first by the East-India Company (1757–1858) and later by the British Crown (1858–1947), but they were separated during the Partition of British India in 1947. The resulting division created the world's fifth longest terrestrial border (4096 km), which despite being regarded as an artificial division at the time is currently the site of a major border securitization and militarization campaign by India to stem a perceived tide of Bangladeshi immigrants, smugglers and terrorists (see van Schendel 2005, Jones 2012). In addition to demarcating new countries, this border resulted in the highest density of international rivers worldwide, with 54 rivers traversing the Indo-Bangladesh border alone (an additional three rivers cross the Myanmar-Bangladesh border).

The Ganges holds particular significance among these transboundary watercourses. It is the most densely populated river basin in the world and supplies water to 37% of the land area of Bangladesh (Figure 1.2). Furthermore, it has been a locus of water tensions between India and Bangladesh for decades as a result of the unilateral construction of the Farakka Barrage in the 1970s. Unlike a dam that impounds water, this barrage is a diversionary structure that enables India to direct indispensable dry-season water supplies away from Bangladesh toward Kolkata (formerly Calcutta). Disputes over

³ Bengal is the region comprised of Bangladesh and the Indian state of West Bengal.

the Ganges River persist despite a landmark treaty that the two governments signed in 1996 to establish water allocations for a period of 30 years. Much of this tension is understood to emanate from Bangladesh's location downstream of all 57 rivers that enter its territory, as well as economic, political and military disparities between the two countries that underpin characterizations of India as a regional hegemon. Although these factors unquestionably contribute to binational relations, my analyses question narratives that frame Bangladesh as a victim of either unfortunate geography or hegemonic hydropolitics, directing attention instead to the social, historical, political and economic foundations of vulnerability to water hazards in the country. As I detail below, these analyses are based on six months of language study, interviews, and archival research in South Asia, as well as two weeks of archival research and participant observation in Europe.



Figure 1.2 Bangladesh and its main rivers. Image modified from a blank outline sourced from d-maps.com.

Field research and data collection

International resource governance in South Asia is deeply imbricated with the region's long history under Britain's suzerain rule and the new identities forged by Britain's withdrawal from the colony in 1947, as well as East Pakistan's independence from West Pakistan in 1971 when it declared itself the sovereign state of Bangladesh (see van Schendel 2009). Association with nation, class, gender and religion, for example, inform rights and claims to resources such as land, water, and protection from

environmental hazards. Traveling to the region therefore was a necessary first step for me to establish a research project on transboundary river sharing.

Phase I: Participant observation and calibration of research expectations

I made my first visit to South Asia in the summer of 2011, during which I spent five weeks in the Indian state of Karnataka as an intern with a local non-profit, non-governmental water conservation and educational organization. While this volunteer placement was not situated within a transboundary river basin, it was an eye-opening introduction to the culture and politics of South Asia. In Bangalore, I was confronted with the humbling revelation that despite four years of graduate training in the physical and social sciences in the United States, there existed a gulf between what I needed to learn about the socioecology of Bangalore's water crisis and what meager contribution I could make to addressing it in the brief amount of time that I was there.

During the years between my undergraduate and master's degrees, I worked as a field biologist in rugged conditions on projects ranging from forest ecology and ecotoxicology on the Eastern Seaboard to seabird foraging research in Washington State and Alaska. Attracted by the opportunity to work on rainwater harvesting and groundwater replenishment systems in India, I naïvely imagined myself drawing upon my earlier field work training as I dug catchment ponds, poured cement, and laid pipes. Immediately reminded of the obvious fact that there is no shortage of labor in India, my actual days were spent preparing PowerPoint presentations on a computer shared with six others and sitting through long meetings during which I transcribed notes. I eventually discovered that my greatest value to the organization was my status as a foreigner. Being

paraded around meetings and project sites, my status as an American doctoral student lent the organization legitimacy and augmented the founder/director's cultural capital.

The contrast between the elevated status I was accorded in public and the condescending paternalism I encountered in the office was illuminating. Weeks later, I would learn about the ways that Filipina nurses and teachers employed as domestic workers in Canada assumed different identities at different times in order to leverage greater support in their campaign for improved working conditions (Pratt 2004). In Bangalore, my identities were chosen for me. I was a mere student or a hapless woman to be dismissed or an esteemed colleague or special guest to be honored and consulted as it suited the program's director. I could not have asked for a more instructive introduction to the complicated social, political, historical, and cultural landscape into which I had embarked.

Equipped with a greater sensitivity and awareness of my privileged subject position as a foreign academic in South Asia, I continued on to Dhaka, Bangladesh. There, I spent one week meeting individually with 13 academics, engineers, federal water resource managers, and community organizers at the Bangladesh University of Engineering and Technology (BUET), Bangladesh Water Development Board, University of Dhaka, Institute for Water Modelling, BRAC University and Practical Action. These meetings were invaluable for helping me calibrate my research goals and expectations against bureaucratic, technical, and cultural realities. I learned who works on what, how my work might complement and build upon existing knowledge, and what resources were and were not available to me (*e.g.* flood and climate models, internal policy reports, hydrological data).

During this phase of pre-dissertation research, I encountered incredulity in India when describing my interest in studying water crises in Bangladesh. A popular attitude then and now is that Bangladesh's problem is one of excess; as one Indian colleague of mine put it, "They have so much flooding, always flooding. We have not enough water, and they have too much water." Conversely, concerns in Bangladesh about downstream hazards of flood, drought, pollution, and seawater intrusion were acute. I thus witnessed in one week how national identity structured beliefs about and experiences of vulnerability, risk, and responsibility. It would take months to assimilate everything that I learned during this trip, but I left South Asia with a clear sense that despite long and on-going research into water conflicts in the region, there was room and support for yet another participant.

Phase II: Language and area studies

Although the Ganges River winds through five Indian states, conflicts between India and Bangladesh hinge on the construction and use of the Farakka Barrage, a diversionary structure that lies approximately 16 km (10 mi) upstream of Bangladesh in the Indian state of West Bengal. As I detail in Chapter 1, West Bengal and Bangladesh historically constituted the region of Bengal, which share many cultural elements including language (Bengali/Bangla), literature, music, and folklore. These cultural ties have attenuated since Partition, but having facility with Bangla would enable me to conduct research in both Bangladesh and West Bengal.

My next trip to the continent, therefore, was for a nine-week intensive summer language immersion program in 2012 at Independent University Bangladesh (IUB) in Bashundhara, Dhaka. In most other circumstances, living and studying with fourteen

other Americans might insulate one from truly experiencing the surrounding culture and environment. Dhaka, however, is an all-consuming force, ensuring that we all left with lasting memories and awareness of its scarred history, subtle beauty, unbridled growth, and complex challenges.

Despite the grueling curriculum (which for the curious consisted of 25 hours of language instruction each week, 10–14hr-long field trips every Friday, weekly guest lectures, 15+ hours of tutoring per week, daily homework, a home stay, and weekly exams), I managed to make a modicum of headway on my pre-dissertation research during the program. The most notable development was a follow-up visit with a faculty member from Rajshahi University (on the western border of Bangladesh), who generously obtained access for and escorted me to the Ganges-Kobadak Project in Kushtia. This restricted government facility houses the intake pumps for the largest irrigation system on the Ganges River in Bangladesh. Photography was prohibited, but I was able to speak with the two engineers on duty, who shared with me powerful stories of their experiences growing up in the area and the dramatic changes in the river system that they had witnessed in the intervening decades. Additional progress toward refining my project came in the form of meetings with a geohydrologist at the University of Dhaka, whom I met the previous summer, and the Project Manager for Ecosystems for Life: A Bangladesh-India Initiative – a recent effort of the International Union for Conservation of Nature to improve Indo-Bangladeshi relations around shared environmental concerns, including river management.

Phase III: Interviews and archives

2013 was a year marked by tumult and tragedy in Bangladesh. In February, tens of thousands of people congregated in Shabagh Square to protest the life sentence of a convicted war criminal who had been tried in the highly contentious International Crimes Tribunal that investigates atrocities committed during East Pakistan's 1971 war of independence from West Pakistan. In April, an eight-story commercial building with garment factories, apartments, and shops collapsed in the largest structural failure in modern history, killing over 1,000 people and sparking weeks of riots and demonstrations. In December, following months of destructive protests and strikes throughout the country, an alliance of political opposition parties announced their boycott of the national elections to be held the next month in response to the incumbent government's refusal to cede power to a caretaker government – a temporary administration established to ensure free and fair elections in a country notoriously crippled by corruption and nepotism.

Against this backdrop, I had to make the difficult decision whether or not to continue my language studies through a second round of the summer language program in Dhaka. I had been awarded another Critical Language Scholarship and felt a responsibility to my research and future informants to take advantage of every opportunity to develop my language skills. However after weeks of deliberation, I finally acknowledged that I would not be able to benefit much from the program while the entire country was erupting in political and social protest. Moreover, my dissertation research was postponed by the Fulbright IIE Program until after the January 2014 elections because of the safety risks posed by political demonstrations. Safety concerns revolved

around protesters who burned buses, torched polling stations, detonated homemade “cocktail” bombs in the streets, and occasionally waged deadly attacks against fellow civilians suspected of supporting a rival political party. These destructive and intermittently violent acts accompanied multi-day long *hartals*, or general strikes, that shut down businesses and crippled transportation systems throughout Dhaka and other major cities.

My return to Bangladesh was therefore postponed until March 2014. Although the country seemed to be in a state of shell shock from the previous year’s trials, systems were functioning again and my research proceeded apace. For nine weeks, I read three newspapers a day, attended organized panels on water and climate change, conducted interviews in Khulna (Batiaghata, Dacope, and Jalma) and Rajshahi, observed a rally protesting India’s withdrawals from the Teesta River, and conducted in-depth interviews with researchers, community organizers, engineers and water resource managers in Dhaka (Table 1.1).

Table 1.1 List of in-depth interviews conducted in Dhaka, Khulna, and Rajshahi, Bangladesh.

Date	Role	Organization	Type
3/26/14	Executive Director	Loving Care for the Oppressed Society	NGO
3/27/14	Civil Engineer	Bangladesh Water Development Board	Government
3/30/14	Deputy Director	Shushilan	NGO
3/30/14	Professor	Khulna University	Academic
3/30/14	Professor	Khulna University	Academic
4/6/14	Professor	BUET	Academic
4/6/14	General Secretary	Bangladesh Poribesh Andolon	NGO
4/17/14	Professor	Rajshahi University	Academic
4/24/14	Professor	Dhaka University/IUB	Academic
4/24/14	Professor	Dhaka University	Academic
4/29/14	Engineer	Joint Rivers Commission	Government
4/29/14	Activist	Bangladesh Poribesh Andolon	NGO
5/1/14	Professor	Dhaka University	Academic
5/5/14	Advisor	IUCN	NGO

In March and April, I conducted semi-structured qualitative interviews with key water resource users (farmers, fishermen, boatmen) in Rajshahi and Khulna Divisions, Bangladesh (Figure 1.2). West central and southwestern Bangladesh capture the points where the Ganges River enters (Rajshahi) and exits (Khulna) the country and where the impacts of border security and water scarcity, respectively, are most keenly experienced along the watercourse (Figure 1.2). This research focuses on agriculture, fishing, and boating as key water-dependent occupations due to their importance as major sources of employment and their unique reliance on surface freshwater resources, either for extraction (farming) or minimum river flows (fishing and transportation; *e.g.* Chowdhury 2010). Agriculture employs approximately two-thirds of the population in Bengal and consumes an astonishing 96% of the annual freshwater withdrawals in Bangladesh (Kartiki 2011, PRASARI and FAO 2011). Furthermore, Bangladesh's inland (freshwater) fishery is among the largest in South Asia and supplies up to 80% of the country's dietary protein (Mirza and Ericksen 1996). Lastly, although transportation is a non-consumptive use of water, boatmen directly depend on river flows for their livelihoods and serve a vital role in maintaining communication and transportation networks in a predominantly rural region where transit by water is both more affordable and efficient than by road (Chowdhury 2010).

To capture this cross-section of water uses, my sample consisted of 25 farmers, 26 fishermen, and 14 boat operators for a total of 65 interviews with resource users who were invited to participate in the study through snowball and opportunistic sampling. I combined a fairly uniform set of open-ended questions (Appendix A) with follow-up questions to develop a comprehensive understanding of informants' experiences with and

perceptions of their occupational uses of water. Responses from two individuals were omitted from analysis because their youth and short length of residence in the area, respectively, precluded them from being able to comment on changes in surface water resources over time (Appendix B). I limited the number of interviews based primarily on saturation in the responses I received, though at one site, my access to boatmen was limited by their availability. Specifically, boatmen in Dacope (Polder 31) were busy working during the day, but nighttime interviews were not possible due to concerns for my personal safety, both at the site and along the route back to my accommodations in Khulna City. I made a similar decision to abandon my plans to conduct interviews on the largest *char* (riverine island) in the Ganges River at Rajshahi on advisement of my faculty contact there who informed me of the legitimate risks of abduction and extortion.

In addition to field interviews, I obtained government reports and records through archival research at the River Research Institute (RRI). I had intended to conduct most of my archival research at the National Archives in Dhaka, and although I was granted full research clearance, I learned from the Director of Research there that virtually all river-related materials were located at RRI. RRI is a federal research facility in Faridpur, Dhaka Division operated under the auspices of the Ministry of Water Resources. RRI's library holdings are not catalogued online (or in any publically-accessible format, for that matter), so I was not able to determine in advance nor in person what records are housed there. However once I arrived, the librarian very generously made himself available to me for two days, during which I skimmed and selectively scanned approximately fifty publications and government reports on river research and development projects.

From Bangladesh, I continued on to Europe where I spent two weeks conducting archival research at the British Library and participant observation at two transboundary water workshops. The first workshop, “The Seventh International Workshop on Hydro-Hegemony: Contesting Hegemony,” was held at the London campus of the University of East Anglia on 10–11 May 2014. The second workshop, “Counting our gains: Identifying, assessing and communicating the benefits of transboundary water cooperation,” was hosted by the United Nations Economic Commission for Europe at the UN Headquarters in Geneva on 22–23 May 2014.

Between these two events, I spent one week collecting materials on Partition and river development from the India Office of the British Library. Using the online catalog for the India Office Records, my search terms consisted of some combination of Ganges, Hooghly, Radcliffe, Bengal, Partition, Farakka, Calcutta, sediment, and navigation, which yielded several hundred hits. I identified the most relevant records and requested 23 items that ranged from hand-scrawled, leather-bound tomes containing 19th century colonial correspondence to microfilm reels chronicling Viceroy Mountbatten’s weekly telegrams to the Crown during the height of Partition.

The accounts of river-border development, dispute, and crisis in Bengal that follow draw on all of these resources: interviews conducted in English and Bangla, declassified Partition reports, confidential hydrological data, colonial-era revenue records, personal observations, and newspaper clippings. I have strived to represent each source accurately and provide relevant context to the best of my ability. A thousand different stories could be told using the same materials. In writing this particular story, it has been my intention to cast the familiar ideas of international rivers and borders in a

different light, one that opens up new avenues for developing systems for just and equitable resource access.

Chapter synopses

In addition to introductory and concluding chapters, the dissertation is comprised of four central chapters, each of which employs the concept of the river-border complex and addresses fundamental ideas about international rivers, upstream-downstream power relations, cooperation, and analytical scale. The following synopses provide an overview of the arguments that I develop in each chapter.

Chapter 2: The Construction of an International River

The Bengali district of Murshidabad is one case that defies the dominant narrative of Partition in which land allocations and border demarcations were made along religious demographic lines. When the Muslim-majority district of Murshidabad was assigned to Hindu-based India, India secured unfettered control of the Ganges River, from its headwaters in Uttarakhand to its mouth at the Bay of Bengal (via Kolkata/Calcutta). *Pace* popular accounts, I present recently declassified records from the Partition period to argue that natural resources and sites of strategic economic importance were given consideration comparable to communal concerns during the process of border delineations. Rather than regard international rivers as an unproblematic fact, this historical analysis reveals their processual, constructed, and contested nature by tracing the political, social, economic and physical contingencies that attend their creation and persistence. I conclude that the Ganges is not just socially and politically constructed as an international river, but that the Ganges River and Indo-Bangladeshi border cannot be adequately understood in isolation of one another.

Chapter 3: Border-Mediated Flows and Uneven Riparian Dynamics

This chapter disaggregates Bangladesh's physical position from its political position. That water flows downhill is a principle of physics. That Bangladesh is small and weak compared to India is a result of politics, history, economic development and a host of other factors. However, there exists a decades-old discursive practice within and outside of Bangladesh that conflates the country's downstream position with its political impotency. Building on emerging scholarship that identifies power asymmetries along an upstream-downstream axis to be both socially and geographically determined, I examine the Ganges River and Indo-Bangladeshi border to identify how these features interact with each other. Specifically, I examine *non-water flows* (e.g. information, people, pollution) within the framework of the river-border complex to argue that many flows along the river are mediated by the discretionary function of the border and that such bordering of flows underpins upstream-downstream dynamics in the region.

Chapter 4: Questioning Calls for Cooperation

That cooperation has become a universal mandate for governing transboundary waterbodies is no more evident than in the United Nations' designation of 2013 as the International Year of Water Cooperation. Taking the form of treaties, joint river management commissions, data sharing and related mechanisms, cooperation is touted as a desirable approach to achieving sustainable and equitable benefits for all parties involved. However, calls for greater transboundary water cooperation operate from the presupposition that issues involving international rivers are necessarily international in scope. In this chapter, I interrogate the apparent paradox that grievances in Bangladesh persist despite a long-term agreement with India. I draw upon qualitative interviews and

previously unpublished hydrological data from the Ganges River to evaluate the widespread perception that ongoing hydro-hazards in Southwestern Bangladesh result from water practices in India, thereby requiring transboundary river cooperation. The analysis indicates that while variability in the timing of water delivery may pose challenges for resource users in Bangladesh, India is broadly abiding by the terms of the Ganges water-sharing treaty. I conclude that cooperation between the riparian states has addressed some conflicts while generating and obscuring others, thus accounting for the persistence of grievances long after conflict was apparently resolved.

Chapter 5: Beyond the Basin: Bringing in Non-riparian Actors

Long described as the “largest poorest” country, Bangladesh has been a prime target for massive infusions of foreign donor aid since its establishment in 1971. Through historical and ethnographic investigation, I document how flood control and agricultural intensification projects underwritten by foreign governments and multilateral development banks exacerbate human and environmental vulnerability to water crises in Bangladesh. This process entails physical modification of river channels, as well as institutional transformations that diminish peasant access to land and water for food production. In effect, these ostensibly pro-poor water governance and economic development programs engender cycles of crop loss, groundwater and soil salinization, diminished fisheries, and impeded navigation that are superficially indistinguishable from the effects of unilateral water withdrawals in India. In this chapter, I argue that these international development programs, while purporting to facilitate poverty reduction climate change adaptation in Bangladesh, in fact perpetuate both the conditions and

rationale for continued flows of aid dollars into the country, necessitating explicit examination of *non-riparian* actors and their actions.

Chapter 2 – The Construction of an International River

It has become popular practice within transboundary water literatures to note that 263 river basins cross national boundaries and that such waterbodies create unique challenges for the 145 countries whose territories sit partially or wholly within a transboundary watershed (e.g. Giordano and Wolf 2003, Yoffe *et al.* 2004, Rieu-Clarke 2010, Schmeier 2010, Swain 2012, Wouters 2013).⁴ An excerpt from a United Nations report exemplifies this common refrain:

“The existing 263 transboundary lake and river basins cover nearly one half of the Earth’s land surface and account for an estimated 60 per cent of global freshwater flow. A total of 145 States include territory within such basins, and 30 countries lie entirely within them.” (UN Water 2008:1)

In addition to reproducing such figures, another conspicuous trend in this literature is the unquestioned acceptance of the notion of the international river itself.⁵ The concept is apparently so self-evident that definitions are in fact difficult to find. In his authoritative text “The Law of International Watercourses,” environmental legal scholar Stephen McCaffrey (2007: 34) writes, “The present work is concerned with the law of *international* watercourses. Yet the ‘international watercourse system’ is a concept whose definition depends upon an understanding of the notion of the ‘watercourse

⁴ While earlier studies counted 261 transboundary river basins (Wolf 1998, Bernauer 2002, Tiwary 2006), the United Nations now places the figure at 276 basins that supply water to 148 countries (UN Water 2013).

⁵ The absence of a widely accepted definition may also be attributed in part to the difficulty of reaching consensus on terminology. Grey and Sadoff have observed at UN meetings that, “the word international is objected to by many, since “international waters” imply they do not belong to anybody...Common approaches should be used. Unfortunately, no common approaches are often the case” (*ibid* 2003:91). Debate at international meetings has done little to curb usage of the term, which has been published in at least 103 academic articles during the five-year period 2010–2014 (according to the Web of Science in a search for “international river”).

system.” Tellingly, the explanation of “watercourse system” that follows indicates that McCaffrey is more concerned with highlighting the importance of groundwater and tributaries for water governance than with the features that make a watercourse system “international.” Other sources that do define the term identify international rivers as “freshwaters whose basins are situated within the borders of more than one state” (Sadoff and Grey 2002:390) and “rivers shared by two or more countries” (Glassner and Fahrer 2003:318).

There are significant implications of these ostensibly straightforward explanations that warrant consideration. These definitions inform us that international rivers only exist by virtue of the fact that they traverse the boundaries that delimit states. In other words, international rivers cannot exist without national borders. That international rivers are conditional on the preexistence of a border begs the question: What is a border?

In the context of states, the term “border” suggests an interface between political entities or a line that demarcates the area of a country, but we can quickly apprehend the slipperiness of the term by reflecting on our own experiences with them. Doing so, we see that borders are porous to some flows (*e.g.* financial instruments, information) but exclusive to others (*e.g.* undesirable immigrants) (Newman 2001, Wonders 2006); they operate in the virtual space of security software systems (Parker and Vaughn-Williams *et al.* 2009, Amoore 2011) and in the psychological space of border crossers (Salter 2008); and, they may be encountered far from the geographic region of the borderland in places like airports and passport agencies (Balibar 2002, Johnson and Jones 2011). These varied, fluid manifestations of the border have emerged from the imperative for state powers “to reconcile security with mobility and sovereignty with economy” (Amoore 2011:64, see

also Habermas 1998). The protean nature of security, mobility, sovereignty and economy, however, requires a concomitant elasticity in bordering practices, which in turn augment the difficulty of defining borders themselves.

French philosopher Étienne Balibar assumes a hard stance by asserting that attempts at definition are futile:

“The idea of a simple definition of what constitutes a border is, by definition, absurd: to mark out a border is, precisely, to define a territory, to delimit it, and so to register the identity of that territory, or confer one upon it. Conversely, however, to define or identify in general is nothing other than to trace a border, to assign boundaries or borders...The theorist who attempts to define what a border is is in danger of going round in circles, as the very representation of the border is the precondition for any definition.” (Balibar 2002:76)

Taken together, we find that a landscape feature (international river) is defined in relation to a political feature (border) that itself evades tidy definition. While such semantic concerns highlight the social construction of international rivers and borders, I do not raise them to suggest that these features are not real. Indeed, rivers and borders present very tangible opportunities, threats, and challenges to the people that encounter them (*e.g.* Wonders 2006, Biggs *et al.* 2009). However, where borders have been richly theorized and are increasingly recognized “not only as fixed territorial lines, but also as social, spatial, and political constructs” (Newman 2001:139), international rivers have not enjoyed the same degree of critical engagement.⁶ Therefore, international rivers continue

⁶ Similarly, critical geopolitics has done much to upend perceptions of states as fixed and always-already constituted. For example, Agnew and Corbridge (1995:5) write, “There is nothing natural about a world simply divided up into territorial states and their interactions with one another,” and Jones and Merriman (2012:941) assert that “national territories are not static backdrops to nationalist discourse and politics but, rather, are contingent and dynamic entities.” But like border studies, critical geopolitics has failed to penetrate into mainstream international river governance discourse (but see Sneddon and Fox 2006, Norman and Bakker 2009, Harris and Alatout 2010, Akhter 2015 as examples of a growing critical water geographies literature).

to be understood in simplistic terms, even as their essential and myriad roles in society engender multiple meanings, values, uses, and practices.⁷

Simon Dalby (1991:274) asserts that "we must not limit our attention to a study of the geography of politics within pre-given, taken-for-granted, commonsense spaces, but investigate the politics of the geographical specification of politics." Applying this tenet from critical geopolitics to the study of transboundary water governance, I contend that only by unpacking the concept of international river can we appreciate how the political, physical, and cultural factors that produced these watercourses historically continue to shape our understandings of and social relations around such features today. Unfortunately, the term "international river" lends itself to commonsense definitions that perpetuate the silencing and obfuscating of the borders, and by extension the politics and violences, that [re]produce them. To address this problem, I propose the "river-border complex" as a conceptual framework for reconfiguring international rivers and borders as synergistic and interdependent. Rather than comprising "pre-given, taken-for-granted, commonsense spaces," the river-border complex encompasses the individual agents (*e.g.* World Bank, hydraulic engineers), discrete events (*e.g.* border demarcation, treaty ratification), and ongoing activities (*e.g.* water sharing, aquaculture) that interact to structure water use and resource access within transboundary river contexts.

Rather than regard international rivers as an unproblematic fact, the goal of this chapter is to reveal their processual, constructed, and contested nature by tracing the historical events and political decisions that produce these features. In so doing, I underscore "the usefulness of employing a critical historical perspective to better

⁷ See Orlove and Caton (2010) for their treatment of water as a "total social fact," and Linton and Budds (2014) for a discussion of the relationship between water and society.

understand challenges to contemporary water management issues” (Biggs *et al.* 2009:221). What follows is an historical examination of the Ganges River and the Indo-Bangladeshi border using colonial records and Partition-era documents obtained from the British Library in May 2014.⁸ My analysis is structured by the questions: How did the Ganges become an international river? How has internationalization affected the ways the river is managed and flows?

The chapter proceeds with a brief introduction to the political events that precipitated the Partition of India in 1947. In the remaining sections, I discuss the implications of the Bengal border designation for contemporary management of the Ganges River and present new historical evidence to settle a long practice of speculation and debate about the assignment of Muslim-majority Murshidabad district to Hindu-based India. In closing, I argue that the Indo-Bangladeshi border and Ganges River cannot be adequately understood in isolation of one another. Where the border is obscured in contemporary transboundary water governance discourse, the river-border complex approach makes explicit the role of the border within and upon the international river.

Making states

“War made the state, and the state made war.” (Tilly 1975:42)

Our story begins with the Second World War. At first glance, a discussion of WWII might appear tangential to an analysis of international rivers, but 41 countries were formed during the first two decades after the war. The creation of numerous international rivers accompanied this carving of territory, both of which would structure political

⁸ The British Library India Office (BLIO) citations throughout this text refer to the documents that I accessed during this period of archival research.

relationships long into the future. Thus, WWII was instrumental to the present condition in which “148 countries occupy 276 transboundary river basins.” As we will see in South Asia, war made the state, and the state made international rivers.

It is an unintuitive yet remarkable fact that the Second World War and British India were mutually transformative. Colonial India provided military, industrial, and financial support to the Allied campaign in the form of two and a half million volunteer soldiers, massive production of matériel, and sizable cash donations. In turn, the war helped galvanize those who had already begun agitating for a free and autonomous state. Notably, the largest and most powerful political party of the day, the Indian National Congress (Congress hereafter), made a bold bid for independence in August 1942. The so-called Quit India Movement was a response to Britain’s failure to meet Congress’s demands in exchange for India’s assistance with the war effort. Although the uprising was forcibly and swiftly quelled, the move further cemented a vision of independence in people’s minds (see Metcalf and Metcalf 2012).

The war was instrumental to the independence movement beyond providing political leverage. As a result of its large-scale and rapid development of industry and armed forces, India assumed new military, economic, and political influence, emerging from the war as the fourth largest industrial power in the world. In contrast, the global conflict left Britain in fiscal and administrative crisis, unable to sustain its reign in South Asia or elsewhere. Mutinies in the Indian armed services and a wave of communal violence after the war provided additional impetus for Britain to cede power. Thus faced with widespread political unrest and a beleaguered exchequer, the British government

deployed a Cabinet Mission to India in 1946 to strategize the transfer of power to Indian leadership.

Beyond the single detail of granting independence from British rule, other aspects of the Cabinet Mission's proposals for the configuration of the new Dominion of India and its government were not so readily received. Disagreements between the Indian National Congress and the All India Muslim League (the second strongest political party) over how provinces would be created and administered erupted into violent confrontations between Hindus and Muslims, neither of which could countenance the prospect of being governed by the other. It has been reported, for example, that Muslim League president Muhammad Ali Jinnah "asserted that Muslims would never submit and would rather die than live together with Hindus under a constitution with one government" (BLIO 1969:9).⁹ Deadly clashes thus reinforced the structuring of statehood negotiations around the issue of religion despite the myriad axes of difference (*e.g.* class, language, customs) that existed in the culturally diverse and complex colony (see van Schendel 2009, Metcalf and Metcalf 2012).¹⁰ Out of this antagonistic social climate rose Viceroy of India Lord Mountbatten's proposal on 3 June 1947 that the issue of partition be decided according to representatives from Muslim and non-Muslim majority districts

⁹ Emerging in the early 20th century, the "Two-Nation Theory" regarded Indian Muslims as constituting a nation distinct from that of Indian Hindus, thereby rendering shared governance untenable.

¹⁰ In Bengal, the communalization of conflicts was also a strategy employed by the *bhadralok* (Hindu landed elite) who saw the building momentum of communist politics among agrarian peasants (Hindu and Muslim) as a threat to their already diminished power in the aftermath of the 1932 Communal Award (Chatterji 1994). This formative piece of colonial legislation shifted the balance of power in favor of Muslims who were awarded nearly 48% of the seats in the Bengal Legislative Assembly, while Hindus only captured 32% of the voting power (Chatterji 1994:20).

in Bengal and Punjab, thus officially announcing the possibility of transferring power to two successor governments as opposed to one (BLIO 1969).¹¹

When the question of whether to partition Bengal came to a vote, the Muslim-majority East Bengal Legislative Assembly voted strongly in favor of remaining united (106–35). The smaller, Hindu-majority West Bengal Legislative Assembly, on the other hand, decided 58–21 to divide Bengal. The disparity between the two halves of the Bengal Legislative Assembly was predictable given the preceding decision by the entire Assembly (126–90) that a united Bengal would constitute part of Pakistan and thereby place the Hindu population under Muslim-majority rule (BLIO 1947:138). Thus it was decided on 20 June 1947 that Bengal would be partitioned. While some anticipated the inevitable social turmoil that would be wrought by severing the highly interconnected region, it is unlikely that equivalent consideration was given to the rivers that ran through it, though the impact of the border designation on the Ganges River and its distributaries would be soon and keenly felt.¹²

Border orders

With the decision to partition Bengal established, the next order of business was to determine how the province would be divided and by whom. In his weekly dispatch to

¹¹ According to Mountbatten's 3 June Plan, demographic information including population and religious affiliation was to be determined using data collected during the 1941 Census. Such data would later prove to be problematic, as the Boundary Commission Chair (Cyril Radcliffe) would complain that the maps supplied were out of date.

¹² One commentator notes, "When in 1947 East Pakistan (presently Bangladesh) was carved out of the Bengal and Assam provinces of undivided India, religion was the sole determinant of demarcation of the boundary, and physical-geographical considerations could hardly be of any significance." (Islam 1990:19–20). Although Islam overstates the role of religion during the border delineation, his comment points to the limited consideration accorded to the impacts of geography on future social-political relations.

the British Crown, Lord Mountbatten reported on 27 June 1947 that it was agreed at the first Partition Council meeting that two Boundary Commissions would be formed to determine the borders of partitioned Punjab and Bengal.¹³ With respect to the latter, Mountbatten wrote, “The Boundary Commission is instructed to demarcate the boundaries of the two parts of Bengal on the basis of ascertaining the contiguous majority areas of Muslims and non-Muslims. In doing so it will also take into account other factors” (BLIO 1947:139).¹⁴ This formula appears to provide a straightforward solution to a communal problem; however, the ambiguous concluding clause would later prove to be among the most scrutinized statements from the partition period, for reasons that we will soon discover.

A second key outcome of the inaugural Partition Council meeting was the decision to name Sir Cyril Radcliffe as chairman of both Boundary Commissions.¹⁵ A barrister from London, Radcliffe had never before set foot in South Asia, which at the time was perceived as testament to his impartiality (Chatterji 1999). However, the impossibly narrow window of time that he was given to establish the borders ensured that his understanding of the massive, complex, and dynamic social-political landscape of India would remain superficial.¹⁶ Radcliffe arrived in India on 8 July 1947 and departed

¹³ For an incisive analysis of the role of boundary commissions at the decline of the British Empire, see Chester (2008).

¹⁴ These terms were in fact Congress leader Jawaharlal Nehru’s suggestion, which he first proposed on 12 June 1947 and which Jinnah accepted to the word on 23 June 1947 (BLIO 1947:246).

¹⁵ Lord Chancellor Jowitt nominated Radcliffe for the task on account of his “great legal abilities...right personality and administrative experience” (Heward 1994:37).

¹⁶ On 20 February 1947, the British government announced their intention to transfer power to representative leadership in India by June 1948. Radcliffe’s timeline was dramatically truncated when Viceroy Mountbatten rescheduled the transfer of power for 15 August 1947.

on 17 August 1947. Within that five-week period, he had to contend with the gravest concerns. In presenting the territorial assignment, which Radcliffe titled the Bengal Award and completed on 12 August 1947, he wrote:

“In my view, the demarcation of a boundary line between East and West Bengal depended on the answers to be given certain basic questions which may be stated as follows:

- (1) To which State was the City of Calcutta to be assigned, or was it possible to adopt any method of dividing the City between the two States?
- (2) If the City of Calcutta must be assigned as a whole to one or other of the States, what were its indispensable claims to the control of territory, such as all or part of the Nadia River system or the Kulti rivers, upon which the life of Calcutta as a city and port depended?
- (3) Could the attractions of the Ganges-Padma-Madhumati river line displace the strong claims of the heavy concentration of Muslim majorities in the districts of Jessore and Nadia without doing too great a violence to the principle of our terms of reference?

...After much discussion, my colleagues found that they were unable to arrive at an agreed view on any of these major issues...in the absence of any reconciliation on all main questions affecting the drawing of the boundary itself, my colleagues assented to the view at the close of our discussions that I had no alternative but to proceed to give my own decision.” (BLIO 1947:310–311)

A new country, a new river

Radcliffe did in fact provide his own decision, which he acknowledged was an imperfect compromise. He wrote in a personal letter, “Nobody in India will love me for my award about the Punjab and Bengal and there will be roughly 80 million people with a grievance who will be looking for me” (quoted in Heward 1994:42). As Radcliffe anticipated, reactions to the Bengal Award, although variable in scope, were unanimously condemning. Among the troublesome new realities on the ground was the administration of 201 parcels of Bengali territory distributed over four regions and between two countries (van Schendel 2005).¹⁷ While these and other decisions of Radcliffe’s continue

¹⁷ The many and enduring casualties of Partition include 197 adversely held enclaves, tiny plots of Indian land located within East Pakistan’s (now Bangladesh) borders and

to spur debate and analysis, the present discussion will proceed by considering just three outcomes of the Award: the assignment of Calcutta to India, the allocation of Murshidabad to India, and unilateral diversion of the Ganges River at Farakka.

Calcutta

It is arguable that India would never have become the “jewel in the crown” of the British Empire had it not been for Calcutta. As the most important trading post of the colony, Calcutta commanded an enormous hinterland that stretched from Varanasi, across the Gangetic plains, to the Brahmaputra in the northeast (Tan 2007). The city connected the prized commodities of this vast region (*e.g.* jute, tea, indigo, opium) with European markets while also serving as the administrative and cultural capital of India from 1772 to 1911 (Begum 1987, Tan 2007). The British relocated the colonial capital to New Delhi in December 1911 in part to temper a burgeoning nationalism in Calcutta (Metcalf and Metcalf 2012), but this move did little to diminish the value of the port city as a cultural and commercial hub, especially in the eyes of Bengalis.¹⁸ This sentiment is poignantly

vice-versa. Due to physical isolation from their respective countries of citizenship, enclave residents are completely cut off from services such as hospitals, markets, and administrative offices. While the prime ministers of India and Bangladesh signed an accord in 2011 to exchange the territories, India has not yet ratified it, and the social and political problems of the enclaves remain outstanding.

¹⁸ Prior to relocating the capital from Calcutta to New Delhi, Bengal had been temporarily partitioned into East and West enclaves from 1905 to 1911. This was the colonial government’s first attempt to subdue aspirations for independence among Bengali nationalists. In a memo entitled “Short Note on Changes in the Boundary of Bengal 1905–1947,” the curator of the India Office Records, Ian A. Baxter wrote that then Viceroy Curzon championed this first partition of Bengal to make the large province easier to administer and to remedy the imbalance between the wealthy and powerful Hindus in the West and the disenfranchised, predominantly Muslim population in the East. But Baxter also offers that “Another perhaps equally important reason for the partition was the desire to weaken the growing impetus of a united Bengali Nationalism and especially the influence of the educated classes of the West on this movement” (BLIO 1971:1). Also noteworthy is that this first partition of Bengal precipitated the

captured in a memorandum to Cyril Radcliffe, in which two representatives of the Muslim League making a case for Calcutta to go to Pakistan wrote, “[Calcutta] is Bengal in miniature. It epitomizes the sum total of the life, talents, resources and progress of Bengal and the State of Bengal. It has been the head and crown, the heart and soul of Bengal, from 1757; the birth of the British Raj in India” (BLIO 1947b:2). Therefore the question of where to assign Calcutta, as Radcliffe quickly ascertained, was of paramount importance to the Bengal Boundary Commission.

Calcutta was located in the Hindu-majority district of the 24 Parganas, therefore it would logically be assigned to India according to the rubric of demarcating territory by religious composition (Figure 2.1). However, the ambiguity around the “other factors” mentioned in the Boundary Commission’s mandate prompted the Muslim League to make an ambitious bid for Calcutta on the basis of equitable division of economic assets between East and West Bengal (BLIO 1947b, Chatterji 1999). Despite the League’s attempt, the city and its associated district (24 Parganas) were awarded to West Bengal, India (Figure 2.2).

formation of political parties along communal lines, leading to the creation of the All India Muslim League in 1906 and the All India Hindu Mahasabha in 1910.

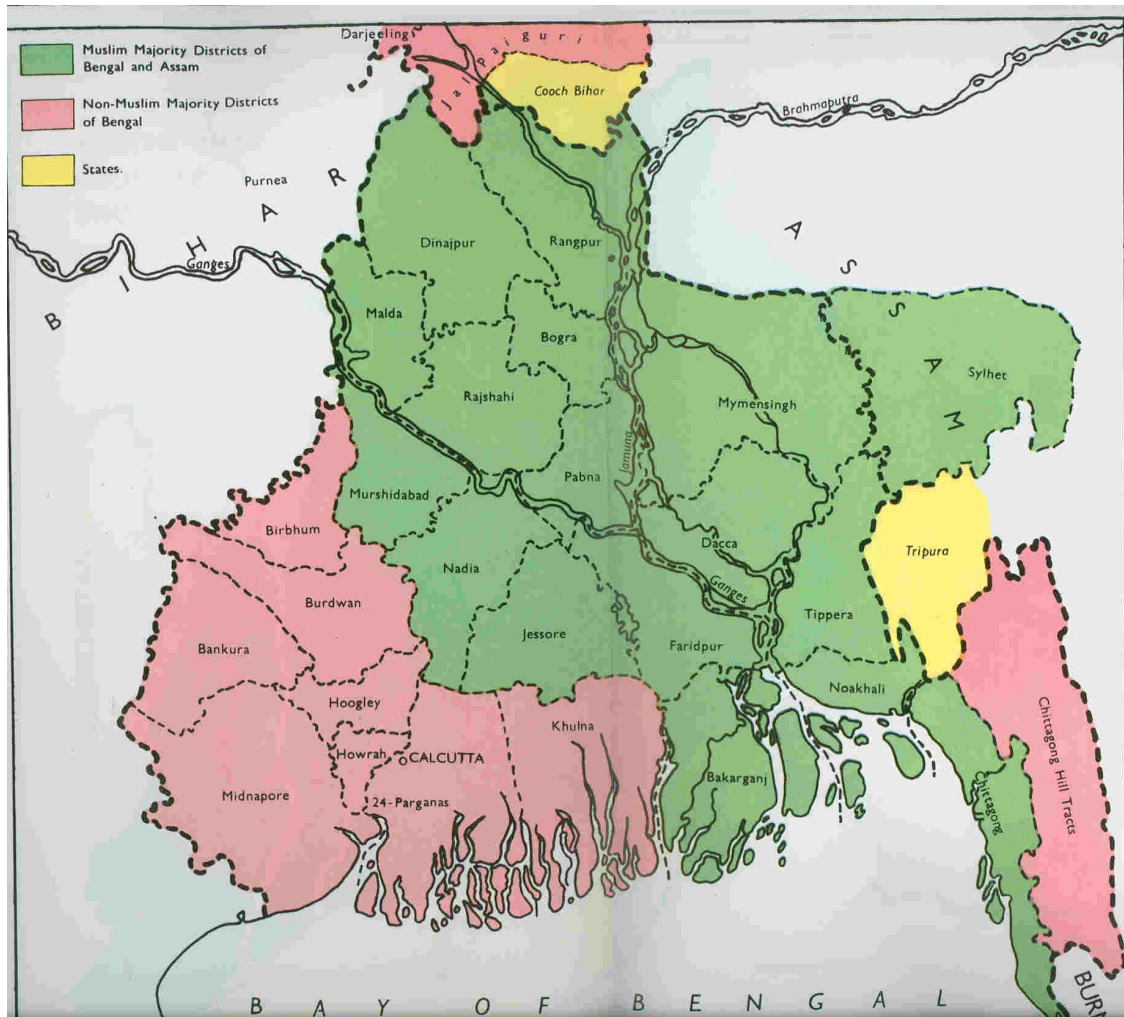


Figure 2.1 Majority religious composition in Bengal per the 1941 Census.

Source: Government of the United Kingdom (<http://www.leics.gov.uk/>)

Regardless of how Radcliffe arrived at this particular decision, the fate of Calcutta could not be determined independently of the river network given that the Hooghly River was the city's lifeline, connecting the port to the Ganges River and the hinterland accessed therewith (Figure 2.3). Certainly, Radcliffe appreciated the significance of the river systems for the viability of Calcutta port (see question (2), quoted above), but it is unclear to what extent he was aware of the navigational issues that the rivers posed.

Stuart Elden notes that while 17th century legal philosopher Hugo Grotius is best known for his seminal work on the international law of the sea, he also posed important

questions about the relationship between rivers and territory. “Fundamentally, [Grotius] asks, if the course of a river changes, what about its territory?” (Elden 2013:241). Unfortunately, Elden does not pursue this line of inquiry further, but I propose that one answer comes to us in the form of territorial disputes over Murshidabad over two centuries later. We will see in this case that changes in river morphology irrevocably transformed understandings of and claims to territory in Bengal.

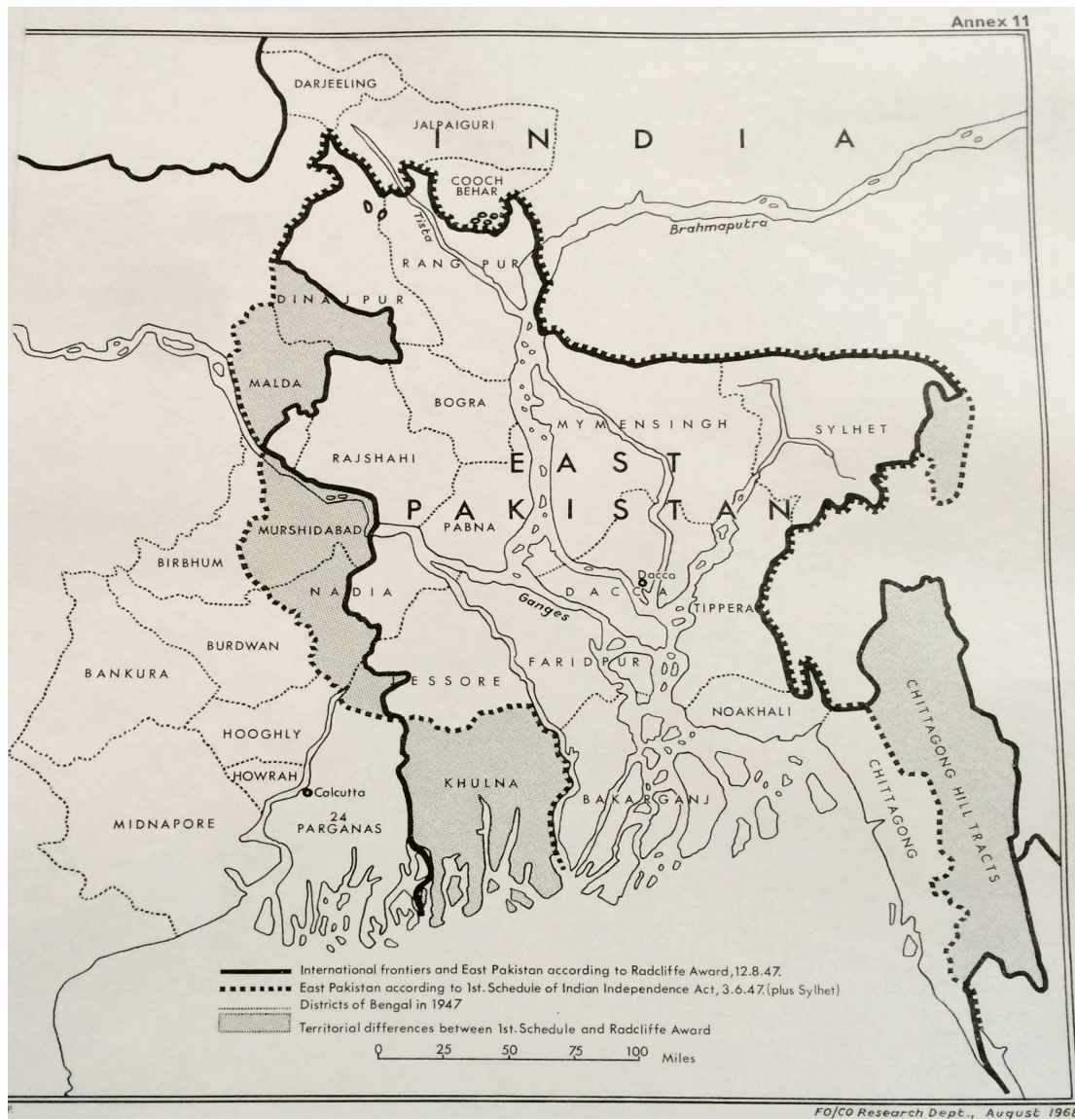


Figure 2.2 District-level map of Bengal indicating the Radcliffe line (thick black line) and the expected border (broken line) according to majority religious demographics. Source: BLIO 1969

Murshidabad

The Hooghly River had once been the main distributary of the Ganges River (via the Bhagirathi), but sometime in the early 1500s, the Ganges shifted away from the Hooghly and assumed a southeasterly course to the Bay of Bengal via the Padma River, which it has maintained to present day (Figure 2.3). As a result, the Hooghly was converted into a spill channel that would only convey water from the Ganges during high flow conditions (Begum 1987). Nearly 200 years later and with full knowledge of this change in river morphology, the British proceeded to construct a port at Calcutta in 1690 despite the Hooghly's inconsistent water volume and a treacherous approach to the port from the sea (Begum 1987). The irregularity and reduction in river flow supplying Calcutta has spawned centuries of navigational challenges all along the Hooghly River, chiefly due to progressive siltation of the riverbed.

Colonial administrative records dating from at least the early 19th century indicate that navigational hazards, including shifting sand bars and drying rivers, captured the attention of engineers, merchants, and military officials alike. These vested interests submitted numerous proposals to the government to mitigate such hazards, variously petitioning for authorization and funds to dredge channels, construct canals, relocate Calcutta port, erect barrages, build river training structures and even avoid the river altogether by building a railway link between Calcutta and the coast.

During a cursory survey of India and Bengal Despatches and Revenue Department logs, I counted fourteen separate proposals for river works on the Ganges-Hooghly system submitted between 1821 and 1854; Crow *et al.* (1995:35) document an

additional ten proposals during the period 1853–1947.¹⁹ These schemes were invariably rejected due to issues of cost, long construction times, extensive maintenance, compensation to land owners for lost property, and risk of project failure. In one such case, officers of the India Revenue Department denied a proposal to construct a canal between the Hooghly and the Ganges on account of the “large outlay...[of] (40,00,000) forty lacs of Rupees,” “difference of opinion regarding the predictability of the works proposed,” and excessive time required, noting that the canal “could not be completed probably under ten years” (BLIO 1844:614–625).

The proposals may have failed to garner political and financial backing, but several were productive in one respect: they contributed to the notion that the navigability of the Hooghly River was deteriorating and that such decline was necessarily connected to the flows of the Nadia rivers (Bhagirathi, Jalangi, Bhairab, Mathabhanga) upon which the Hooghly depended for its supply of Ganges river water (Crow *et al.* 1995). Reports dating from 1919, 1939, and 1946 on the subject of navigability all concluded that reduced spill water from the Ganges into the Nadia river system was causing deterioration of the Hooghly, which could be remedied by improving the headwater supply of the Hooghly (Crow *et al.* 1995). The logic was that increased headwater flows would effectively flush accumulated silt from the Hooghly and avert its demise. Certainly, the lower reaches of the Hooghly had required consistent dredging since 1906, but there was no evidence of actual deterioration (Crow *et al.* 1995). Even in the absence of a definitive connection between headwater flows and downstream sedimentation, these

¹⁹ For instance, on 20 November 1821, Lieutenant John Augustus Schalch submitted a plan to the Bengal Revenue Department to build a canal with locks between the Ganges and Hooghly to keep access to Calcutta free from sand deposits (BLIO 1821).

studies advocated for either dredging or diverting water into the Nadia rivers, the most important of which, the Bhagirathi, originates in the Muslim-majority district of Murshidabad.

At the northern end of Murshidabad District, the Bhagirathi River branches off of the Ganges River, flows through the center of Murshidabad, then becomes the Hooghly River upon entering Hooghly District, eventually flowing into Calcutta (Figure 2.3). The commercial interests in Bengal invoked the navigation studies in convincing the provincial government leadership that prophylactic measures must be taken to circumvent any potential deterioration of the Hooghly (Crow *et al.* 1995). Given the course of the Bhagirathi River, this commitment to hydrological intervention rendered Murshidabad inseparable from any discussion of the continued viability and success of Calcutta as a city and port. Therefore during Partition, Congress maintained not only that Calcutta belonged in India but that Murshidabad must also be awarded to India, even at the expense of losing Khulna, a large Hindu-majority district (Chatterji 1999). Though it is unclear whether or not Radcliffe was aware of the Hooghly's condition, this is in fact precisely the arrangement that he decided upon when he assigned Khulna to Pakistan and Murshidabad to India (Figure 2.2).

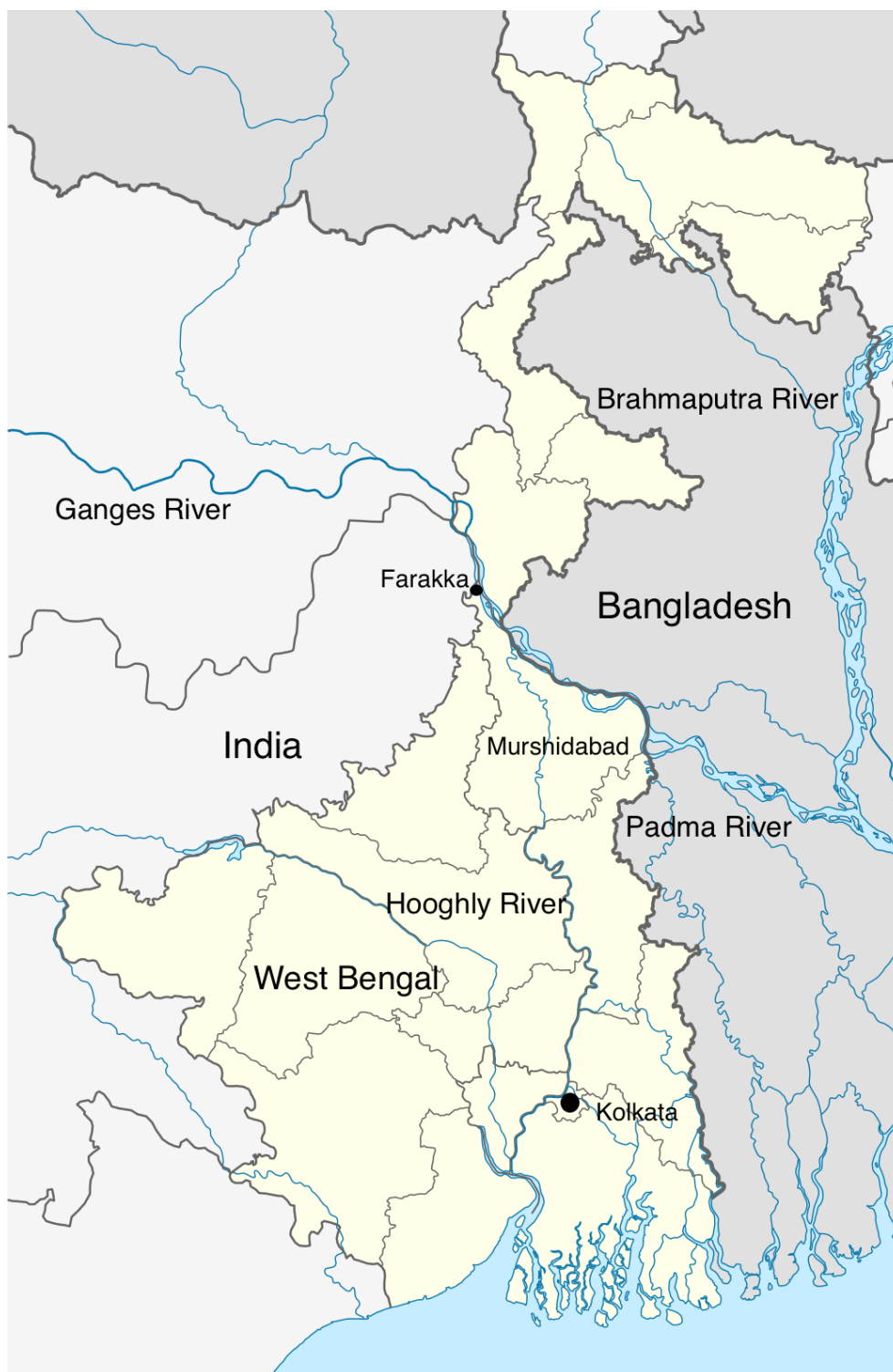


Figure 2.3 Present day district map of West Bengal (yellow) indicating the position of Calcutta/Kolkata relative to the Hooghly and Ganges Rivers. Murshidabad District is a key site where the Hooghly branches off from the Ganges River. Surrounding areas of India are shaded in light gray, and dark gray areas indicate non-Indian territory. Image modified from a blank outline obtained at d-maps.com.

Farakka

The distribution of religious groups in South India was such that no territorial division would have left all the rivers as national entities.²⁰ Once it was established that British India would be partitioned along communal lines, the creation of some number of border-crossing rivers was therefore inevitable. However, when Radcliffe allocated Muslim-based Murshidabad to Hindu-dominated India, he conferred to India unfettered control of the Ganges River along its entire length, from its headwaters in Uttarakhand to its mouth at the Bay of Bengal (via the Hooghly). Thus, the nascent government of India governed the river as a domestic watercourse, and did so with minimal resistance from the central Pakistani government, preoccupied as it was with securing water from the Indus Rivers, claiming territory in Kashmir, and acquiring foreign aid (Hossain 1998, Tiwary 2006, van Schenel 2009).²¹

The issue of siltation was taken up again in 1952 when a group of esteemed Indian hydrology experts examined the results of experimental models of the Hooghly and Calcutta Port (Crow *et al.* 1995). Although the evidence was inconclusive, the committee determined that deterioration was occurring and could be attributed to reduced water supply to the Bhagirathi (Crow *et al.* 1995). The resultant report formed the basis for the Indian government's unilateral decision in 1960 to proceed with construction of the Farakka Barrage, a 2.25km-long structure used to divert 40,000 cusecs of water

²⁰ Several international rivers already existed between British India and China and Bhutan.

²¹ Even during Partition, Mountbatten observed the disparity in attention afforded to the two enclaves of Pakistan: "The Muslim League High Command themselves take a good deal less interest in East Bengal than in Western Pakistan and I am afraid East Bengal is at the bottom of the priority list" (BLIO 1947c:169).

during the dry season (January–May) from the Ganges into the Bhagirathi-Hooghly (Figure 2.3).²²

As soon as the project was formally announced in January 1961, Pakistan pursued negotiations with India. Although ten meetings were held over the course of the decade, India limited discussions to technical issues and binational exchanges never advanced to the ministerial level (Begum 1987). Indeed, despite the fact that the Ganges River supplied water to a full 37% of East Pakistan, it was not until 1970 that India formally acknowledged the Ganges as an international river and as such would need to be shared (Hossain 1998). The following year, East Pakistan gained independence from West Pakistan and the river sharing problem became one for the new state of Bangladesh to handle. Early signs of accord between India and Bangladesh, including the 1972 Treaty of Friendship, were soon replaced by disagreements on how to meet both countries' dry season water demands and what water volume to allot to Bangladesh (Begum 1987, Hossain 1998).

Over two decades of disputes followed the commissioning of Farakka Barrage in 1975, which had immediate, large-scale, and deleterious effects on the industry, food production, transportation and communication systems, and ecology of Bangladesh (Begum 1987, Crow *et al.* 1995, Adel 2001). In 1996, the two countries finally managed to negotiate a 30-year treaty that regulates dry season sharing of the Ganges River from Farakka. However, discord over the Farakka Barrage persists to this day due to ongoing water crises in Bangladesh and the negligible degree to which the diversion has alleviated the Hooghly's navigation problems (see Chapter 3).

²² This is the volume, reported in cubic feet per second (cusecs), that was established as necessary to counteract sedimentation of the Hooghly River.

Setting the river, setting the record

In light of the manifest departure of the Radcliffe Line from the mandated rubric of demarcating territory according to religious majority, as well as the profound consequences this action had on East Pakistan, Radcliffe came under intense scrutiny, which he deflected by appealing to the immense pressures of exigency and imperfect data (Crow *et al.* 1995). In particular, it has been a standing question whether Radcliffe used the clause of “other factors” to include the hydrology of the Ganges river network in his deliberations on the border. As recently as 2009, an historian of South Asia wrote:

“The Boundary Commission allocated considerable non-Muslim-majority areas to Pakistan...and, conversely, allocated Muslim-majority areas such as Murshidabad to India. The members of the Boundary Commission never explained or justified these anomalies. Historians assume, however, that one reason for Murshidabad – whose population was 57 per cent Muslim – to be awarded to India was an attempt to keep the port of Kolkata linked to the Ganges/Bhagirathi river system serving its hinterland.” (van Schendel 2009:99–100)

There has also been speculation that Radcliffe simply caved to pressure from influential leaders in West Bengal, who we saw earlier were resolute about Murshidabad’s assignment to India (Chatterji 1999), but a government memorandum written for the India and Burma Committee of the British cabinet offers somewhat more tangible evidence of Radcliffe’s intent:

“In the Presidency Division, the Murshidabad District (containing 927,747 Moslems and 648,987 Hindus) goes from East to West Bengal and the Nadia and Jessore Districts are both divided between the two Provinces instead of going entirely to East Bengal. These changes are designed to leave to West Bengal control over Calcutta’s river system.” (quoted in Crow *et al.* 1995:79)

Despite the unequivocal explanation provided therein, Crow and his co-authors consider the finding to be inconclusive, later explaining, “It is clear from the drafts in the file that this explanatory note was inserted by Mr. Rumbold, Under-Secretary of State, in a draft

by E.W.R. Lumby. Rumbold may have done no more than provide his own interpretation of Radcliffe's Award" (Crow *et al.* 1995:248).

It appeared that this would be the last word on the subject given that Radcliffe destroyed all his records upon his departure from India.²³ However in 2000, the British government quietly declassified a Research Department memorandum entitled "The origins of the frontier between India and East Pakistan."²⁴ The 42-page report outlines the history of British presence in South Asia, the evolution of the idea of a separate Muslim state, various proposals for Pakistan, the formation of the Boundary Commissions, the Radcliffe Award, and the territorial disputes that ensued. Most importantly, it provides a definitive explanation for the assignment of Murshibad to India:

"Murshidabad district was awarded to India. The total population was 1,640,530, of whom 927, 747 were Muslim and only 684, 987 were Hindu. Radcliffe awarded this district (despite its Muslim majority) to West Bengal so that it could control the rivers on which the life of Calcutta as a city and port depended. The award was therefore in India's favor." (BLIO 1969:12)²⁵

Therefore, the Bengal border was nominally demarcated along communal lines but in practice natural resources (rivers) and culturally and economically important sites (ports,

²³ In his biography, written by his nephew Edmund Heward, the issue of eliminating all evidence of the border deliberations is cast in a neutral, mundane light of utility: "Radcliffe destroyed all his notes and drafts in connexion with the Boundary Commissions before he left India and brought no papers home. This followed his usual practice of destroying everything when no longer needed" (Heward 1994:45).

²⁴ The folder itself was labeled "CLOSED COLLECTION NOT TO BE ISSUED UNTIL A.D. 2000." I was only permitted to view it in a specially designated area in front of the staff desk, where my Reader Pass was held until I returned the file. Also, unlike many other materials I accessed, I was not allowed to make copies of the document myself but was required to submit a staff assist print order.

²⁵ The following section of the report further corroborates Rumbold's note (presented by Crow *et al.* 1995). It explains the division of Muslim-majority districts Nadia and Jessore between India and Pakistan as also intending to confer to India control over the rivers that supported Calcutta (BLIO 1969:12–13).

cities) figured just as prominently in the decision-making as did census data.²⁶ By directly influencing the placement of the border and representing a lifeline for the commercial and cultural life of Calcutta, the Ganges became a case in which “water internalizes social relations and politics, as opposed to being merely the object of politics” (Linton and Budds 2014:171).

The river-border complex

My aim in this chapter has been to initiate a new kind of scholarly engagement with international rivers, to reenvision international rivers analogously with the reframing of borders within border studies and the reconceptualization of states within critical geopolitics. In essence, I have called for scholars and practitioners of transboundary water governance to foreground the political, social, economic and physical contingencies that attend the creation and persistence of international rivers. Where there were resounding calls starting in “the late 1990s for more attention to borders as the sum of social, cultural, and political processes, rather than simply as fixed lines” (Johnson and Jones 2011), there has been a remarkable silence on this front with respect to international rivers.

Jones and Merriman (2012:941) suggest, “If, as Brubaker (2004, page 11) argues, we should think of nations and other groups in “relational, processual, dynamic, eventful, and disaggregated terms,” then the spaces and territories aligned with nations should also be viewed in such terms.” As we have seen, borders and rivers constitute such “spaces

²⁶ Radcliffe alludes to this very calculus in his presentation of the Bengal Award on 12 August 1947: “I have done what I can in drawing the line to eliminate any avoidable cutting of railway communications and of *river systems, which are of importance to the life of the province*: but it is quite impossible to draw a boundary under our terms of reference without causing some interruption of this sort...” (BLIO 1947:312, emphasis added).

and territories,” intimately bound up as they are in national identities and claims within Bengal. This is consistent with Chatterji’s (1999:189) assessment that while Partition was executed to fulfill communal demands for autonomy and self-determination, “territorial questions were paramount.” I thus offer the river-border complex as a framework for thinking of international rivers in “relational, processual, dynamic, eventful, and disaggregated terms,” and have demonstrated one application of the approach using the case of the partition of Bengal.

Drawing upon British colonial records, it is evident that the Ganges River became a transboundary watercourse not in the single moment of Partition, but over a period of centuries and through a combination of physical, economic, political and cultural factors. This conclusion is not to suggest a teleological progression whereby the internationalization of the Ganges was inevitable, but rather the opposite. The development of the Ganges as an international river was an extremely contingent one that hinged on an interconnected suite of events, actions, and decisions over a 500-year period.

The process began when a major change in river course transformed the Hooghly from the main distributary of the Ganges River into a seasonally-fed spill channel. Nearly two hundred years later, aggressive growth in British imperial trade motivated the establishment of a major port city on the banks of the Hooghly River. Although the river had long posed challenges to navigation, sedimentation became increasingly problematic throughout the 19th and early 20th centuries, prompting a number of proposals to ensure the continued functioning of the river and port. Finally, colonial administration of Bengal during the early 1900s contributed to the communalization of social conflicts and the

establishment of political parties organized by religion, parties that would later vote for the partition of the province. It was this complex physical and social landscape that Radcliffe encountered in July 1947 and which ultimately set a new course for the Ganges as an international river.

The river-border complex approach reveals that the Ganges is not just socially and politically constructed as an international river, but that the Ganges River and Indo-Bangladeshi border cannot be adequately understood in isolation of one another. Indeed, they are co-constitutive. The river figured prominently in the original delineation of the border, and because it comprises 129 km of the border itself, it continues to structure the border's form and function. In turn, the river is understood and managed as an international watercourse through the enactment of the border and subsequent claims in Pakistan (and later Bangladesh) to a share of the water. Where prevailing scholarship treats international rivers as *fait accompli*, the river-border complex makes explicit their social construction and processual nature, thus providing an analytical tool that "subverts the discursive practices of conventional politics, calling into question all the silences and taken-for-granted constructions on which they are based" (Dalby 1991:269).

In the following chapter, I move beyond the construction of the Ganges River and Indo-Bangladeshi border to examine how these features are performed and articulate with each other. Specifically, I examine non-water flows within the framework of the river-border complex to argue that many flows along the river are mediated by the discretionary function of the border and that such bordering of flows underpins upstream-downstream dynamics in the region.

Chapter 3 – Border-Mediated Flows and Uneven Riparian Dynamics

The Ganges River is known as many things – large, sacred, polluted – but few readers would likely describe it as dry. Yet this is precisely how a 45-year old farmer in western Bangladesh portrayed the river when I inquired about the water issues he faces in his work: “The Padma [Ganges] River...has become dry now. India is holding back the river water. If they do not share the water, Bangladesh will become a desert.”²⁷

India is also known as many things – large, populous, polluted, a developing country struggling to overcome pervasive poverty and corruption. As such, many readers would fail to recognize it as being particularly powerful. However, from the perspective of a 42-year old Bangladeshi farmer, India is quite powerful indeed: “Bangladesh is a small country, and [India] is more powerful than our country. If they (Indians) want [to release water], they will, if they do not want, they will not....India is holding back the fresh water.”²⁸

As my informants’ statements indicate, Bangladeshis’ perceptions of their rivers and of India are deeply intertwined. I heard many more stories attributing Bangladesh’s water woes to India while interviewing fishermen, boatmen and other farmers in Bangladesh, as well as during meetings with federal resource managers, community activists, and researchers in Dhaka. These oral accounts echoed others that I had encountered in print. To be sure, reports of water dispossession by India pervade popular media (*e.g.* Haque 2014, Khan 2014, Uddin 2014) and academic publications (*e.g.* Rahman *et al.* 2000, Adel 2001, Mirza and Sarker 2005, Shahid and Behrawan 2008).

²⁷ Interview conducted on 17 April 2014 with a farmer in Rajshahi, Bangladesh.

²⁸ Interview conducted on 29 March 2014 with a farmer in northern Khulna, Bangladesh.

On first glance, Bangladeshis' lack of access to transboundary river water is a natural outcome of the country's downstream geographical position *vis-à-vis* India. However, this chapter argues that riparian position does not necessarily indicate a disempowered situation. While these two things—geography and power—are often conflated in discussions of Bangladeshi water woes, in fact both the perception and the reality of Bangladeshi water deprivation are outcomes of particular discursive practices and border control strategies.

This chapter employs the idea of the river-border complex (that I introduced in Chapter 1 and developed in Chapter 2) to examine how asymmetries in international hydropolitics are [re]produced in South Asia. It opens with a discussion of the strengths and weaknesses of international water law in addressing riparian power imbalances. I then show how the concepts of hydro-hegemony and the hydrosocial cycle, while compelling, are insufficient for the specific purposes of this chapter. As their names suggest, these analytic concepts focus attention on water, but rivers are more than water and the governance of transboundary rivers entails exerting control over more than water as a physical substance.

Transboundary water literatures understandably focus almost exclusively on water, but pollution, shipping traffic, fish, sediments, and other river-based flows also crucially influence upstream-downstream relations. I therefore make a case for analyzing such *non-water flows* as instrumental factors in structuring riparian relations, and then proceed to trace a subset of non-water flows along the lower reaches of the Ganges River system. The chapter concludes with the argument that the Indo-Bangladeshi border mediates both water and non-water flows to reinforce power disparities between the two

countries. In this chapter, I disaggregate Bangladesh's physical position from its political position and offer a novel approach to understanding uneven riparian dynamics that combines border studies, critical water geography, and identity politics. In so doing, this work responds to the "urgent need...to theorize and empirically substantiate the processes through which particular socio-hydrological configurations become produced that generate inequitable socio-hydrological conditions" (Swyngedouw 2009:57).²⁹ The analysis focuses on India and Bangladesh but provides an example of how to denaturalize the apparent inevitability of uneven upstream-downstream dynamics elsewhere (*e.g.* US-Mexico, China-Vietnam).

The geopolitics of being downstream

The geopolitical landscape of South Asia seems ready-made for asymmetrical control over transboundary water resources. After all, Bangladesh is downstream of all 57 rivers that flow across its border, and 54 of these emanate from India, which is unquestionably the dominant economic and military presence in the region. Known among its denizens as the "Land of Rivers," riparian and political identities collide and coalesce in Bangladesh, producing particular understandings of its water crises as outcomes of its downstream position. As *The Daily Star*, a major Dhaka newspaper, editorialized in March 2014: "...Bangladesh's people have remained deprived for decades of a fair share of water, with upper riparian countries unilaterally withdrawing at

²⁹Although Swyngedouw's provocation is now several years old, it has primarily animated scholarship concerned with water governance in urban (*e.g.* Cousins and Newell 2015, Finewood and Holifield 2015, Jensen et al. 2015) and other domestic contexts (*e.g.* Bisung *et al.* 2014, Wooden 2014). Swyngedouw's call for engagement with the relationship between socio-hydrological configurations and uneven socio-hydrological conditions is, I argue, ideally suited for yet absent from examinations of transboundary water problems.

least 50 percent water [sic] from international trans-boundary rivers” (The Daily Star 2014b:16). That Bangladesh is impotent as a downstream riparian to resolve its water problems is a deeply held and widespread belief, an example of what geographer Majed Akhter (*in review*) describes as “imaginative geographies of downstream,” that powerfully structures interpretations of the causes of water crises in Bangladesh, as well as perceptions of available remedies (*e.g.* cooperation with India, see Chapter 3). While important and tangible differences exist between India and Bangladesh (*e.g.* India is eight times more populous and 22 times larger than Bangladesh and has a military budget that exceeds Bangladesh’s by 30 times; Thomas 2012), the hasty elision of political and riparian positions in Bangladesh is suspect.

Although there are inherent hydrological advantages to occupying upstream territory (whereby upstream water users have the first opportunity to capture and use the resource), upstream-downstream dynamics are not determined by geography alone. In analyzing river development projects in the Indus River Basin, Akhter observes that upstream and downstream are also socially and politically enacted positions:

“‘Downstream’ is not only a ‘natural’ matter of topographical difference between controlling regions at higher elevations and vulnerable regions at lower elevations. Downstream regions also become downstream through the virulent contestation and opposition of infrastructure projects by regional elites.” (Akhter 2013:11)

The presupposition of riparian imbalance in favor of the upstream is also called into question in cases where strong downstream countries influence or dictate the apportioning of river flows (*e.g.* pre-Arab Spring Egypt and Ethiopia, United States and Canada). Restated, “downstream” represents a combination of a geographical relationship to a watercourse and socio-political relationships to other riparians, rather than simply signifying a Cartesian fact. If “downstream” is not just a matter of location along a water

channel, then how have people in Bangladesh come to understand themselves as downstream? Furthermore, if they imagine themselves downstream of the 57 rivers that flow across their border, is it the water in these rivers that structures their imagination?

Upstream and downstream flows

A host of topographical and hydro-climatological parameters such as grade, precipitation patterns, and bed substrate give rise to the spectacular diversity of river types that we see around the world. In spite of such diversifying factors, rivers are uniformly subject to gravity, flowing inexorably from higher elevations to lower ones. This basic principle of rivers, in turn, makes location along a watercourse vitally important, underpinning fundamental issues of water access, rights, claims, and use. Stated plainly, there are advantages and disadvantages built directly into the landscape whereby upstream users have first dibs to use, extract, impound, or contaminate water and externalize the negative effects of such practices onto downstream users – those who are inescapably positioned at the receiving end of all the accumulated uses of the river, benign or otherwise (see Frey and Naff 1985, Dinar 2008).

Because rivers are not only valued for the water that they convey, this inherent asymmetry may be tempered by the ability of downstream riparians to regulate commercial traffic along a navigable channel (a pivotal concern along the Rhine River, for example) or to harvest or impede anadromous fish migrating inland to freshwater spawning grounds (*e.g.* Columbia River salmon). Moreover, not all upstream practices are detrimental to downstream polities. Downstream benefits may accrue, for instance, from upstream structures that mitigate seasonal fluctuations in water flow or from

upstream flow data that can be incorporated into flood forecasting systems.³⁰ However, the balance of power has tended to lean in favor of upstream riparians who hold monopoly control of the upper reaches of a river or watershed, despite the fact that harm can “flow both ways” (Turton 1999, Uprety and Salman 2011, McIntyre 2014). Thus, “symmetry between the actors will only exist as far as the hydrological asymmetry between the actors is balanced out by *other factors*” (Haftendorn 2000 quoted in Dinar 2008:46–47, emphasis added).

While physical geography structures social relationships along an upstream-downstream axis, there does exist a multitude of “other factors” that can either reinforce or diminish this skewed arrangement. The relative political, economic, and military strength of co-riparians figures prominently in this calculus, whereby strong-upstream/weak-downstream parties reify riparian power asymmetries (*e.g.* South Africa-Namibia *vis à vis* the Orange River) and weak-upstream/strong-downstream parties attenuate the inherent hydrological imbalance (*e.g.* Nepal-India *vis à vis* the Mahakali/Sharda River; Dinar 2008, Kistin-Keller 2012, Hill 2013). Disputes arising out of asymmetrical riparian relationships between states are predominantly addressed through recourse to international watercourse law, where a putative parity exists between riparian states and their respective claims to water resources (Zeitoun and Allan 2008, Zawahri and Mitchell 2011, Wouters 2013, McIntyre 2014).

International water law

Legal theories in international water law comprise a spectrum ranging from absolute territorial sovereignty to absolute territorial integrity. *Absolute territorial*

³⁰ In some cases, rivers cross a national border more than once, which often improves the bargaining power of a downstream riparian.

sovereignty confers to a state complete freedom to use the stretch of an international watercourse that lies within its territory regardless of the harmful consequences that might befall its co-riparians. Although some states have attempted to assume this position (e.g. Chile – Rio Lauca), the principle has never been enacted and is in fact widely repudiated. At the other extreme, *absolute territorial integrity* maintains that upstream states may not engage in any activity that would alter natural water flows into a downstream state, effectively giving the downstream state veto power over any activities that the upstream state may wish to pursue. Although rarely implemented, Pakistan attempted to invoke this theory in negotiations with India over the Indus Rivers, and Egypt has exercised exceptional control over the Nile River for several decades. With rare exception, the intermediate principle of *limited territorial sovereignty* is the most commonly enacted theory of rights and obligations (LeMarquand 1976, Kliot *et al.* 2001, McCaffrey 2007). Whereas absolute territorial sovereignty and absolute territorial integrity skew the privileges of water access and use in favor of the upstream or downstream riparian, respectively, the theory of limited territorial sovereignty maintains that all riparians have an equal right to use a watercourse (Goldenman 1990, McCaffrey 2007).

The popularity of limited territorial sovereignty can be measured in its many manifestations. The theory has been codified in universal legal guidelines and instruments, including the 1966 Helsinki Rules on the Uses of the Waters of International Rivers, the 1992 UN Convention on the Protection and Use of Transboundary and International Lakes, the 1997 UN Convention on the Law of Non-Navigational Uses of International Watercourses, and the 2004 Berlin Rules on Water Resources, as well as

hundreds of bilateral and multilateral treaties (see for example UN Water 2008, Wouters 2013). Its broad appeal lies in its reasonableness, maintaining that self-interested use of a river is defensible only insofar as it does not impart significant harm upon other states (LeMarquand 1976, Kliot *et al.* 2001). Moreover, it "is inherently flexible and quite capable of taking account of a very wide range of needs and interests of riparian states, including potential and future uses and the need to protect the entire watercourse ecosystem" (McIntyre 2014:49).

Inter-state cooperation is widely touted as the optimal approach to preventing conflict and generating shared benefits, thereby leveling the bargaining field skewed by riparian position and political economic strength (*e.g.* Sadoff and Grey 2002, UN Water 2008, Subramanian *et al.* 2012, Wouters 2013, Al-Faraj and Scholz 2014, Pangare and Nishat 2014, Pohl *et al.* 2014). Cooperation may take many forms, including high-level negotiations, joint river management institutions, data sharing, and monitoring, but among its various manifestations, formal legal agreements (treaties and their equivalents) are especially esteemed.

In an analysis of conflict and cooperation in transboundary river basins, De Stephano and her colleagues (2010) employed a 15-point "water event intensity scale" that ranged from declared war (-7) to unification into a single nation (+7) (Table 3.1). So prized are treaties in this rubric that the scale measures the positive intensity of international freshwater treaties (+6) as secondary only to voluntary unification of two states over the issue of water (De Stephano *et al.* 2010, see also Sadoff and Grey 2005:424).

Table 3.1 Water event intensity scale modified from the Basins at Risk (BAR) project. Reproduced from De Stephano *et al.* (2010:873).

BAR value	BAR event description
-7	Formal declaration of war
-6	Extensive war acts causing deaths, dislocation or high strategic cost
-5	Small scale military acts
-4	Political-military hostile actions
-3	Diplomatic-economic hostile actions
-2	Strong verbal expressions displaying hostility in interaction
-1	Mild verbal expressions displaying discord in interaction
0	Neutral or non-significant acts for the inter-nation situation
1	Minor official exchanges, talks or policy expressions, mild verbal support
2	Official verbal support of goals, values, or regime
3	Cultural or scientific agreement or support (nonstrategic)
4	Non-military economic, technological or industrial agreement
5	Military economic or strategic support
6	International freshwater treaty; major strategic alliance (regional or international)
7	Voluntary unification into one nation

De Stephano *et al.* (2010) scored hundreds of inter-state interactions over transboundary water resources over an 8-year period. Plotting the frequency of scores, they found that positively-scored events significantly outweighed negative ones, thus corroborating an earlier finding that riparian states are far more likely to engage in cooperative rather than conflictive behavior (De Stephano *et al.* 2010). By evaluating trends in hydropolitical relations over time and enumerating cooperative events, the authors highlight two functions of treaties; treaties may serve as a *method* for resolving conflicts and as an *indicator* that a conflict has been resolved.

De Stephano and her colleagues make a reasonable case, but their research problematically reinforces understandings of treaties as solutions. But not all treaties are viable (McCaffrey 2007), and legal pacts do not always serve the needs of signatories. Scholars who examine the power relations between riparian states (not just the formal legal interactions between them) suggest that treaties do not necessarily resolve conflict or indicate its cessation. Conflict can be ongoing, and in extreme cases treaties can exacerbate the very inequitable dynamics they were ostensibly intended to ameliorate.

Hydro-hegemony

The fact that over 400 international water treaties have been ratified during the past 200 years has been used to dispel predictions of impending water wars (Wolf 1998, Postel and Wolf 2001, Swain 2001, Barnaby 2009). However, while “[t]reaties are the major instrument of cooperation in international relations...” (Malanczuk 1997:37), they do not necessarily dampen or balance skewed power dynamics or uneven control of water between co-riparians. For example, one Bangladeshi legal scholar complained, “The law is silent against the powerful states. They will bypass the law, interpret or manipulate the law” (interview at the University of Dhaka, 1 May 2014).

A growing body of research indicates that, while full of positive intent, international water law often fails in practice to yield equitable outcomes and may actually perpetuate power imbalances between co-riparians (Lowi 1992, Rieu-Clarke 2010, Kistin-Keller 2012, Zeitoun *et al.* 2013). Rather than unequivocally embodying cooperative water governance or resolving resource conflicts (as intimated in the study detailed above), legal instruments themselves may be used to exploit existing power asymmetries for control over transboundary water resources (Warner *et al.* 2013). For example, hegemonic states (either upstream or downstream) may structure treaties according to their preferences and coerce weaker states into complying with unequal terms of agreement (Zeitoun and Warner 2006).³¹ Lowi writes,

³¹I follow Zeitoun and Warner’s (2006:437) interpretation of a hegemon as a group “whose superior power position effectively discourages any violent resistance against the [hegemon’s preferred] order.” Crucially, compliance with the hegemonic order is achieved not through force or threats of violence but through normative and ideological mechanisms that create, respectively, a sense of self-interest to comply and naturalized beliefs about the “way things are” (Zeitoun and Warner 2006).

“In all cases, outcomes reflect the distribution of power. Cooperation is not achieved unless the dominant power in the basin accepts it, or has been induced to do so by an external power. Moreover, the hegemon will take the lead in establishing a regime or accept regime change, and will enforce compliance to the regime, only if it serves to gain as a result.” (Lowi 1993:203)

The establishment and enforcement of the regime usually entails a “soft power” approach whereby non-hegemonic states are brought into line with the preferences of the hegemon using discursive power (persuasion, incentives, pressure) rather than physical force (Zeitoun *et al.* 2010, Warner *et al.* 2013), which could invite negative attention onto the hegemon and perhaps interference from non-regional actors within the international community.

This notion of “hydro-hegemony” has made a crucial intervention by reconceptualizing international legal agreements not only as tools for resolving competing claims and demands for water, but also as one of several devices used by hegemons to control water resources (Turton 1999, Rieu-Clarke 2010, see also Kistin-Keller 2012). Zeitoun and Warner also hint at the mutually enhancing relationship between powerful states and the benefits that flow to them. Accordingly, control over water enables hydro-hegemony, whereby “hegemony at the river basin level [is] *achieved through* water resource control strategies such as resource capture, integration and containment;” conversely, hydro-hegemony enables control over water, whereby “power relations between riparians *are the prime determinants of* the degree of control over water resources that each riparian attains” (Zeitoun and Warner 2006: 435, 436, emphasis added).

Borders and the hydrosocial cycle

Despite such strides in elucidating the power dynamics at play in international hydropolitics, engagement with critical border theory and emerging research on water as a hydrosocial phenomenon remains underdeveloped in the transboundary water governance literature. As I established in the previous chapter, borders and bordering processes (*e.g.* fencing, patrols, intimidation) operate silently where transboundary rivers are concerned, but they have significant implications for the structure and management of such watercourses. Moreover, water is increasingly understood dialectically as a social product that in turn “reconfigures social relations” (Linton and Budds 2014:171), which certainly includes upstream-downstream relations. The so-called hydrosocial cycle:

“represents the process by which alteration or manipulation of water flows and quality affect social relations and structure, which in turn affect further alteration or manipulation of water...The cyclical aspect of this process is suggested by showing that once in place, or through being put in place, the production of water then exerts its own political and social effects.” (Linton and Budds 2014:175)

In fact, the dialectical relationship between water and social power, suggested above in the concept of hydro-hegemony, lies at the center of the hydrosocial cycle, which regards water and social power “as hybrids rather than pre-given entities” (Linton and Budds 2014:173). Incorporating border studies and the hydrosocial cycle into analyses of transboundary water governance thus opens up new lines of productive inquiry into how rivers shape and are shaped by social power. International rivers are not only political constructs (Chapter 2) but, consistent with the hydrosocial cycle, also represent social products that “reconfigure social relations.” As hydrosocial entities, what social relations do international rivers engender? How do borders reify or disrupt the upstream-downstream organization of river flows?

Non-water flows

To fully answer these questions, we must examine rivers as both water flows and *non-water flows*. The specific composition of non-water flows that travel along a river depend on the physical and social features particular to that watercourse but may include tangible entities (fish, sediment, people, pollution) and intangible entities (capital, information, energy). Like all rivers, the Ganges River is replete with non-water flows. Abundant kinetic energy has long made the river a target for hydropower development, though the risk of devastating social and environmental impacts has limited hydropower production to a fraction of its estimated 20,700 MW potential (NIH 2015). Limited development of hydroelectric generation has not been mirrored in restrained development along the river's banks, however. Despite its sacred status, the river is used as a receptacle for the daily discharge of 500 million liters of industrial waste (including chromium, lead, mercury and chlorinated compounds), as well as over 3.5 billion liters of untreated sewage in India alone (Chaudary 2015). This inhospitable environment notwithstanding, diverse fauna inhabit the waterway, including 140 fish species, 90 amphibian species, and 5 species of freshwater cetaceans. Together with the Brahmaputra, the river has the highest sediment load of any river basin in the world, transporting up to two billion tons of sediment per year (Brammer 1990, Hossain and Sakai 2008). Kinetic energy, pollution, wildlife and sediment comprise just a subset of the non-water flows of the Ganges river network, each of which is significant for the socio-ecology of the region.

In presenting the river-border complex, I made an argument for understanding international rivers as a composite of both hydrological and bordering processes. To do

so is to be attentive to the ways that the border operates within and upon the river, to acknowledge that the border acts on all flows along the river., even in cases where the river is not coterminous with the border. This mode of examination is consistent with two key observations from border studies. The first is that state power is consolidated in part through the control of flows along and across borders: “No longer strictly a matter of disciplinary practices that stop, prohibit, enclose, delimit or proscribe, *the work of the contemporary border is conducted in and through movement itself*” (Amoore 2011:64, emphasis added). While articulated in the context of human movement, I suggest that this argument applies equally to the policing of non-human movements. A second and related point is that borders, while used to regulate mobility, are themselves increasingly mobile (Mountz 2011). For instance, by documenting how Australia and Britain’s borders shift in time and space, Weber’s research (2006:24) highlights “...the mobile nature of border controls which transcend the constraints of physical borders and operate both outside and within them.” From this foundation, I posit that the Indo-Bangladeshi border becomes manifest at and along the Ganges River through the regulation of water and non-water flows, contributing to a downstream subjectivity in Bangladesh, or in other words, a pervasive sense of helplessness in the face of upstream activities in India.

Downstream subjectivity

The sense of disempowerment expressed in the quotes at the start of this chapter epitomize what I refer to as Bangladesh’s downstream subjectivity. It is an identity that conflates social power with riparian position, whereby occupying the downstream region is linked with a perceived inability to influence the undesirable downstream effects of upstream activities. It represents the imaginary that one is *subject to* the whims and

vagaries of upstream riparian(s). Drawing on Judith Butler, Weedon (2004:7) describes subjectivity as internalized performance:

“‘Identity is performatively constituted by the very “expressions” that are said to be its results’ (Butler 1990)...As individuals inserted within specific discourses, we repeatedly perform modes of subjectivity and identity until these are experienced as if they were second nature. Where they are successfully internalized, they become part of lived subjectivity.”

Applying this logic to inter-state riparian dynamics, a downstream subjectivity is created and reinforced each time someone describes Bangladesh in terms of its helplessness in the face of India’s use of transboundary rivers. The cumulative effect of individual experiences, perceptions, and voices in Bangladesh combine to inform a collective political identity, one shaped not only by India’s control of water flows but also the bordering of non-water river flows. We have seen that non-water flows abound in the Ganges system. Here I will elaborate on just two such flows to illustrate that the power imbalance between India and Bangladesh is not simply an outcome of spatial configuration or a relict of Partition (whereby India was awarded vastly larger and more developed territory), but is reproduced in part through the border-mediated flows of hydrological information and people.

Non-human flows

As with any river, the Ganges is a dynamic watercourse that can be characterized by a multitude of parameters. Fed by tributaries originating in Nepal, the Ganges flows for 2240km across India before culminating its overland journey in Bangladesh. During its course to the Bay of Bengal, the river is subject to innumerable withdrawals, diversions, and additions. For instance, the river’s water is diverted along more than 30,000 km of major and minor canals to irrigate approximately 4.1 million ha of land in

the Indian states of Uttarakhand, Uttar Pradesh and Bihar (FAO 2011). The channel receives substantial volumes of industrial and household waste, but as an object of Hindu worship, it also absorbs annually the ashes and bodies of hundreds of thousands of people seeking to end the cycle of rebirth. Additionally, the Ganges receives seasonal inputs of glacial meltwater and monsoon precipitation, with the latter making an important contribution to annual flooding in the lower reaches of the river (Mirza 2011). All of these inputs and withdrawals constitute tangible modifications that are monitored and recorded (albeit inconsistently, see Nishat and Faisal 2000, Sadoff *et al.* 2013, Price 2014), thus constituting a valuable flow of information along the watercourse.

Alterations to the river's volume and composition can have significant impacts on the quantity and quality of water that reaches lower riparians, which is why formal data sharing mechanisms are common and prominent features of river basin organizations and legal agreements (Sadoff *et al.* 2013, Wouters 2013). Indeed, the 1996 Ganges water sharing treaty between India and Bangladesh mandates that a bilateral Joint Committee record river flow volumes on either side of the border. Furthermore, Article-VI of the agreement states that the "Joint Committee shall submit to the two Governments all data collected by it and shall also submit a yearly report to both the Governments" (GoB 1996). Data sharing in reality, however, is a vastly more complicated proposition.

First, hydrological data shared between the two governments are exempt from public access, thereby preventing any non-state actors (*e.g.* researchers, civil society, media) from evaluating the strengths and weaknesses of joint river governance (Chowdhury 2014, Surie and Prasai 2015). Secondly, India is only legally bound to disclose information about river volume at a single point on the Ganges (Farakka

Barrage), thus enabling India to withhold data about the myriad flows in the remainder of the basin (described above), as well as any information about the other 53 transboundary rivers that it shares with Bangladesh. Expressed another way:

“Bangladesh cannot even ask what amount of water is being shared. After flowing through West Bengal and Bihar, whatever amount is left, (the residual flow) enters Bangladesh. Then India says that it is distributed honestly.” (Professor Asif Nazrul quoted in Chowdhury 2014:7)

Indeed, retention of river data is paradigmatic in India where hydrological information for the Himalayan rivers is regarded as a national security issue, creating what some have characterized as a regime of secrecy (Price 2014, Surie 2014). This practice is consistent with the observation that “[g]lobal cross-border flows are “not only *endured*, but are also *facilitated*, by states in order to facilitate their interests” (Rudolph 2005 quoted in Wonders 2007:33).

India’s suppression of hydrological data contributes to conspiracy theories and distrust among its neighbors (Price 2014), and serves as another form of deprivation. For instance one reporter noted, “Bangladesh and India share 54 cross-boundary rivers but Dhaka hardly has any data from the other country on these rivers” (Zaman 2014). Another Bangladeshi commenter similarly observed, “We hardly possess credible data on how much water Indians withdraw unilaterally from the common rivers” (Uddin 2014:11). Perceptions of India’s “unilateral” water use are thus tied to its institutionalized lack of transparency, aggravating concerns that Bangladesh is neither adequately informed nor consulted about the use of rivers that inevitably affect it (Surie and Prasai 2015). In summary, the Indo-Bangladeshi border mediates the flow of river data, such that valuable information is intercepted and retained within India, thereby accentuating upstream-downstream disparities.

Human flows

In Chapter 2, I described how Bengal was ostensibly partitioned along communal lines, whereby the Boundary Commission used the 1941 census map to demarcate majority areas of Muslims and non-Muslims. However, the neatly shaded areas of pink, green and yellow depicted on the 1941 census map (Figure 2.1) belied a complexity on the ground in which religious majorities in many cases were established by a narrow margin (*e.g.* Khulna, Figure 3.1). Rather than comprising internally coherent socio-political units, districts were heterogeneous and interdependent, connected by social and economic ties (see Cons and Sanyal 2013). Partition therefore was experienced not as a natural division of already distinct groups but as a violent and bewildering rupture of cultural, political, economic and kin relations (Chatterji 1999, van Schendel 2005).

In the years following Partition, several million people relocated from one side of Bengal to the other (Tan 2007). However, given the substantial number of Hindus who remained in East Bengal and the many Muslims who stayed in West Bengal, Partition was an incomplete division that left important connections across the border (religion, culture, identification, kinship) intact (Feldman 2003, Cons and Sanyal 2013). Livelihood strategies were among the most difficult facets of life to reconcile with the new borders, as “[a]ll three new states [India, Pakistan, Burma] laying claim to the Bengal borderland developed economic policies that sought to enclose economic relations within their national territories” (van Schendel 2005:147). As a result, the routes and channels that had long connected jute producers with Calcutta markets, peasant homesteads with sharecroppers’ plots, creditors with debtors, tenants with landlords, and fishermen with fishing grounds were abruptly blocked. Moreover, previously quotidian movements

between such groups and sites were criminalized, so that anyone who was caught transiting the new border was subject to detention, harassment, beatings, confiscated property, and sometimes death (Chatterji 1999).

In the case of Punjab, Akhter (2015) argues that Partition was not a single event but is an ongoing exercise in state-making facilitated by hydraulic development.³² There are valuable parallels to be drawn with Bengal where the act of bordering East Pakistan was not accomplished with the Radcliffe Line in 1947, but has been a cornerstone in India's efforts to curb flows of Bengali immigrants, Hindu and Muslim alike, since the turn of the millennium. In 1986, the central Indian government announced plans to construct a fence along the Bangladesh border, but the idea did not gain traction with the provincial leadership of West Bengal until the rise of the 'global war on terror' (Jones 2012). In this recent bordering campaign (ostensibly intended to repress a burgeoning culture of terrorism), East Bengalis have not only been discursively and legislatively constructed as smugglers and illegal immigrants, but also as "irrational, pre-modern, violent, and potentially evil terrorists" (Jones 2012:72).

³² Here, Akhter extends the point that Vazira Fazila-Yacoobali Zamindar makes in her 2010 book "The Long Partition and the Making of Modern South Asia" that the formation of India and Pakistan entailed a protracted process of creating national identities and imposing them onto new territorial states.

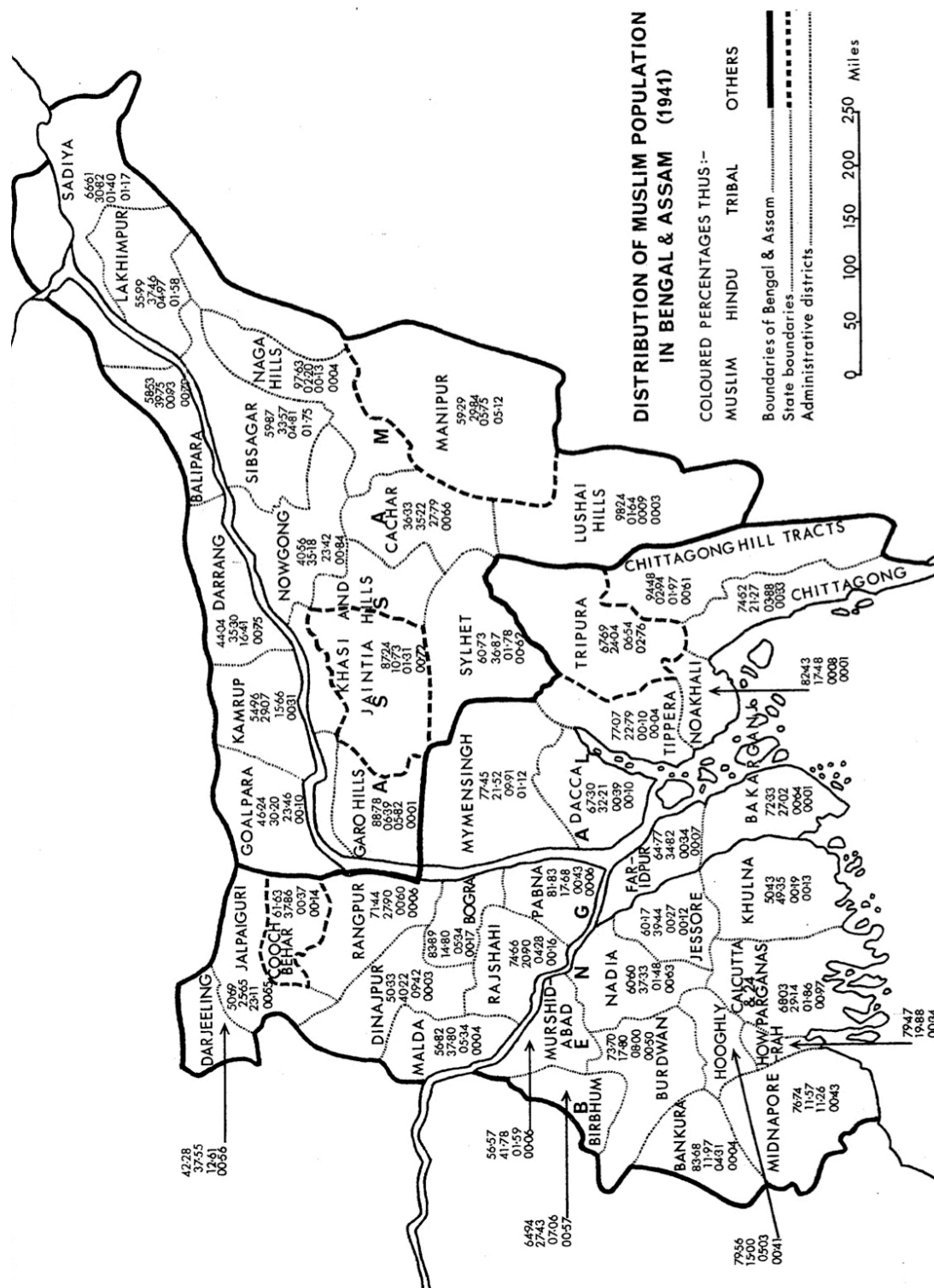


Figure 3.1 District map of religious demographics in Bengal and Assam per the 1941 census. Note: numbers are listed in numerical order and do not correlate with a consistent order of religions. Source: BLIO 1969

Negative characterizations of Bangladeshis allow the Indian Border Security Force (BSF) to operate with impunity. The BSF's shoot-on-sight policy has resulted in the deaths of several hundred civilians from both countries, many of whom were caught trying to transport cattle from predominantly Hindu India (where beef consumption is strongly discouraged and cow slaughter has been banned in several states) to Muslim-majority Bangladesh (where cows are prized for their meat and hides; Sattar 2012, Ghosh 2014, Ghosh 2015). Despite clamorous protest and several highly publicized deaths, including that of a 15-year old girl caught in 2011 crossing into Bangladesh to get married, the extrajudicial killing of unarmed civilians persists (Sattar 2012, Choudhury 2014). India pledged to implement "non-lethal strategies" at its border with Bangladesh as an act of goodwill and to assuage protesters, but it has recently emerged that such alternatives were never enacted; a high-ranking Indian government official was quoted in April 2015 saying, "There is nothing like a non-lethal strategy. What is paramount is that our border needs to be protected" (Singh 2015).

Against this backdrop, residents of Rajshahi reported that their occupational fishing and boating activities along the river are significantly circumscribed by their fears of abduction, detention, and brutality by the BSF. A Hindu fisherman said to me, "If we go closer to the Indian border, BSF will catch us and send us to jail. That's why we remain cautious not to cross the border."³³ This type of self-governance attends what Isin calls the "neurotic citizen," who "...is incited to make social and cultural investments to eliminate various dangers by calibrating its conduct on the basis of anxieties and insecurities rather than rationalities" (Isin 2004 quoted in Salter 2008:373). However,

³³ Interview conducted on 16 April 2014 with a fisherman in Rajshahi, Bangladesh.

even when one is willing to sacrifice livelihood opportunities, conscious efforts to avoid particular fishing grounds or boat launches are challenging because the river (and by extension the border, in this case) can dramatically and rapidly change course. As another fisherman explained, “The river is changing its course frequently. The river is swinging from India to Bangladesh and Bangladesh to India. When the river shifts to India, fishermen have to go near the border to catch fish. Then, the BSF abducts Bangladeshi fishermen.”³⁴

India has recently announced a new border control technology that should eliminate such ambiguities. Since 2003, the Indian government has been constructing an 8-ft tall, double-walled barbed wire fence along 3400 km of its border with Bangladesh. Although the border fence, when complete, will constitute the longest barrier in the world, the Indian government is dissatisfied with the fact that the land barrier leaves 930km of riverine border unfenced (Business Standard 2014, Z News 2015). Unfenced does not mean defenseless; the BSF patrols rivers and other waterbodies with speed boats, floating outposts, and a proprietary “laser wall” technology that sounds alarms when a web of laser beams is disturbed (The Hindu 2015, Z News 2015). However, even this degree of futuristic border security has been deemed insufficient, prompting the newly installed Modi government to announce in August 2014 that the Indian government will adopt a floating fence—designed in Singapore and known as the “skid marine hedge model”—to insulate riverine areas from incidental or intentional incursions of Bangladeshis (Gupta 2014).

³⁴ Interview conducted on 16 April 2014 with a 40-year old fisherman in Rajshahi.

Selective filtering at and along the Indo-Bangladeshi border corroborates Wonders' (2006:64) observation that "[a]lthough a more global world has enormous potential for reducing inequality, in many wealthy countries, national borders are rapidly being constituted to function as a hard metal sieve, sifting and sorting people in ways that (re)produce global stratification."³⁵ In the case of the Ganges River, the exclusion of certain people (Bangladeshis) and the criminalization of people and their everyday activities generate and perpetuate stratification between upstream and downstream riparians.

The gravity of the situation

This chapter emerged from an attempt to answer four questions, to which I now return. I wanted to know how people in Bangladesh have come to understand themselves as "downstream" and whether or not it is only water that structures their downstream imagination. I also sought to determine what social relations international rivers engender and how borders inform the upstream-downstream organization of river flows. Following Tiwary's (2006:1685) assertion that "[t]he advantages and disabilities which emanate from the riparian structure are neither permanent nor absolute or non-negotiable," I developed the position that the upstream-downstream relationship between India and Bangladesh is shaped not only by the spatial orientation of the two states, but is also a powerful imaginary that is both materially produced and discursively reinforced through border mechanisms and perceptions of vulnerability to India's hydrological engagements.

³⁵ Globalization is popularly understood in terms of accelerated flows in an increasingly 'borderless world,' but since the 1990s, critical scholars have been complicating 'borderless' and analogous 'flat world' ontologies, arguing instead for greater cognizance of "the complexity and flexibility of states' infrastructural power and its territorializing thrust" (O'Dowd 2010:1032; see also Newman and Paasi 1998, Brenner 1999, Paasi 2009).

In the absence of infrastructure, water flows downhill. However, as evidenced by the cases of the United States, India, and Egypt, a polity that is downstream geographically is not necessarily downstream psychologically. The mapping of a state of powerlessness onto the lower riparian position, as has been the case in Bangladesh, marks a particular subjectivity in which Bangladeshis perform their “downstreamness” through personal and official narratives of being at the whim of India’s “unilateral” use of common rivers. Exemplified in statements such as, “Indian barrages, canals, reservoirs and national water grids are slowly strangling Bangladesh” (Ahmed 2014:2), the downstream subjectivity becomes manifest through complaints, blame, distrust and pleas directed upstream at India.

I have also argued that uneven riparian dynamics do not result only from hegemonic uses of transboundary water but also through the bordering of non-water flows. Non-water flows include both tangible and intangible entities such as fish, capital, people, information, and pollution. Once one trains herself to pay attention to non-water flows, it is easy to appreciate how important such flows are to the composition and use of rivers. However, non-water flows have received little to no treatment within transboundary water governance literatures that focus instead on the management of water and its various uses (hydropower, irrigation, navigation).

The analysis also drew on the river-border complex, which explicitly acknowledges that international rivers do not exist independently of borders. Weber (2006:24) suggests that “...borders are becoming malleable and fluid.” This is certainly true in South Asia where the Indo-Bangladeshi border does not constitute a fixed, passive

interface between countries but is effected at multiple points along the river, mediating both water and non-water flows throughout the Ganges system. As mentioned in Chapter 2, Farakka Barrage lies just upstream of the border, diverting critical dry season water supplies away from Bangladesh toward Kolkata. Moreover, hydrological data are collected at various points throughout the basin, but in an atmosphere where “transboundary water management and cooperation have been highly nationalistic, technocratic and zealously securitized” (Surie and Prasai 2015:2), such information is retained within India’s borders, much to the frustration of its riparian neighbors. Conversely, rhetoric about Bangladesh as an incubator for Muslim fundamentalists and potential terrorists has stimulated fresh investments in securing and militarizing the riverine portions of the border, thereby excluding millions of people from traditionally-held access to family members and economic opportunities. Thus, asymmetrical power relations between upstream and downstream states are reified through the bordering of non-water flows even as many non-water flows themselves (*e.g.* fish, salt, people, cargo) defy typical upstream-downstream dynamics.

In the foregoing account, I described how the Indo-Bangladeshi border functions with respect to two non-water flows along the Ganges River, thereby elaborating the river-border complex and revealing a long-established but hitherto unrecognized process “through which particular socio-hydrological configurations” (upstream-downstream power asymmetry) “become produced that generate inequitable socio-hydrological conditions” (Swyngedouw 2009:57). While identifying the role of the border on river flows is important for elucidating riparian dynamics in South Asia, there is more at stake than the reification of the asymmetrical upstream-downstream configuration between

India and Bangladesh. A crucial but yet unexamined result of the downstream subjectivity delineated above is that hydrological hazards and suboptimal conditions in Bangladesh are interpreted as outcomes of being downstream of India. Combined with the urging of a variety of actors within and outside of Bangladesh, this interpretation has compelled Bangladesh to seek recourse through inter-state cooperation with India. However, the evaluation that follows indicates that bilateral cooperation over the Ganges River has failed when it was expected to succeed, and succeeded when it was expected to fail.

Chapter 4 – Questioning Calls for Cooperation

On 22 May 2014, one hundred policy makers, government officials, and academics filed through the august halls of the United Nations (UN) office in Geneva to participate in a workshop entitled “Counting our gains: Identifying, assessing and communicating the benefits of transboundary water cooperation.” The UN Economic Commission for Europe (UNECE) convened the event to solicit commentary on a draft policy note for the 1992 UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes, which had opened for accession to all UN Member States in February 2013.³⁶ The workshop organizers observed that transboundary water cooperation is increasing, but some countries fail to cooperate with each other in part because of the “lack of recognition of the benefits of cooperation” (UNECE 2014:3; see also Sadoff and Grey 2002).

Various breakout sessions were scheduled for small-group consultation and brainstorming, but while participants were invited to openly share their experiences and lessons learned, the workshop conveners were explicit about what was and what was not suitable for discussion. During the opening remarks it was announced that “[t]he point of the workshop is not to discuss what we mean by transboundary water cooperation” (Demilecamps 2014). Instead, those in attendance were instructed to refer to the definition listed in the policy note, which stated, “In the context of this Policy Guidance Note, transboundary water cooperation is understood as cooperation between two or more countries sharing a transboundary water basin” (UNECE 2014:5). Effectively defining cooperation as cooperation does little to explain what countries are committing to when

³⁶ The framework is often referred to in shorthand as the Water Convention.

they engage in cooperation, nor does it clarify what costs or benefits might accrue to them from doing so. The question that this meeting raised for me—a question that is of pressing importance in South Asia—is this: “Just what is cooperation, anyway?”

This uncomplicated framing of cooperation at a high-level UN meeting stands in striking contrast to my own experiences in South Asia, which more closely resemble the following interaction:

“...on hearing the passionate plea for greater bi-lateral or multi-lateral cooperation over water data and projects made by a Bangladeshi representative at a recent water round-table—to temper the tragic consequences of drought and flood cycles—the Indian representative’s response was ‘but, we are cooperating.’” (Zeitoun and Mirumachi 2007:305)

This anecdote points to a significant disconnect between India and Bangladesh’s perceptions of cooperation. Such disparities are unlikely to be resolved by reference to circular definitions of cooperation (as provided in the UNECE Policy Note), but may be more fruitfully apprehended through consideration of the power relations between the two countries. Indeed, characterizing interactions between state actors according to the simplistic rubric of conflict or cooperation risks eliding subtler forms of interaction (*e.g.* coercion, intimidation, stalling) that can lead to inequitable or unfair outcomes in negotiations over water (see Chapter 3).

Recognizing cooperation as an ambiguous and contested concept raises several important questions. What is Bangladesh asking for when it seeks greater cooperation from India? How do we recognize cooperation when it occurs? What conflicts does cooperation resolve? Returning to the anecdote above, what role is India perceived to play in “the tragic consequences of drought and flood cycles” in Bangladesh? Is transboundary water cooperation the corrective to these problems?

Before turning to these questions, it will be helpful to revisit the hydropolitical context of South Asia. Bangladesh has 57 transboundary rivers, all of which originate outside its borders, and most of its domestic rivers are distributaries of those waterways (Chowdhury 2010). As such, when channels run dry or when their banks are breached, Bangladeshis often direct their attention to India (see Zaman 1993, Mirza 1997, Adel 2001, Brichieri-Colombi and Bradnock 2003, Dewan 2010, Feroze 2014). Indeed, a sense of vulnerability and helplessness to the “whims” of India pervades political and popular discourse (Chapter 3).³⁷ For instance, a former Bangladeshi member of the bilateral Joint Rivers Commission was quoted in April 2014 as saying that “...ups and downs of water flow has been happening [sic] *as per India’s whim*” (Siddique 2014:4, emphasis added). Analogous descriptions of India’s unilateral control over water similarly inscribe a downstream subjectivity on the Bangladeshi imagination: “Almost all of Bangladesh’s major rivers enter her territory via India. As the upper riparian country, India therefore holds over Bangladesh an enormous leverage, which she has been using to her advantage” (Islam 2010). A crucial result of this downstream subjectivity is that hydrological hazards and suboptimal conditions in Bangladesh are interpreted as outcomes of being downstream of India.

Compounding concerns expressed within Bangladesh, the Ganges-Brahmaputra-Meghna basin has been identified as being at critical risk of widespread food insecurity, loss of livelihoods, and human displacement, which in turn are attributed to population growth, climate change, and resource scarcity (Swain 1996, UNDP 2006, Malhotra 2010,

³⁷ The assumption that Bangladesh’s downstream position equates to vulnerability *vis à vis* India is reinforced by authors outside of the subcontinent, as well (*e.g.* Krug 1957, Ansink and Ruijs 2008).

Choudhury *et al.* 2012, Gosden 2014, GWP 2014). Rivers sit at the nexus of these threats; their myriad applications for hydropower, irrigation, commerce, industry, and ecosystems services (*e.g.* fisheries, conveyance of sediments and pollutants) make rivers inseparable from questions of economic development, land use, and energy and food production in South Asia. Competing uses, growing demand, and decreasing or inconsistent water supply thus become the basis for prescriptions for increased coordination and cooperation among user groups, both within and between states (*e.g.* Parua 2001, Chowdhury 2010, Uprety and Salman 2011, UN 2013, Wouters 2013).

In evaluating cooperation over the Ganges River, I draw again upon the idea of the river-border complex, which I have defined as the network of agents, events, and activities that interact to structure water use and resource access within transboundary river contexts. In the present analysis, I focus on the *event* of treaty ratification as a historical moment that has shaped water sharing since 1997. I also draw attention to the ongoing *activity* of treaty implementation to identify why and how grievances over the Ganges River have persisted in Bangladesh.

The chapter proceeds with a survey of the hydrological hazards faced in Bangladesh during periods of water excess (floods) and scarcity (drought). Using field-based interviews, news media, and academic publications, I show how the discursive linkage of hydrological hazards to upstream practices in India form the basis for additional demands for bilateral cooperation by both Bangladeshis and foreigners, despite a landmark treaty signed in 1996 to address Bangladesh's complaints. I analyze 18 years of hydrological data (12 years of which are classified and unpublished) to evaluate claims

that India has not been adhering to the agreement.³⁸ My analysis shows that India has been largely abiding by the terms of the treaty. However, this does not mean that the treaty has been an unmitigated success. While addressing some conflicts (no assurance of dry season flow to Bangladesh), it has also generated new ones (water diversions during the most critical period of the dry season).

Seasonal water variability

Southwestern Bangladesh, which comprises the terminal portion of the Ganges basin catchment, is an especially sensitive barometer of shifts in water supply (Figure 4.1). There, large tracts of *char* land, or river islands, can be submerged, eroded, or deposited on time scales ranging from days to years. With little to no alternative, landless people sacrifice terrestrial stability for the opportunity to grow crops and graze cattle on the fertile soil. Approximately 600,000 *char* dwellers eke out precarious livelihoods on these constantly shifting landforms, usually with limited access to education, health care, and communication (Sarker *et al.* 2003, Hofer and Messerli 2006).

Although *char* dwellers are particularly vulnerable to the vagaries of the river network, any resident in the Southwest Division of Khulna can attest to the promises and perils of the river flows. The degree to which a given water condition is considered beneficial or hazardous is determined by both timing and magnitude of water availability. Rainfall is highly seasonal, with 85–87% of annual precipitation occurring during the narrow five-month period (June–October) during and after the monsoon season (Rahman *et al.* 2000, Chowdhury 2010).

³⁸ The 18-year time frame of the hydrological analysis (1997–2014) corresponds to the active period of the ongoing water-sharing treaty.



Figure 4.1 Division map of Bangladesh. The Ganges River flows from India into west central Bangladesh at Rajshahi. The Ganges branches into several distributaries that supply the southwestern division of Khulna.

Source: http://www.nationsonline.org/oneworld/map/bangladesh_map.htm

The expectation of heavy rain during the wet season is captured in the concept of *borsha* (normal flooding), which is a welcome and much anticipated event that heralds the end of the long dry season (Paul 1984, Boyce 1990, Haque 1994, Hofer and Messerli 2006). *Borshakal* (flood season) is a period when fields are hydrated, nutrient-rich silts are deposited on land, fish ponds are replenished with water, aquifers are recharged, tidal rivers are freshened, navigation routes that withered during the dry season are reopened (Mirza *et al.* 2003, Paul 2003, Islam *et al.* 2010). In anticipation of the arrival of the flood waters, cultivators time and position the planting of flood-adapted, lowland rice varieties with the expected rains and heightened river flows (Hardin 1963, Paul 1984).

Rain and river flows that occur beyond typical conditions are known as *bonna*, which are characterized by significant deviations in duration, magnitude, timing, areal extent, and/or degree of inundation (Paul 1984, Mirza 2002, Hofer and Messerli 2006).³⁹ This range of factors means that the proximal causes of extreme floods vary with each event and therefore complicate efforts to mitigate their deleterious impacts (Hofer and Messerli 2006). While the development of each *bonna* condition is unique, the catastrophic effects are generalizable: widespread crop loss, human fatalities, livestock death, and the destruction of infrastructure, including household dwellings, roads, railways, factories, and communication lines (Haque 1994, Islam *et al.* 2010, Paul and Routray 2010). For instance, floods in August 2014 displaced nearly half a million people from their homes and damaged 40,000 hectares of agricultural land (Al-Mahmood 2014,

³⁹ The parameters of ‘normal’ flood events are often established by the environmental requirements of common crops. For example, respondents to one survey described less than one foot and greater than eight feet of inundation as abnormal because *aman* rice requires at least one foot but no more than eight feet of water depth, prompting Paul (1984:4) to observe that “The agriculture of Bangladesh is, thus, both flood-dependent and flood-vulnerable.”

Quadir 2014). While losses reported in aggregate provide valuable information about the magnitude of flood events, they also obscure profound and lasting impacts experienced by individuals.

Wet season dynamics

Missed work is an obvious but rarely reported burden of floods. Forty-one percent (14/34) of the informants in this study commented on the hardships of lost work as a significant consequence of floods (see also Haque and Zaman 1993, Sultana and Rayhan 2012). All of the fishermen and half of the boatmen interviewed shared experiences of the rivers becoming too hazardous to fish or operate their boats due to powerful flows and treacherous currents. Others noted that when given sufficient advance warning of flood conditions, work is disrupted because houses and belongings have to be secured and livestock relocated to higher ground. Respondents reported a loss of 5–30 workdays for each major flood event, which is prohibitive considering the narrow margin by which the majority of residents live. To illustrate, 62% of respondents support themselves and their families with loans from the government, village committees, NGOs and wealthy individuals that can carry punishing interest rates and strict repayment schedules (see Haque and Zaman 1993, Cons and Paprocki 2010, Sultana and Rayhan 2012). As a result, lost income for each day of suspended work is multiplied several times after accounting for protracted debt repayment.

Although government assistance is available during severe events, it is often administered through local officials who may make arbitrary decisions about who receives or is denied aid. One respondent, a landless farmer, reflected on his experience during Cyclone Aila in 2009 and its aftermath. He said,

“During Aila, the experience was...horrible...Men as well as domestic animals were flushed away. The storm and flood happened together. [Rice] paddy got ruined. I had no work, just lived on government relief. ...I use this [card] for the government allowance, but if I have a bad relationship with the Union Member, it becomes very difficult for me to get any help.”⁴⁰

Dry season dynamics

At the other end of the regional climate spectrum, the dry season levies a different suite of adversities upon residents. Although informants recounted difficulties with limited water access and erosion, high salinity emerged as their foremost grievance about water. Salinity is a perennial issue for communities in Southern Bangladesh where the coastline is indeterminate; tidally-influenced rivers carry saltwater tens of miles inland, and fingers of land extend deep into the estuary (Figure 4.1). River-ocean exchange occurs throughout the year in this region but is most pronounced during the dry season when rain and river water are insufficient to resist seawater intrusion into rivers and groundwater (Mirza 1998, Rahman *et al.* 2011).

Elevated water salinity is detrimental to Khulna’s socio-ecological system in manifold ways (Mirza 1998). Agriculture is the principle livelihood of the region and consequently is the sector most affected by changes in salinity. Rice, fruit, and vegetable crops are all highly sensitive to salt, which absorbs water that would normally be taken up by the root system and whose ions (*e.g.* sodium and chloride) can dissociate and concentrate in the plant tissues to toxic levels (Rahman *et al.* 2011). Seawater and brackish river water also percolate into the soil, rendering groundwater unusable for human consumption or irrigation.

⁴⁰ Interview conducted with a farmer on 27 March 2014 in Khulna, Bangladesh.

Furthermore, increased salinity disrupts the ecology of the Sundarbans, a UNESCO world heritage site that contains both a freshwater swamp forest and the world's largest contiguous tract of mangrove forest. In addition to hosting a diverse array of fish, mammals, and other fauna, the forests stabilize the shoreline and thus serve as a critical buffer against cyclones and other tropical storms (Chowdhury 2010). However, the tree species that characterize these ecosystems require moist-to-saturated soils and both fresh and brackish water and are therefore vulnerable to changes in freshwater supply and seawater intrusion (Mirza 1998, Chowdhury 2010).

Fluid problems, fixed solution

As a direct and indirect determinant of people's wellbeing and quality of life, water and its myriad challenges have been the subject of sustained examination in Bangladesh. The ways that these challenges are understood, in turn, shape approaches to resolving them. How have water hazards in Bangladesh been framed? What solution emerges from such framings?

Descriptions of the hydrological regime in Bangladesh invariably highlight its downstream position. Engineers, journalists, policymakers, legal scholars, ecologists, and social scientists alike note that Bangladesh is the lowest riparian in the second largest hydrologic region in the world, a corollary of which is that 90–94% of the country's surface water flows are allochthonous (Krug 1957, Boyce 1990, Nishat and Faisal 2000, Dinar *et al.* 2007, Bhaduri and Barbier 2008, Islam 2010). Given the potentially devastating impacts of floods and droughts, Bangladeshis are keenly aware of the relationship between water availability and crop yields, fisheries, groundwater supplies, forest health, and property damage. When paired with the downstream subjectivity

shaping perceptions of vulnerability to upstream water management (Chapter 3), India becomes the obvious target for blame for deficiencies and excesses in river flow: “Indian barrages, canals, reservoirs and national water grids are slowly strangling Bangladesh” (Ahmed 2014:2).

The commissioning of the Farakka Barrage in 1975 was met with immediate and unmitigated protest in Bangladesh as India unilaterally diverted water to Kolkata (Chapter 2). Bilateral negotiations progressed in fits and starts for more than twenty years until the two countries signed a long-term agreement in December 1996.⁴¹ The 30-year treaty assures Bangladesh a minimum volume of Ganges water during the dry season, but the agreement has done little to stem the charges leveled against India.⁴² As recently as 2011, one writer asserted that “Although a 30-year water treaty has been in effect between the two countries since 1996, it has been seen that India diverted water according to its own will, depriving Bangladesh from her just share during [the] dry season” (Islam 2011).

Personal accounts of hazards

Several informants in this study identified a range of hydrological challenges and hazards that they face, including greater salinity, inundation, heightened tidal effects, and more hazardous conditions in general (Table 4.1). Although their descriptions of hydrological dynamics differ from those provided by researchers, residents and

⁴¹ A five-year treaty was signed in 1977, and two Memoranda of Understanding (signed in 1982 and 1985) extended the terms of the 1977 agreement for a period of three years each (Crow et al. 1995, Hossain 1998, Salman and Uprety 2002).

⁴² The relative merits of the Treaty are discussed elsewhere (see Hossain 1998, Subedi 1999, Tanzeema and Faisal 2001, Rahaman 2009, Thomas 2012).

academics are united in pointing to the release or retention of water in India as the cause of water hazards in the region.

Table 4.1 Hydrological shifts and hazards attributed to water resource practices in India, as described by informants in Bangladesh.

Observation	Testimony
Increased salinity	“Before the liberation war in 1971, water was saline like this, but during the British period when I was a little boy, the water was much fresher than now. The salinity started to increase since Farakka construction began. Fresh water from upstream is not enough to make the river water fresher, seawater gives pressure northward.” – Boatman, age 72
Greater tidal effects	“The fresh water used to come from Farakka, through Ganga River. India made a barrage there. Now they have signed a treaty with the Bangladesh government and release water according to the conditions of treaty. But I have not seen the situation getting better after the signing of the treaty, not at all. If the situation got better, the condition is supposed to be like [it was during] my childhood. The current flow is supposed to flow from North to South as I have seen in the past, but it is flowing from South to North now.” – Farmer, age 55
Flooding	“If India releases water, we get water. If they hold back the water, we will not get water. India doesn’t release water very easily. The excess water flows over the [Farakka] barrage and comes to our portion of the river. If they open up one sluice gate, we will sink under water.” – Boatman, age 32
Low water levels	“In past, the river was full of water...Now, we can cross some portion of river by foot...The river will return to its old condition if India stops holding the water back.” – Farmer, age 60
Water hazards	“I think the cause of this turbidity in our river is sudden release of water during monsoon from Farakka. We had an accident six months ago; my uncle died in that accident. The accident was because of turbidity current. Six people died.” – Boatman, age 36
Reduced navigability	“You can see that the river has not water full to the brim now. But in India, they have more than enough water. Big ships can navigate to their portion but we are operating small boats.” – Boatman, age 23

Expert accounts of hazards

Personal accounts like those documented in Table 4.1 are corroborated by academic studies that identify saltwater intrusion, fisheries decline, groundwater depletion, erosion, floods, and impeded navigation among the pernicious outcomes of altered river flows due to Farakka Barrage (Swain 1996, Adel 2001, Mirza and Sarker

2005, Shahid and Behrawan 2008, Rabbani 2014). For example, in a study of salinity effects in Southwestern Bangladesh, Rahman and his co-authors (2000:31) found that “[l]arge-scale surface water withdrawal in India after commissioning the Farakka Barrage causes a drastic fall in the Ganges low-flow condition within the Bangladesh territory during every dry period.” They conclude,

“Seawater from the Bay of Bengal is the main contributor to surface water salinity, and this is caused by the reduction in the Ganges water flow, which lowers the river water level and ultimately paves the way for saline water intrusion into the fresh water zone of the study area” (*ibid*:37).

Conversely, Zaman (1993:5) notes the common attribution of flooding in Bangladesh to India: “It is held that the Farakka barrage on the Ganges in West Bengal, upstream from Bangladesh, is used to...increase the river flow during the rainy season, causing downstream floods.” Indeed, one researcher recently suggested that “...when India releases too much water during rainy season from dams and reservoirs then Bangladesh get [sic] flooded more than the land can handle” (Khalequzzaman 2013:213).

Calls for cooperation

Demands for increased international water cooperation thus become a logical response to hydrological challenges that are widely perceived to emanate from poor or insufficient transboundary river governance.⁴³ Indeed, transboundary water cooperation is purported to deliver a broad suite of socio-ecological benefits that will not only resolve water disputes between India and Bangladesh but will also extend into other areas of concern (Table 4.2).

⁴³ See for example Nishat and Faisal 2000, Parua 2001, Salman and Uprety 2002, Chowdhury and Ward 2007, Rahaman 2009, Malhotra 2010, Sivakumar 2011, Ahmed 2013.

Table 4.2 Anticipated benefits from cooperation between countries riparian to the Ganges River.

Type of benefit	Mode
Environmental protection	“Regional cooperation is required for the preservation of the environment and ecology of the river basin and for equitable and sustainable socio-economic development of the people who are dependent on rivers.” (Ahmed 2013:20)
Conflict resolution	“Cooperation among the countries can play a two pronged role. It carries a real potential of resolving various water issues between the countries and in the process also enhancing relations between the countries.” (Malhotra 2010:10)
Human health and security	“The findings demonstrate an urgent need for a shared evidence-based understanding of the full basin system, calling for significantly enhanced regional cooperation in water, weather and climate information, along with operational modelling, and forecast and warning systems. These are critical initial steps towards the sustainable management of the basin, and the safety and prosperity of its people.” (Sadoff <i>et al.</i> 2013:150)
Cooperation on other issues	“Cooperation with regard to shared water in the Ganges basin definitely strengthens relations between riparian countries and catalyses broader cooperation, integration and stability. Cooperation in shared water resources between countries will enhance cooperation and integration in other fields beyond the river.” (Rahaman 2009:184)

The argument for international cooperation promulgated by many water policy and management researchers within and beyond Bangladesh can be summarized as follows: Southwestern Bangladesh is notoriously victim to profound socio-ecological hazards during both the wet season (floods and associated damages) and dry season (seawater intrusion, loss of navigation routes, diminished fisheries, etc.). Khulna occupies the most downstream position in the Ganges River Basin and is therefore particularly vulnerable to changes in water flows from upstream riparians, namely India. The persistence of hydrological calamities in spite of a bilateral treaty with India requires that additional cooperative measures be undertaken at the international scale.

Questioning the cooperation narrative

There are two bases from which to question this argument for cooperation. First, the Ganges Treaty only stipulates water sharing during the dry period (January 1 to May 31). This condition has been used to argue that India releases excess water to Bangladesh during the wet season and increases flood risks there as a result. However, the Ganges River shifted course toward Bangladesh several centuries ago (Chapter 2). Therefore, without the Farakka Barrage directing water to Kolkata, Bangladesh would otherwise receive all the monsoon-fed river flows.⁴⁴ Furthermore, the barrage is not a storage structure, so there is no reservoir of water that would be discharged to Bangladesh during the wet season. As a result, there has been no discernable effect of Farakka Barrage during the wet season (Haque and Zaman 1993, Hofer and Messerli 2006).

The second basis for questioning the cooperation narrative involves the degree to which India is complying with the Ganges Treaty. Water data in South Asia are considered a matter of national security and are exceedingly difficult to obtain (Chapter 3). Speaking at a water management workshop in Dhaka in March 2014, Bangladesh Water Resources Minister Anisul Islam Mahmud was optimistic about India and Bangladesh's potential to resolve recent water disputes through bilateral negotiation, provided, however, that India shares hydrological data for the river system (Zaman 2014). Pointing to the absence of such practices in general, he remarked, "Unless I have

⁴⁴ Some argue that flood risk in Bangladesh has also been augmented due to shifts in sedimentation, whereby altered river flows have increased sedimentation in the riverbed and thereby reduced its carrying capacity (*e.g.* Adel 2001, Rabbani 2013). However, analysis of 27 years of data (1968–1994) reveals no relationship between sediment load and discharge rate of the Ganges River (Hofer and Messerli 2006:378–384).

the raw data, I don't think [bilateral negotiation] will be an effective way of [resolving the conflict]" (Zaman 2014).

A parallel lack of public access to Ganges flow data have thus left policy analysts, scholars, the media, and the public to speculate about the implementation and efficacy of the treaty (Chapter 3). For instance, Subramanian and his colleagues (2012:32) had no data to upon which to comment but stated in a World Bank report, "While the Ganges Water Sharing Treaty did provide a framework for future cooperation between India and Bangladesh, the agreed upon flows to Bangladesh did not fully materialize."

Fortunately, in 2008 the Joint Rivers Commission in Bangladesh began publishing as online press releases the amount of water received from Farakka Barrage for each dry season (JRCB 2014). These data have been used to corroborate claims that India is not adhering to the agreement. For example, Islam *et al.* (2013:164) report, "The analysis of flow data revealed that during the years 2008–2011, 85% of the times [sic], the flow at Farakka Barrage were [sic] below the respective historic average-flow." However, here and elsewhere, the authors only examined the data as binaries in which Bangladesh did or did not receive the minimum flow (Islam *et al.* 2013, Khalequzzaman and Islam 2012). Furthermore, their analyses were limited to publicly released data. In contrast, collating the JRC data with those that I obtained from the River Research Institute in Faridpur yields the full range of flow volumes for the active period of the treaty (1997–2014) and which I plot not as binaries but as deviations from the mandated volumes (Figure 4.2).

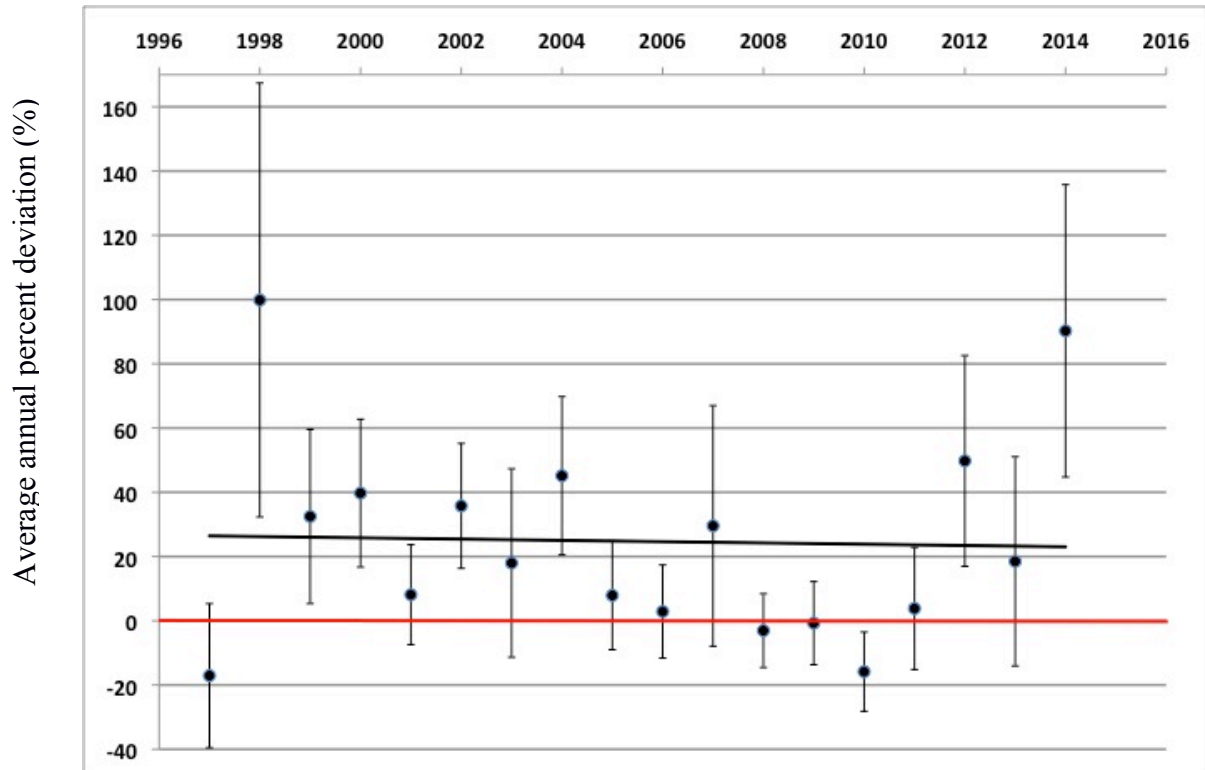


Figure 4.2 Average surface water flows released at Farrakka Barrage to Bangladesh from 1997–2014 plotted as percent deviations from the volumes mandated by the 1996 Ganges water-sharing treaty. The zero line (shown in red) represents the condition in which India releases precisely the quantum to Bangladesh as scheduled in the treaty. Each point is the average of percent deviations for all fifteen 10-day water-sharing periods (January 1–May 31) within a single year. Error bars represent one standard deviation from the average. Plot based on data from GoB (2011) and JRC (2014).

The treaty stipulates a fixed quantum of water that must be released to Bangladesh during the five-month dry season (January 1 to May 31), which is divided into fifteen periods of ten days each (*e.g.* Jan 1–10). I calculated the percent difference between expected and actual flows for each of the 270 ten-day periods between 1997 and 2014, then averaged them by year. As such, this analysis provides an indication of *how much* water was delivered, not just whether or not Bangladesh received the minimum mandated flow. Thus, the points plotted in Figure 4.2 are annual averages of the percents by which flows deviated from the required volume. Far from a consistent trend of deprivation, the

data indicate that *on average India has released more than the required volume* to Bangladesh (black trendline, Figure 4.2).

Timing is (almost) everything

Despite this general trend of compliance, India did fail to release the minimum volume 25% of the time. Perceptions of deprivation in Bangladesh may lie in the timing of water delivery. Over the past ten years, negative deviations, when they did occur, ranged from -1% to -29% during the 14 water-sharing periods from January 1st to May 20th.⁴⁵ The negative deviations abruptly skyrocket to -40% or more during the last water-sharing period, which is often when the need for water is most dire (Table 4.3; see also Shahid 2008). Therefore, India unilaterally diverts water to Kolkata at a time when the viability of many crops in both countries is at its most vulnerable stage. Given this inopportune timing, such significant water withdrawals by India are likely to be more keenly felt and therefore leave a disproportionate impression on overall water sharing dynamics between the two countries.

⁴⁵ From 2005–2014, negative deviations occurred on 34 out of 140 occasions during the period Jan 1 – May 20, with 73.5% (25/34) of negative deviations occurring in the range of -1% to -15%, and 26.5% (9/34) of negative deviations in the range of -15.1% to -29.1%. Incidentally, nearly 40% (13/34) of the negative deviations occurred in 2010 alone, which is currently tied with 2005 as being the hottest on record and marked a 15-year low for rainfall in Bangladesh.

Table 4.3 Percent deviations in the amount of Ganges water released to Bangladesh at Farakka during the last water-sharing interval of the dry season (May 21–31).

Year	Deviation (%)
2005	-40.5
2006	-39.6
2007	-4.3
2008	-44.6
2009	-41.0
2010	-51.9
2011	-40.3
2012	-36.6
2013	-43.0
2014	-13.9

The timing and spatial distribution of fresh water is critical for the viability of many crops and fisheries, upon which tens of millions of Bangladeshi people depend directly for their sustenance and livelihoods (Willcocks 1930, Paul 1984, Mirza and Ericksen 1996). Among the 12,000 plant varieties and 50 major crops that grow in Bangladesh (Rahman *et al.* 2011), rice claims paramount importance as the country's staple grain. Although thousands of rice cultivars exist, most farmers have abandoned indigenous varieties in favor of Green Revolution, high-yielding *boro* rice, which accounts for one-half to two-thirds of national rice production (Rahman *et al.* 2011, Paprocki and Cons 2014). However, *boro* is a dry season crop that requires irrigation and few farmers in Khulna can afford the cost of pumping groundwater from the greater depths where salinity and arsenic levels are sufficiently low.⁴⁶ Therefore, agriculture during the dry season is typically limited to small-scale production of fruits and vegetables. One farmer I spoke with commented on the challenges residents face during

⁴⁶ Only four of the fourteen farmers I interviewed in Khulna reported that they cultivate *boro* rice, and three of these were wealthy landowners who could afford to bore deep tube wells.

this time by saying, “During the dry season we do not get enough water for irrigation. We use waters of small rivers and canals to water our vegetables near our house, but these waters are not enough for fields upon fields of crops. Crop conditions become bad. Farmers have to face losses. Farmers lose their smiles.”⁴⁷

India’s unilateral dispossession of water owed to Bangladesh during the most critical time of the dry season therefore demands redress, especially in light of evidence that diverted flows to Kolkata have done little to mitigate the sedimentation problems that motivated construction of Farakka Barrage in the first place (Prakash 2007).⁴⁸ However, while deleterious in effect, this discrepancy in water sharing during a single 10-day period is unlikely to account for all the grievances discussed above. For instance, there is little basis for assertions that India is responsible for Ganges floods given the lack of storage capacity at Farakka, as well as the inevitability of flooding in Bangladesh due to its position within a massive floodplain (see also Zaman 1993). Individual and local-scale vulnerability to such flooding, however, is another matter. Extreme (*bonna*) floods disproportionately affect women, the poor, landless, and lowland farmers and residents. These factors are of immense policy importance but fall outside the purview of Indo-Bangladesh negotiations.

Claims of increased navigational hazards in Khulna due to activities in India are equally problematic (Table 4.1). The tidal rivers of Bengal are capricious, unstable entities—dynamic erosion and deposition of river boundaries, tidal bores, the coupling of

⁴⁷ Interview conducted on 27 March 2014 with a farmer in Khulna, Bangladesh.

⁴⁸ Despite diverting water from the Ganges for the express purpose of maintaining navigability of the port, the Ganges’ high siltation rates have necessitated annual dredging of twenty million cubic meters of silt every year at a cost of \$65 million US (Sanyal 2003).

peak monsoon flows and high tides, and shifting sand bars have posed hazards to navigation for centuries (see Majumdar 1941, Begum 1987, Jansen *et al.* 1989). Starting at least as early as the 19th century, engineers and merchants made various proposals to the British Government to minimize the hazards of navigating the channels of West Bengal. Writing in 1829, Major L.R. Stacy advocated for the construction of a channel to facilitate safe passage to and from Calcutta “as a means of overcoming the Dangers which at present cause a frequent, and heavy loss of Lives and Property” (BLIO 1829). Moreover, rapid and significant shifts in river courses have long necessitated expensive dredging operations, annual relocation of ferry terminals, and even resettlement of villages and towns that were either abandoned or swept away by rivers (Jansen *et al.* 1989, Hofer and Messerli 2006). One respondent expressed such concerns about riverbank instability when he said, “[People in] this area [are] being frightened by intensive river erosion. The river used to be 200 feet away from this road...It has now come to 20 feet away from here because of erosion. We will not be able to live here if erosion continues at this rate. We have to leave this house after 10 years.” Taken together, such evidence belies claims that attempt to causally link the operation of Farakka Barrage with small-scale navigational hazards in Khulna.

Rethinking cooperation

Serving as legal counsel for the World Bank, Uprety and Salman (2011:651) observe, “After a number of short-term legal instruments, India and Bangladesh have been able to resolve their long and bitter dispute over the Ganges through a 30-year Treaty.” My analyses indicate that this statement is only partially true. The most visible conflict occurred over a twenty five year period (1971–1996), during which the

governments of India and Bangladesh convened over 100 meetings. A series of short-term agreements helped alleviate tensions, but overall this period was marked by great uncertainty and distress for Bangladesh, which lacked any assurance of dry season flow and suffered from India's unilateral water withdrawals (Abbas 1982, Crow *et al.* 1995). Given this protracted phase of conflict, it makes sense that the 1996 Ganges treaty would be hailed for "remov[ing] one major irritant affecting Bangladesh-India relations" (Hossain 1998:131).

The received wisdom dictates that conflicts along international rivers demand international cooperation. However, the foregoing discussion reveals that regarding treaties as the metric of successful cooperation and conflict resolution problematically precludes consideration of water dynamics after treaties are signed. In so doing, this analysis echoes recent calls for the substitution of linear approaches with a sense of "ongoingness", for concern with processes rather than beginnings and endings (Grant 2011, Lepawsky and Mather 2011). Understood as a major event structuring water use and access in South Asia, ratification of the treaty has provided critical assurance of flow to Bangladesh during the dry season. The treaty thus solves the conflict of India unilaterally diverting water to Kolkata. However, understanding the implementation of the treaty as an ongoing activity, it becomes clear that new conflicts have emerged in the midst of an active cooperative agreement.

The treaty mandates a specific quantum of water that India must release to Bangladesh during every ten-day period of the dry season. I present hydrological data that shows that India regularly and dramatically deprives Bangladesh of its due share of water (to the tune of -40% to -50%) during the May 21–31 period when water demand in

both countries is most critical. Moreover, by releasing more water than required during the remaining water-sharing periods, India can claim within almost any given year that it is complying with the agreement (Figure 4.2). These findings crucially question calls for cooperation over transboundary water that fail to recognize how cooperation can lead to inequitable outcomes.

Despite a landmark treaty between India and Bangladesh, residents of Southwest Bangladesh continue to suffer incalculable hardship. However, not all of their grievances are consistent with water practices in India, suggesting that other dynamics may be at play. Contrary to the commonsense notion that struggles along an international river transpire between *riparian states*, this chapter demonstrated that not all hydrological conflicts arise solely or principally from actions in India. Rather, their genesis can be traced to the activities of *non-riparian actors*, the subject of the following analysis.

Chapter 5 – Beyond the Basin: Bringing in Non-riparian Actors

When I first began research in Bangladesh, I expected to find evidence corroborating the many claims and criticisms that India was depriving Bangladesh of its due share of water and that the hydrological crises that plague western Bangladesh could be traced to withdrawals and diversions in India (Chapter 3). While analyzing hydrological data in August 2014, I was astonished to discover that India was actually complying with the Ganges water-sharing treaty that it signed with Bangladesh in 1996 (Chapter 4), but this was not the first major surprise of my research.

Soon after arriving in Khulna in March 2014, I witnessed several of the dry season dynamics that journalists and academics had described about the region: pervasive soil and water salinization, low river levels, a devegetated landscape, stranded boats, and struggling fisheries. In addition to these conditions, the ubiquitous residue of foreign development programs also caught my attention. The residue appeared in many forms: a farmer wearing a USDA ballcap, NGO and development bank logos on signs dotting the landscape, a boatman proudly showing me a brochure from a USAID program. These objects and symbols seemed somehow out of place to me. How could so many development programs be so active in the area (to the tune of billions of dollars in foreign aid over a period of decades), and yet residents continue to suffer so profoundly from poverty, food insecurity, and environmental hazards? I would discover over the following weeks and months that this was not a paradox but an ongoing and pervasive problem. This chapter traces the process of that discovery.

Issues of scale

Since the mid-1990s, international relations and cognate fields have been criticized for effectively treating the state as the sole locus of power and for its concomitant focus on the state as the default unit of analysis (*e.g.* Agnew 1994, Brenner 1999, Power and Campbell 2010, Moisio and Paasi 2013). Around the same time that Agnew (1994) was sketching the contours of this “territorial trap,” international water resources management (IWRM) was capturing the hearts and minds of policy makers and resource managers around the world. First formulated in Article 21 of the 1992 World Summit on Sustainable Development in Rio, IWRM is invariably defined as “a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in a equitable manner without compromising the sustainability of vital ecosystems” (UN Water 2008, Subramanian *et al.* 2012, Wouters 2013). While the goals and intent of IWRM seem laudable, the concept—like the focus in international relations on the scale of the state—has drawn criticism for its *a priori* privileging of the river basin as the optimal scale of governance (Caton 2007, Norman and Bakker 2009, Warner *et al.* 2008, Orlove and Caton 2010, Zeitoun *et al.* 2013).

Much of the appeal of the river basin scale lies in its status as an apparently neutral, hydro-geographical unit. Viewed as a “natural” unit rather than a political one, it ostensibly serves to help rationalize and democratize water management by stressing efficiency, sustainable use, and multistakeholder participation (see Sneddon 2002, UN Water 2008, Norman and Bakker 2009, Zeitoun *et al.* 2013). In the years since Rio, IWRM and its insistence on the river basin scale have become hegemonic (Orlove and

Caton 2010). “Presented as the most appropriate scale for water management, not by human choice but mandated by ‘nature’, river basin management acquires an untouchable legitimacy” (Warner *et al.* 2008:134). However, there are several reasons to question the river basin approach to water management. First, it is difficult to delineate river basins because groundwater basins and surface watersheds rarely align (Orlove and Caton 2010). Second, river basins are disputed rather than neutral spatial units that overlap political boundaries (Warner *et al.* 2008, Venot *et al.* 2011). Finally, resource management occurs across multiple scales and institutional levels, making the choice of the basin scale of management a political one (Warner *et al.* 2008, Venot *et al.* 2011). That is, the “natural” river basin is a political construct more than it is a physical reality.

This chapter employs the river-border complex framework to build on earlier research on the politics of scale. I argue that treatment of conflicts along international rivers suffer from a similar type of reductive gymnastics that place undue focus on interactions between co-riparians to the exclusion of other activities and agents. Here, I focus on the fact that foreign aid programs underwritten by entities such as the United States, Netherlands, World Bank, and Asian Development Bank, who I refer to as “non-riparian actors,” are virtually invisible in transboundary water governance discourse. However, as I have discovered in this research, they have played a major role in creating vulnerability to the rise and fall of water in the hydroscape of Bangladesh.

While India’s ability to control flows of water, hydrological information, people and other river flows afford it disproportionate influence over rivers shared with Bangladesh (Chapter 3), the tendency in popular media and transboundary water governance literatures to focus on international conflict and cooperation between

riparians is overly constrained. Analysis of state-state interactions allows for convenient reference to established political units, but it problematically obscures conflicts occurring at other scales, delegitimizes the needs and uses of local resource users, and “fails to recognize many actors and processes...that simultaneously support and challenge the state at multiple scales” (Sneddon and Fox 2006:185). Therefore, rather than assume that dealing with socioecological crises along transboundary rivers necessarily requires coordination and cooperation among riparian states, I develop a critical hydropolitics of the Ganges River within a hydrosocial cycle framework to elucidate how processes and actors at subnational and extranational scales shape conflicts and crises along transboundary rivers.

Developing a critical hydropolitics entails a three-part project that (1) examines how river basins are constructed and represented as “cooperative space, as *transnational* space,” (2) identifies “nodes of water conflict” and processes within them, and (3) provides opportunities for alternative conceptualizations of river basins (Sneddon and Fox 2006:183–184). I combine this approach with the concept of the hydrosocial cycle, which “denotes a hybrid physical-social process, the examination of which provides a way of gaining insights into wider processes of capital accumulation, uneven development and social inequality, and the power relations within” (Linton and Budds 2014:175).

From this methodological foundation, I use textual and interview data collected in Bangladesh (Khulna and Dhaka) and India (Kolkata) during Spring 2014 to trace the material and discursive construction of water as a hazard in Bangladesh. The analysis focuses on the southwestern division of Khulna (Figure 4.1), the most downstream

portion of the Ganges river network and a key site for interconnected interventions aimed at poverty reduction, agricultural expansion and intensification, climate change adaptation, and hazards mitigation. Through an examination of polders (embanked riverine islands) as “nodes of water conflict,” I discover that many water-related crises in southwestern Bangladesh (flood, water salinization, water scarcity, vulnerability to cyclones, fisheries decline, loss of navigable routes) are not problems of international cooperation, as commonly asserted (Chapter 4), but rather are outcomes of a dialectical relationship between foreign development aid and socioecological hazards in a dynamic river delta.

The hydro-hazardscape of Bangladesh

Draining an area 12 times its size, Bangladesh occupies the most flood-prone region in the world (Thompson and Sultana 1996, Mirza 2002, Choudhury *et al.* 2004). Approximately 80% of its total land area is floodplain and normal floods, known locally as *borsha*, inundate one-fifth to one-third of the country annually (Mirza 2002, Hofer and Messerli 2006, Chowdhury 2010, Sultana and Rayhan 2012). Agricultural activities and many other facets of social and economic life, such as travel and fishing, have been organized around these recurring events for centuries (Majumdar 1941, Haque and Zaman 1993, Boyce 1990, Brammer 1990a, Adel 2001, Paul 2003). However, *bonna* (abnormal floods) flout standard parameters of timing, magnitude, areal extent, and duration (Paul 1984, Mirza 2002, Hofer and Messerli 2006). Such events markedly destabilize and threaten people’s lives and livelihoods by facilitating disease transmission, disrupting communication and transportation systems, and through the

destruction of infrastructure, crops, livestock, and personal property (Krug 1957, Haque 1994, Paul 2003).

Despite the substantial disaster potential of floods in Bangladesh, their absence can be equally devastating (Boyce 1990, Paul 1998, Shahid and Behrawan 2008). Surface freshwater not only sustains agriculture, industries, and human life, it is also essential for healthy fisheries, groundwater replenishment, inland navigation, and mangrove forests that protect coasts from erosion and tropical storms (Mirza and Ericksen 1996, Deb 1998, Paul 2003, Hofer and Messerli 2006). Drought conditions pose additional perils in coastal areas where tidally-influenced rivers contaminate water and soil with salts that render water non-potable and land toxic to plants.⁴⁹ Globally, agricultural losses from salt-induced land degradation have been estimated at \$27.3 billion per year (Qadir *et al.* 2014), and 12.6% of all arable land in Bangladesh is affected by salt damage (Roy 2014). Soil and water salinization have been implicated in a wide range of environmental and human health problems, including soil infertility, livestock losses, hypertension, premature births, and low-birth weight babies (Azad *et al.* 2009, Rahman *et al.* 2011, ICL 2014, Plantz 2015).

As the lowest riparian country in the second largest hydrologic region on earth, water woes in Bangladesh are often framed in reference to its downstream position (see Zaman 1993, Brichieri-Colombi and Bradnock 2003, Hussain 2004). With approximately 90% of its surface water flows making ingress from India, it comes as little surprise that Indian water management is implicated in the full gamut of hydrological challenges

⁴⁹ Seawater intrusion is maximal during high, spring tides, as well as during the dry season when river flows are too weak to stem the influx of estuarine water (Chowdhury 2010).

facing Bangladesh, which include floods, fisheries declines, seawater intrusion, hazardous currents, mangrove destruction, reduced groundwater recharge, and loss of navigable routes for watercraft (see Bradnock and Saunders 2000; Chapter 4). Indeed, thousands of dams and irrigation technologies in India intercept and alter many water resources otherwise bound for Bangladesh (Adel 2001, Uprety and Salman 2011).

However, in the Ganges portion of the drainage basin, there are grounds for seriously questioning India's culpability with respect to Bangladesh's water hazards. Hydrological data indicate that India is broadly complying with the terms of a water-sharing treaty with Bangladesh despite vociferous claims to the contrary (Chapter 4). In addition to quantitative evidence of water sharing, residents of southwestern Bangladesh themselves hint at structural and social factors that may also partially exonerate India from blame for hydrological adversities faced in the region.

The question of embankments

Interviews with water resource users and residents in the southwestern division of Khulna (Figure 4.1) revealed that the very same issues of flooding and salinity that were connected to hydro-engineering in India were simultaneously linked to decades-old embankments. For instance, one respondent said:

“Before WAPDA [Water and Power Development Authority] embankments, the sea water remained on Sundarban area [along the coast], but this embankment is now confining the river sides so water pressure comes upward [inland]...Flood cannot be controlled when a lot of water comes from India all of a sudden. Do you think it is possible to prevent flood with such embankments and dams?”⁵⁰

This resident expresses a commonly shared sentiment that India inundates Bangladesh with excess water during the wet season. However, he also identifies the additional role

⁵⁰ Interview conducted on 27 March 2014 with a boatman in Khulna, Bangladesh.

of embankments in reconfiguring and disrupting water flows, pointing to an important but oft-overlooked feature in the transboundary watershed. How do embankments contribute to both the wet-season hazard of floods and the dry-season hazard of high salinity? Why are these structures omitted from international discussions of hazards vulnerability in the Ganges river system?

Embankments are conspicuous features of southwestern Bangladesh that serve diverse functions beyond their intended purpose of isolating land from the surrounding hydrological regime (Segeren 1983). The dikes are contested, multi-use spaces coopted for rural traffic and unregulated housing for the landless, while the areas they cordon off from riverine and tidal flows have created, to borrow Mustafa's (2013) term, a unique and complex "hydro-hazardscape," the contours of which I trace out below. In developing a critical hydropolitics of the Ganges Basin, embankments are therefore ideal for examination as "nodes of water conflict" and for identifying "the multiple networks of political-economic, discursive and ecohydrologic processes intermingling with these nodes, that fall outside or under the fixed scale of the transnational basin" (Sneddon and Fox 2006:184). While state-centered hydropolitics prevail in the Ganges Basin, in the course of the present analysis, it becomes evident that *non-riparian* actors have been influential in shaping and creating the institutions, policies, and structural interventions directed toward mitigating hydrological hazards in Bangladesh. Their continued involvement in water management and planning in the face of repeated failures to meet their programmatic objectives raises serious questions about the actual beneficiaries and outcomes of foreign development aid in Bangladesh.

The era of flood control

No national-level government water sector was put in place during colonial rule, but each decade following the 1947 Partition of India has witnessed a new phase in national and regional policies aimed at controlling the circulation and distribution of freshwater in East Pakistan, later Bangladesh (Haque 1994, Hussain 2004). Catastrophic floods in 1954, 1955, and 1956 precipitated the first formal attempts at water resource planning in East Pakistan at which time the Government of Pakistan enlisted the United Nations to conduct a Technical Assistance Mission (Krug 1957, Haque 1994, Ali 2002, Nowreen *et al.* 2014). Leading the mission was Julius Albert Krug who, undoubtedly shaped by his previous roles as a power engineer for the Tennessee Valley Authority (TVA) and head of the U.S. Army Corps of Engineers, recommended the creation of a centralized state bureaucracy to address water and power development in East Pakistan (see Crawford 1969).

Following this counsel, the East Pakistan Water and Power Development Authority (EWAPDA) was established in 1959 (Haque 1997). Despite the role of floods in catalyzing UN involvement in East Pakistan, annual shortfalls in food and the promotion of Green Revolution technologies led to the prioritization of food production over hazards mitigation (USAID 1970, Haque 1994, Thompson and Sultana 1996, Haque 1997, Shahabuddin 2000). Therefore, EWAPDA commissioned a series of large-scale flood control, drainage, and irrigation projects that would provide maximum protection to cropland from flood damage (Schmidt 1969, Haque 1994, Choudhury *et al.* 2004, Hussain 2004, Islam 2006, Chowdhury 2010). These projects spanned a range of engineering interventions based on guidance from the Krug Mission, including dams,

embankments, barrages, and canals. However, one structural form implemented in the coastal regions would prove to have an inordinate impact on the socio-ecological system of Southwestern Bangladesh: the Dutch polder.

In addition to Julius Krug, the 1957 UN Mission was comprised of six expert consultants of Dutch, American, and British origin. Perhaps recognizing superficial similarities between the alluvial floodplains of the Netherlands and Bangladesh, the team of hydraulic engineers and economists included among their recommendations the erection of polders (permanent, ringed embankments used extensively in the Netherlands) to seal off swaths of land from riverine flows and prevent flooding and seawater intrusion (Segeren 1983; Figure 5.1). This decision flags an apparent failure to appreciate the difference between the northern temperate climate of the Netherlands and the monsoon-driven climate of South Asia, with sharply defined wet and dry seasons. Furthermore, the team observed that residents already practiced embankment construction: “In the saline areas, local embankments are used to limit the ingress of saline water and sluice boxes to control drainage” (Krug 1957:194). However, it failed to highlight the most salient feature of these embankments, which was their seasonal construction and use.

From the 17th century, *zamindars* (powerful landlords) commissioned the construction of *ostomasi badh*, temporary earthen embankments used to exclude saline water and thereby protect arable land during the dry season (Maddrell 1993, Pitman 2005, Islam 2006, Islam and Kibria 2006, Nowreen *et al.* 2014). However, during the rainy season, freshwater was sufficient to flush tidal channels and press the salinity front shoreward. Therefore at the onset of the monsoon, the dikes were dismantled to allow freshwater to inundate the land and thus enable rice cropping during both the dry and wet

seasons (Pitman 2005, Nowreen *et al.* 2014). This practice continued until the dissolution of the *zamindari* system in 1951 and has since been replaced by the permanent, Dutch-style polders endorsed by the UN Mission.⁵¹ In 1961, the Government of Pakistan launched a series of massive engineering works including the large-scale introduction of polders to the Southwest region (Thomas 1972, Haque 1994, GoB 2001, Pitman 2005). Through the Coastal Embankment Project, a total of 108 polders were erected, compartmentalizing a combined area of three million acres currently occupied by 20 million people (Schmidt 1969, Thomas 1972, Maddrell 1993, Ali 2002, Islam 2006, Salisbury 2015).



Figure 5.1 A polder in Khulna, Bangladesh separates a village (left) from a distributary of the Ganges River (right). Source: Md. Abdul Quayyum/Oxfam

⁵¹ It has been argued that after the abolition of the *zamindari* system, bunds constructed by local farmers were structurally unsound and insufficient (Schmidt 1969, Ali 2002).

These works were barely underway when a major flood occurred in 1962, prompting a second UN report, this time authored by American engineer John Ray Hardin.⁵² While Hardin advocated a measured approach to addressing flood risks in East Pakistan, he maintained an overriding faith in the capacity for engineering solutions to prevail in the dynamic landscape, confidently stating, “After a century or more of progress, the art of river engineering has, to a large extent, become a science” (1963:287). Therefore Hardin’s report and EWAPDA’s 1964 Master Plan that followed it, focused almost exclusively on large-scale structural measures to mitigate flood damage, including embankments/polders, channel dredging, and drainage canals (Hardin 1963, Haque 1994, Shahabuddin 2000).

By the early 1970s, over 4000km of coastal embankments had been constructed and yielded promising results (USAID 1970, Maddrell 1993, Haque 1994, Islam 2006). Significant gains (up to 200–300%) in food-grain production were achieved through effective protection from tidal surges and flooding, as well as the introduction of high-yield rice varieties (Schmidt 1969, Brammer 1983, Haque 1994, Pitman 2005, Islam 2006). However, within 10–15 years, these early successes were accompanied by growing and wide-ranging complaints: water-logging within the polders, depletion of open freshwater fisheries, sedimentation of river channels, reduced fish diversity, loss of navigable routes, and higher rates of disease transmission (Thomas 1972, Brammer 1983, Islam 2006, Nowreen *et al.* 2014). Moreover, many residents discovered that the confinement of floodwaters to river channels paradoxically increased their vulnerability

⁵² A decorated World War II veteran in the U.S. Army, Major General Hardin’s qualifications for this particular task derived from his previous position as President of the Mississippi River Commission (U.S. Army Corps of Engineers).

to abnormal floods (ERL 1992, Haque 1994, Paul 2003, Auerbach *et al.* 2015). Despite renewed efforts in the late 1980s and 1990s to rehabilitate damaged embankments and modify polders with drainage canals, improved sluice gates, and low-lift pumps, each round of interventions simply introduced new problems (Haque 1994, Ali 2002, Pitman 2005).⁵³

Troubling developments

Once celebrated, polders are now increasingly denounced in the strongest terms, including “man-made disaster” (Islam 2006:241; Nowreen *et al.* 2014:264), “project of mass destruction” (Islam and Kibria 2006), “violent enclosure of common-pool resources” (Warner 2010:75) and “man-made hazard” (Swapan and Gavin 2011:47). If Hardin envisioned river engineering as a science and an art, then it was a science of devastation and an art of destruction.

Polders were intended to allow for controlled flooding of land by way of regulators and gravity drainage, thus maintaining the positive benefits of floodwaters while circumventing crop and property damage (Schmidt 1969, Brammer 1990b, Mirza and Ericksen 1996, Islam 2006; Figure 5.2, left).⁵⁴ In theory, sluice gates could be opened during the rainy season to allow accumulated water to drain off the land, or closed during the dry season to avert saline intrusion and tidal flooding (Mirza and Ericksen 1996, Ali 2002, Nowreen *et al.* 2014). In effect, polders channelized the rivers and forced

⁵³ These include numerous ill-fated Flood Control and Drainage (FCD) and Flood Control, Drainage and Irrigation (FCDI) projects implemented per the 1964 Master Plan and 1991 Flood Action Plan (FAP) (see Thompson and Sultana 1996, Warner 2010).

⁵⁴ People residing in some project areas do claim benefits of flood protection (Paul 2003), but the benefits accrue unevenly and typically only toward influential or politically connected individuals (Boyce 1990, Thompson and Sultana 1996, Warner 2010). Furthermore, polders consistently fail to meet projected targets in terms of area protected and crop yields (Thomas 1972, Brammer 1983, Nowreen *et al.* 2014).

sediments to be deposited in the riverbeds, thereby reducing the carrying capacity of the rivers, increasing the river height relative to the embankments, and ultimately augmenting the risk of overtopping (Brammer 1983, Maddrell 1993, Hossain and Sakai 2008, Swapan and Gavin 2011; Figure 5.2, center).

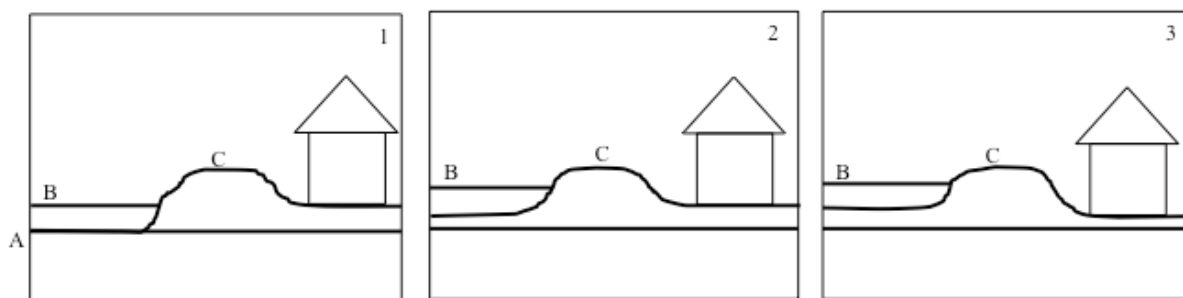


Figure 5.2 Cross-sectional view of the area inside (right) and outside (left) of a polder over time. The line labeled A is a visual guide to assist comparison of landscape features across panels. Panel 1 illustrates the period soon after construction of the embankment. Sediments are gradually deposited within the river channel (Panel 2), thus raising the height of the river (B) relative to the height of the embankment (C). After 15–20 years (Panel 3), the riverbed continues to shoal (in the absence of dredging) and soil compaction within the polder lowers the ground level below the height of the river.

Compounding these problems, sluice gates and drainage canals quickly became inoperable due to poor maintenance and rapid sedimentation (Maddrell 1993, Choudhury *et al.* 2004, Nowreen *et al.* 2014; see also Pitman 2005). By blocking floodwaters, clogged gates prevented new silt from being deposited within empoldered areas; the resultant soil mining and compaction has led to 1.0–1.5m of elevation loss that has left the land dangerously below river height (Swapan and Gavin 2011, Auerbach *et al.* 2015; Figure 4.2, right). In addition to exacerbating flood risk, the congested drainage canals and disparity in land levels prevented rainwater (during monsoon season) and saline water (during tidal floods and storm surges) from draining out of the polder (ERL 1992, Maddrell 1993, GoB 2001, Islam 2006). Disastrous water logging ensued and persisted

for months, and the stagnant waters became rife with hazards (Brammer 1983, Swapan and Gavin 2011).

Gangetic floodwaters are naturally rich in blue-green algae that convert abundant atmospheric nitrogen (N_2) into ammonium (NH_4^+), a limiting factor in plant growth and a compound critical to soil fertility (Krug 1957, Brammer 1983). The exclusion of these soil-enhancing microbes and the saturation of soil with saline water severely reduced the productive potential of the land. In addition to destroying crops and damaging property, the standing water also elevated the incidence and transmission of malaria, dengue, cholera, dysentery and diarrheal diseases (Ali 2002, Mirza 2011, Ahmed *et al.* 2013, Nowreen *et al.* 2014). Moreover, 60% of Bangladesh's 251 species of fish are floodplain dependent and 77% of fish are wild caught from inland, freshwater fisheries (Zaman 1993). Fish provide 60–80% of Bangladeshis' dietary protein, and are an especially important food source for the landless poor (Boyce 1990, ERL 1992, Mirza and Ericksen 1996, Thompson and Sultana 1996, Ali 2002, Mahmud 2014). Diverse fish populations that had once been abundant in coastal rivers, *beels* (low-lying depressions), and *baors* (oxbow lakes) were decimated by reduced habitat or by impeded migration routes and access to spawning grounds as a direct result of embankments (Boyce 1990, Haque and Zaman 1993, Mirza and Ericksen 1996, Thompson and Sultana 1996, Ali 2002).⁵⁵ In addition to decimating freshwater fisheries, compartmentalization also severely impacted the communication and transportation systems built around the river network. Water-based transport is vital in rural areas where country boats provide affordable, efficient

⁵⁵ However, consultants from Leedshill de Leuw Engineers, who conducted an evaluation of the Coastal Embankment Project in 1969 for EWAPDA, concluded that reports of reduced fish catches in channels obstructed by embankments were “unsubstantiated” and proposed overfishing as an alternative explanation for the reductions (ERL 1992:38).

transit for people and goods (ERL 1992, Chowdhury 2010). However, polders rendered numerous channels non-navigable, threatening this critical form of transportation and the regional economies that rely upon it (Mirza and Ericksen 1996, Thompson and Sultana 1996, Hossain and Sakai 2008).⁵⁶ Faced with increasingly sterile land, significantly fewer fish, and diminished transportation, many people were forced to abandon their homes and land in search of employment in urban areas (ERL 1992, Islam 2006, Nowreen *et al.* 2014).⁵⁷

Reinventing polders

Not everyone adversely affected by the polders relocated; many who stayed resisted by making illegal cuts into the embankments in an effort to either drain waterlogged land or to allow entry of normal flood water that had been excluded by the structures (Thomas 1972, Brammer 1990a, Ali 2002, Pitman 2005, Nowreen *et al.* 2014). Although such breaches provided temporary relief, they resulted in the long-term risk of structural failure during cyclones and related storm surges (Brammer 2010, Kartiki 2011). Moreover, the cuts facilitated seawater intrusion during the dry season, thereby introducing additional risk of soil and water salinization. While failing to meet expected targets for poverty reduction, food self-sufficiency, and hazards protection, polders became inundated with brackish water during even moderate storm surges. This had the

⁵⁶ I refer here to small channels, but sedimentation of principal navigational routes is also problematic, requiring the Bangladesh Inland Water Transport Authority to dredge over 1.8 million m³ each year to maintain just 13 routes (Choudhury *et al.* 2012).

⁵⁷ Severe floods exacerbate poverty, which has a disproportionate impact on women because men are more likely to desert their wives and families after such events. Abandoned wives and young, unmarried women from poor families may be lured to cities (in Bangladesh or abroad) by predatory gangs and pimps, only to be forced into prostitution, while older women may relocate to cities to subsist on begging and other forms of charity (Paul 2003; see also Thompson and Sultana 1996).

unintended benefit of creating ideal habitat for intensive shrimp cultivation (Islam 2006, Brammer 2010, Swapan and Gavin 2011, Nowreen *et al.* 2014).

Bangladesh made its entry into the global shrimp export market in the 1980s when social and environmental failures decimated aquaculture production in already established seafood-exporting countries including Thailand, Indonesia, China, the Philippines and Taiwan (Azad *et al.* 2009). Over the following three decades, shrimp farming was catapulted from an artisanal practice for domestic consumption into Bangladesh's second largest foreign income generator after ready-made garments (Rahman and Hossain 2009, EJJ 2014). Today, Bangladesh's annual production of 58,000 tons of shrimp directly employs approximately 1.2 million people, while an additional 4.8 million are indirectly dependent on the industry (EJJ 2014). Such figures suggest that Bangladesh will achieve its goal of middle-income status by 2021 (Choudhury *et al.* 2012); however, they also obfuscate profound socio-ecological costs borne by the sector's growth and success.

While government policies and programs helped to promote the expansion in shrimp farming, the industry's frenzied growth was primarily executed in an unregulated and uncoordinated fashion, including the forcible seizure and conversion of agricultural land to shrimp ponds within the polders (Deb 1998, Islam 2008, Azad *et al.* 2009, Adnan 2013, Ahmed 2013, EJJ 2014). Uneven rural power structures privilege wealthy and politically connected individuals who regulate water salinity within the polders for their own benefit by taking control of sluice gates or making cuts in embankments (see Hussain 2004 and Warner 2010). As one informant explained, "The river is embanked and sluice gates are being controlled by shrimp farmers. Once we complained to the TNO

(municipal government) office, but that was of no use. The shrimp farmers are influential people.”⁵⁸ Thus, polders that had been constructed in part to exclude saline water were now repurposed to create brackish environments for shrimp cultivation. This had grave consequences for the socio-ecology of the area.

Areas that once supported the production of rice, jute, fruit trees, vegetables, fish, cattle and poultry were rendered sterile by the unilateral salinization of soil and water for shrimp production (Rahman *et al.* 2011). Moreover, salt water from shrimp ponds easily infiltrates adjacent fields, forcing neighboring farmers of means to adopt shrimp cultivation themselves and further perpetuating the destruction of land and livelihoods (Islam 2006, Kartiki 2011). For those who can engage in it, shrimp farming is one of the most lucrative professions in Bangladesh, generating ten times the income of rice farming (Kartiki 2011, Rahman *et al.* 2011). However, its additional attributes of being capital intensive and requiring minimal labor makes entry prohibitive for poor farmers while simultaneously generating little viable employment (Kartiki 2011, Swapan and Gavin 2011, EJP 2014). Therefore, while some residents transition to shrimp farming voluntarily or through circumstance (as above), more often shrimp farm operators are industrialists who originate and reside outside the region (Islam 2008, Adnan 2013, EJP 2014).

The radical transformation of Bangladesh’s coastal landscape has not been an inevitable or peaceful process. Wealthy, powerful urbanites often acquire property illegally through intimidation, coercion, harassment and forced inundation of fields with the assistance of *mastaan* (hired thugs) and corrupt law enforcement and government

⁵⁸ Interview conducted on 29 March 2014 with a farmer in Khulna, Bangladesh.

officials (Islam 2008, Swapan and Gavin 2011, EJF 2014). The situation is bleak for non-shrimp farming residents: “Saline water is invading through the sluice gate of the WAPDA embankment. Most of the people are suffering. A few musclemen are being benefited.”⁵⁹ Livelihood and subsistence options are further circumscribed by federal land policies that give nominal priority to peasants while in practice effecting land privatization for the benefit of closed-water aquaculture (Adnan 2013). As noted above, inland fisheries constitute the primary source of protein for the great majority of rural households. Modest reductions in open-water capture require a concomitant doubling or trebling of closed-water production in order to sustain equivalent harvests while simultaneously reducing fish and dietary diversity (Boyce 1990). Indeed, shrimp production has skyrocketed, but the valuable seafood is exported abroad rather than providing a replacement for diminished open-water fish harvests (Ali 2002). The overall result is widespread depeasantization of the coastal zone in which most low- and middle-income individuals and households migrate to urban areas in search of work while those who stay become seasonal, low-wage laborers in the shrimp industry (Swapan and Gavin 2011, Paprocki and Cons 2014).

The cost of aid

The plight of Bangladeshis has not gone unnoticed. Poverty, high unemployment, food insufficiency, and threats of climate change (sealevel rise, abnormal cyclones) have captured global attention, with much of the international response taking the form of development aid programs.⁶⁰ As a result, Bangladesh has received over \$50 billion US in

⁵⁹ Interview conducted on 29 March 2014 with a resident of Khulna, Bangladesh.

⁶⁰ Aid is not understood in purely humanitarian terms. Fears of desperate, radicalized Bangladeshis fleeing from the effects of climate change also motivate foreign

foreign aid since gaining independence from Pakistan in 1971, with over \$5.7 billion US sourced from USAID alone (Daily Star 2012). Vast sums of foreign aid continue to flow into the country, with recent commitments by the World Bank, Netherlands, and the United States approaching \$1.5 billion US (Mahbub 2013, Blue Gold 2012, Daily Star 2012). Some of the flood control projects described above are summarized in Table 5.1, including statements from agency reviews of completed projects.

intervention: “Climate change will foster terrorism and will fuel immigration to the UK as millions of people are displaced by rising sea levels, a senior military figure has warned” (Gosden 2014).

Table 5.1 Overview of some past and current flood control and private sector development projects in Bangladesh.

Project (Purpose)	Funding Agency	Project Dates	Project Cost	Internal Evaluation
Coastal Embankment Project (construct polders)	USAID	1960–1971	\$278 million US (USAID 1971)	“...the project actually diminished rather than enhanced the farmers’ productive capacity.” (Thomas 1972:41)
Flood Action Plan 20 (construct and test polders)	Government of the Netherlands	1990–2000	\$27.9 million US	“In brief, the technical feasibility of the entire FAP concept is not demonstrated and projects involving large-scale embankments must be considered out of reach at this time.” (NDC 1993:5)
Coastal Embankment Rehabilitation Project (repair polders)	World Bank	1995–2002	\$87.8 million US	“The project partially achieved its objectives with several shortcomings and the outcome is rated as moderately satisfactory. ..Sustainability is rated as unlikely.” (Pitman 2005:ix)
Khulna-Jessore Drainage Rehabilitation Project (improve polder drainage)	Asian Development Bank	1994–2004	\$44.9 million US	“The Project was rated as unsuccessful, bordering on partly successful. It was rated as partly relevant, less effective, inefficient, and unlikely sustainable.” (ADB 2007)
Poverty Reduction by Increasing the Competitiveness of Enterprises (PRICE) (expand aquaculture)	USAID	2008–2013	\$12.9 million US	PRICE increased “sales in aquaculture...” (OSG 2013:viii) and “demand [for shrimp] by linking processors with new customers from the United Arab Emirates and Saudi Arabia and expanding within the European market” (OSG 2014:17).
Coastal Embankment Improvement Project	World Bank	2013–2020	\$400 million US	N/A (active); Purpose: rehabilitate 600km of coastal polders (Mahbub 2013)
Blue Gold	Government of the Netherlands	2013–2019	\$60 million US	N/A (active); Purpose: enhance flood protection and agricultural productivity in polders

It has long been the case that economic and environmental crises in Bangladesh provide rich commercial prospects for the international development industry, and water management has been an especially profitable sector (Thomas 1972, Boyce 1990, Bradnock and Saunders 2000, Hofer and Messerli 2006, Haque 2014). One USAID report identified that nearly one-third of the total foreign development aid in the year 1967–1968 went to the Bangladesh water sector, while 15–20% of those funds were directed right back out of the country to pay for foreign consultants (Thomas 1972). A brief discussion of a few of the development projects listed above (Table 5.1) illustrates what is at stake for non-riparian involvement in Bangladesh’s hydroscape.

Coastal Embankment Project

For ten years of consulting (1962–1971) on the ill-fated Coastal Embankment Project (CEP), the San Francisco-based firm Leedshill de Leeuw Engineers provided Bangladesh with 17 experts for a sum of \$3 million US, funded with USAID loans (Thomas 1972). Embankment construction itself was a food-for-work operation funded through Public Law 480 (PL-480), the US Food for Peace program that found international outlets for surplus American wheat, rice, edible oil, and cotton (Khalil 1991, Haque 1994). Signed into law in 1954 by President Eisenhower, PL-480 allowed cash-strapped, food-deficient countries to pay for American food imports with their local currencies rather than US dollars, though “food aid” was secondary to the program’s main objective of reducing agricultural surpluses (USAID 1970, USDS 2013). From 1972 to 1990, Bangladesh purchased \$1.77 billion US of surplus agricultural commodities and continues to be a target of PL-480 programs (Khalil 1991, USAID 2011), this despite early concerns that long-term continuation of the program “would

disrupt the export markets of several allies, including Great Britain and Canada” (USDS 2013). To underscore the US demand for maximum returns on its investments, the USAID loans for CEP not only charged interest, mandated the employment of American engineering consultants, and relieved Americans of excess grain, but also required “all material, equipment and services” for the project to be procured in the United States (USAID 1970:90). Such stipulations have become the industry standard, elaborated since the 1990s to include payment for material suppliers, contractors, and consultants *prior to* complete or proper installation of works (Haque 2014).

Blue Gold

Euroconsult Mott MacDonald, the Dutch consulting firm for FAP-20, is now leading the Technical Assistance team for a new Dutch-funded program in Southwestern Bangladesh fetchingly called Blue Gold (Table 5.1). Although FAP-20 was not sited in Southwestern Bangladesh, it was an important pilot project for testing the feasibility of replicating polders elsewhere in the country (NDC 1993, Warner 2010). Despite the conclusion that FAP-20 was “neither replicable nor sustainable” (Warner 2010:77), the Blue Gold program also centers on polder construction and maintenance, ostensibly for improved water management and increased agricultural productivity. The labor source for polder construction ironically includes many of those displaced by earlier embankment projects. First conceived in 1987 and promoted by the Government of the Netherlands as a mechanism for poverty alleviation and community participation, Landless Contracting Societies (LCSs) are groups of the landless poor who are given contracts for the construction and maintenance of embankments (Dewan 2012). The Blue Gold program mandates that LCSs (mostly women) must complete at least 25% of

earthwork construction “so that employment and income generating activities are provided to the poor sections of the community” (Blue Gold 2012:40). In other words, foreign-devised water management projects employ landless and disaster-affected people to rehabilitate and maintain the very structures that perpetuate their vulnerable status.

While polders may not protect residents from cyclonic flooding, water logging, soil salinization, and food insecurity, they do ensure a reliable source of shrimp for American and European consumers. The US and Netherlands are among the top four importers of Bangladeshi shrimp, with Americans consuming an average of 4 pounds of shrimp per person each year (EJF 2014, WWF 2014). To facilitate this trade, foreign loans for shrimp cultivation programs like PRICE and Blue Gold are disbursed only on condition that Bangladesh adopt liberal trade policies that benefit importers. For example, to overcome perceived obstacles to growth in the shrimp industry, PRICE worked to improve “private sector competitiveness”, defined as:

“Improv[ing] policies, laws, regulations, and administrative practices affecting the private sector’s ability to compete nationally and internationally. All the sectors include not only the *adoption and implementation of policies*, but also their oversight by elected officials, NGOs, and the private sector.” (Foreign Assistance 2014, emphasis added)

Similarly, although shrimp farming is touted by foreign donors as a mechanism for poverty alleviation and job creation (ERL 1992, Blue Gold 2012, OSG 2013), the Government of the Netherlands is actively working to streamline the production process to improve the export quality of the shrimp. The process includes the “introduction of (small-scale) mechanisation [that] will *alleviate labour work*” (Blue Gold 2012:7, emphasis added), as well as the development of market linkages that connect importers directly with producers, thereby eliminating intermediate buyers and sellers from the

commodity chain (interview on 30 March 2014 with the Deputy Director of Shushilan, a non-profit organization for marginalized groups in SW Bangladesh, see also The Daily Star 2014a, TFE 2014).

Making non-riparians visible

Despite extensive and ongoing international aid and investments of nearly \$10 billion US in embankments (Cohanpour 2013), the same problems of vulnerability to hydrological hazards (flood, drought, salinity) and underdevelopment (poverty, food deficits) that first prompted foreign intervention in Bangladesh persist and spur additional foreign intervention. For example, announcing in 2013 its \$375 million US loan to Bangladesh for repairing 17 coastal polders, the World Bank reports:

“In addition to providing protection against storm surges and floods, the project will help to reduce poverty by facilitating the growth of farm and non-farm activities in the coastal area. Around 8.5 million people living in these six districts would benefit through agriculture development, employment, and food security.” (Mahbub 2013)

So we see that foreign development projects that purport to alleviate poverty, increase food security, reduce hazards vulnerability and facilitate climate change adaptation in Bangladesh through polder rehabilitation and shrimp farming in fact perpetuate both the conditions and rationale for continued flows of aid dollars into the country. Rather than benefitting poor and hazards-vulnerable populations, foreign engineers, consultants, suppliers, importers and affiliated firms are the principal beneficiaries of such projects (see Thomas 1972, Boyce 1990, Bradnock and Saunders 2000, Hofer and Messerli 2006). While lamentable, this is hardly surprising given that failed development projects are known to serve unstated and at times unidentified functions:

“...because “failed” development projects can so successfully help to accomplish important strategic tasks behind the backs of the most sincere participants, it does

become less mysterious why “failed” development projects should end up being replicated again and again.” (Ferguson 1994:256)

More crucially, foreign aid programs underwritten by entities such as the United States, Netherlands, World Bank, and Asian Development Bank are virtually invisible in transboundary water governance discourse. A recent study of water resources development in the Ganges states:

“All countries in the basin benefit from the Ganges and suffer from its extremes; all could benefit more and suffer less from the devastating floods and periodic droughts which routinely undermine development in the region. There are many opportunities for cooperation and productive management of the river” (Sadoff *et al.* 2013:148).

In light of the foregoing analysis, it is evident that such claims are misleading; countries and agents *outside* the basin also benefit greatly from the Ganges and at the expense of millions of people within the basin. The attribution of floods, seawater intrusion, storm surges, food insecurity, and migration to climate change (USAID 2011, Choudhury *et al.* 2012, World Bank 2013, Cohanpour 2013, Gosden 2014) or to hydro-development within India (Adel 2001, Bradnock and Saunders 2000, Mirza and Sarker 2005, Rahman *et al.* 2011) helps legitimize misguided foreign “development” projects and hydro-diplomacy efforts between India and Bangladesh while enabling non-riparian actors to silently manipulate the social and physical landscape of the Ganges Delta for limited gain.

Taking hydrological hazards and conflicts in a transboundary water system seriously entails a comprehensive analysis of actors across multiple scales (riparian and non-riparian, state and non-state). Versions of this argument have been made before (*e.g.* Mostert 2003, Sneddon and Fox 2006, Norman and Bakker 2009, Harris and Alatout 2010, Zeitoun *et al.* 2013), but even when advocating for a full accounting of all actors and scales of conflict, the majority of transboundary water governance research still

focuses on cooperation between riparian states (*e.g.* Swain 2001, Sadoff and Grey 2005, Rieu-Clarke 2010, Sivakumar 2011, Subramanian *et al.* 2012, Leb 2014). Rather than waiting on the sidelines to be called into service, international aid agencies and their contracted experts actively engineer policies, contracts, rivers, and landscapes within transboundary watersheds (*e.g.* Sneddon 2002, Zeitoun and Warner 2006, Adnan 2013). Given this state of affairs, these actors in turn must be included from the outset in examinations of transboundary water crises and conflicts.

Returning to scale

River basins have been discursively engineered as natural, pre-existing hydrological units, putatively making them the optimal unit for efficient and sustainable management of water resources. However, critical scholarship on the politics of scale informs us that what is construed as the “natural” (*i.e.* river basins) is always-already the political. The choice of scale, then, is a political one, but “...by making recourse to Nature, the debate on river basin management is prematurely closed, as it rules out democratic deliberation on the desirable scales for water management” (Warner *et al.* 2008:123). The lack of democratic deliberation on desirable or appropriate scales for water management means that the choice of scale is typically a foregone conclusion. In the case of IWRM, the river basin is pre-established as the target for intervention. A parallel foreclosure of options and debate operates within prevailing policy and legal frameworks, where conflicts over transboundary rivers are already established as conflicts between riparian states.

However, IWRM and legalistic transboundary water governance schemes fail to account for the actions and influence of non-riparians. As I have shown in the foregoing

account, residents of southwestern Bangladesh suffer profoundly from hydrological hazards, which are commonly attributed (by actors within and outside of Bangladesh) to upstream water diversions and withdrawals in India (Chapter 4). Although India's water use impacts the socio-ecology of Bangladesh (particularly during the dry season), the activities of foreign aid agencies and multilateral banks in the country have received little attention in popular, policy or academic media. Feasible solutions to hydro-hazards will necessarily take into account not only the putatively "natural" geography of the river basin and the ostensibly "political" dynamics of co-riparians, but will also incorporate awareness of the frequently invisible—yet nevertheless palpable—actions and machinations of non-riparian actors.

Chapter 6 – Conclusion: The River-Border Complex as Method

Decades of intensive research have transformed the fields of border studies and transboundary water governance. Notions of national borders and transboundary water, in particular, have changed remarkably over time. For instance, “...rather than treating the concept of the border as a territorially fixed, static, line (as paradigmatically depicted by Mercator’s map), we begin thinking of it in terms of a series of practices” (Parker *et al.* 2009:586). Such bordering practices include surveillance, barrier construction, biometric data collection, selective filtering of humans and non-humans, territorial claims, and diverse legal categorizations of border crossers (tourists, migrants, citizens, smugglers, terrorists). Similarly, as our understanding of claims to and conflicts over transboundary water has evolved, so too have our conceptualizations of the resource itself. Transboundary water has been variously configured as a catalyst for conflict, a source of cooperation, a “fugitive” (unidirectionally mobile) resource, and as a virtual resource, among others (Chapter 1). Curiously, these two bodies of scholarship have not been brought into conversation to any appreciable degree, this despite the fact that transboundary water does not preexist national borders (see Chapter 2).

The mutual lack of engagement between these literatures has real effects. One unfortunate effect is that borders and transboundary waterbodies, such as international rivers, are understood to occupy separate domains of concern, both in practical and theoretical terms. As a result, border and river processes are analyzed separately within prevailing scholarship on international river issues, including trade, trafficking, fisheries, and navigation. Accordingly, flows of goods and people between countries are understood through the lens of border practices such as taxation and exclusion, while the

viability of fish migration and shipping routes are approached as functions of river flow volume and in-stream structures. The present work asserts that we can make yet more headway in our understanding of transboundary waters by examining how borders operate within and upon international rivers (*e.g.* the bordering of non-water river flows can amplify asymmetrical upstream-downstream relations between riparian states, see Chapter 3). Research on international rivers, in turn, can advance our theorization of borders by expanding our understanding of where and how they operate (*e.g.* flows of Bangladeshi people along the Ganges River create unique challenges for Indian border patrols, leading to new border security technologies, see Chapter 3). Indeed, there is demand for such theorization:

“The most immediate task for an approach to border studies that is to remain critically awake is to *extrapolate new border concepts, logics, and imaginaries that capture the changing perspective on what borders are supposed to be and where they may be supposed to lie*. Such concepts would be the fundamental plank of a critical border studies: that is to say, a border studies capable of illuminating the changing reality of borders...” (Parker and Vaughan-Williams 2009:583, emphasis added)

A second problematic effect of current framings of transboundary water and borders is the constraint on analytical scale. Widespread conceptions of the state or river basin as fixed, static, and pre-given have lead to a myopic condition in which decisions about the appropriate scale and/or unit of analysis in transboundary water governance are foreclosed (see Chapter 5). As such, water management schemes are directed at the scale of the river basin, while conflicts and claims over transboundary water resources are presumed to be limited to actors within a basin.

I have developed the concept of the river-border complex to address this critical gap in integrative research on rivers and borders. I defined the river-border complex as the network of individual agents (*e.g.* World Bank, hydraulic engineers), discrete events

(e.g. border demarcation, treaty ratification), and ongoing activities (e.g. data collection, aquaculture) that interact to structure water use and resource access within transboundary river contexts. To demonstrate some of the potential applications of this concept, I employed the river-border complex to answer two over-arching questions: Where do international rivers and borders intersect? How do they interact?

In formulating responses to these questions, I interrogated familiar, taken-for-granted assumptions about the nature of international rivers, upstream-downstream dynamics, cooperation, and relevant scale of analysis. These assumptions have generated a number of problematic outcomes. For instance, international rivers are conventionally understood as watercourses that cross national boundaries, while borders themselves are taken to be static and given – passive features over and across which riparian processes play out. Such simplistic understandings of international rivers ignore the ways in which international rivers and borders interact and constitute each other, and in so doing, also fail to acknowledge their historical and political contingency (Chapter 2). I have shown that the conflation of riparian position with political power produces understandings of particular asymmetrical riparian power dynamics as inevitable. In contrast, I combined emerging scholarship that regards borders as semi-permeable and mobile with a unique analysis of non-water flows to argue that uneven riparian dynamics are discursively and materially [re]produced and thus open to resistance and reconfiguration (Chapter 3). Cooperation is widely promulgated to address riparian conflicts, and treaties are regarded as a primary mechanism by which cooperation is enacted and achieved. However, by contrasting the *discrete event* of treaty ratification with the *ongoing activity* of treaty implementation, I highlighted some of the ways that treaties can both resolve and

engender conflict (Chapter 4). Finally, this work questions the conventional wisdom that disputes over international rivers solely exist between states co-located along a watercourse. In contrast, I identified a few of the ways that *non-riparian actors* can dramatically transform and structure water-related issues of access, use, and vulnerability to hazards while also highlighting that such actors currently lie outside the purview of transboundary water governance (Chapter 5).

Seeing without looking

Given the broad applicability of these findings, I expect the river-border complex to have relevance for transboundary river systems elsewhere. However, part of my intention in describing my process of discovery in southwestern Bangladesh (Chapter 5) was to demonstrate the fluidity of the river-border complex framework. Rather than advocate a predetermined unit of analysis (*e.g.* river basin) or set of actors (“stakeholders” within a river basin), I argue that the relevant “agents, events, and activities” of a given system must emerge from the particular context under consideration. In this way, the river-border complex serves as a method for *seeing* what entities and processes structure water access and use instead of *looking* for prespecified actors at predetermined scales, which runs the risk of missing the relevant drivers of conflict and crisis in transboundary river systems.

I intend to test the concept in two additional transboundary river systems: the Columbia River Basin in North America and the Red River Delta in Southeast Asia. The Pacific Northwest presents a complex environmental governance case in the Columbia River Estuary, a site where I previously conducted seabird foraging research in 2003. This is a fascinating and topical situation where regional economies of cargo shipping

and renewable energy production collide with conservation ethics regarding seabird extirpation and fishery viability. With over 200 large dams, the Columbia River system generates 44% of the total hydroelectric power used and produced in the United States. The lower stretches of the river's main stem serve as an indispensable shipping artery that connects the Port of Portland in Oregon with the Pacific Ocean. These two river uses, hydropower and commerce, have had compounding effects for decades on valuable and endangered salmon fisheries. While dams have long been known to impede salmon migration to breeding grounds, much less attention has been given to the role of maintaining the Columbia as a navigable channel.

Starting in the 1990s, Caspian terns and double-crested cormorants have been nesting on river islands formed through decades of accumulated dredge spoil. These artificial habitats have enabled the seabirds to form massive colonies of 7,400 and 13,000 breeding pairs, respectively, that decimate wild and hatchery juvenile salmonids as they migrate to sea. To remedy this situation, the U.S. Army Corps of Engineers recently proposed to shoot and kill 11,000 cormorants over a four year period (Lee 2015). Against this backdrop, the United States and Canada are currently deliberating whether or not to terminate a treaty signed in 1964 that regulates the development and operation of dams for power generation and flood control along the Columbia River. Although generally regarded as a success, significant economic gains resulting from the treaty have come at great social and environmental cost. In Chapter 3 of the dissertation, I complicated the idea of rivers as channels of water, instead drawing attention to non-water river flows. Similarly, through an examination of shipping, energy production, and wildlife management in the Columbia River Basin, I expect to resist the commonsense notion that

a river bed lies at the bottom of a river. Through the formation of dredge spoil islands, the river bed emerges out of the water surface to produce a new kind of landscape feature that has political and material implications for the lives of people, salmon, and seabirds.

The second case for my future research is situated in the Red River Basin in Southeast Asia. Here, too, competing and contested uses of the river underpin conflicts between riparian states. Popularly described since the time of French colonization as two rice baskets at opposing ends of a pole, Vietnam's socio-ecology is strongly structured by the fertile deltas of the Mekong River in the south and the Red River in the north. However, valuable rice production and fisheries in northern Vietnam are being threatened by large-scale industrial waste disposal and aggressive hydroelectric dam construction upstream in China. In Chapter 4, I problematized the notion that treaties resolve transboundary water conflicts. However, an additional weakness of the focus on treaties as solutions is that it presupposes a representative politics. In contrast to the Ganges and Columbia river systems where the polities in question putatively have representative governments, those of China and Vietnam are not democratically elected. Whereas the Ganges and Columbia River Basins are governed by treaties between democratically elected governments, the Red River Basin is not governed by a legal agreement, and the governments in question do not espouse a representative politics. The Red River therefore provides a fruitful point of contrast with these other river basins.

Like the Ganges, these cases sit at the confluence of several streams of thought including political ecology, conservation biology, resource governance, and indigenous rights, providing rich opportunities for examining synergistic interactions between rivers and borders.

Appendix A – Sample Interview Questions for Resource Users

Background questions:

Did you grow up here?

How long have you lived here?

How many members are in your household?

For how long have you worked as a [farmer, boat operator, fisherman]?

Do you have any other sources of income or ways of supporting yourself and/or your family?

If so, how much of the month/year do you spend doing that?

How do you feel about the water that you use in your work? [clean/dirty, too much/not enough, un/reliable, easy/hard to get]

What are the causes for the water being this way?

Farmers:

How many growing seasons do you plant/grow crops?

What crops do you grow?

Do you make enough to sell?

Where does your water come from?

How do you get this water?

How do you use it?

Fisherman:

During what seasons do you fish?

What kinds of fish do you catch?

What kind of equipment do you use?

Do you sell any of the fish you catch? If so, where?

How do you get it there?

Does the river ever become too dangerous to fish?

If so, what do you do? How do you respond?

Boat operators:

Do you work from your boat year-round?

If not, when do you not work from your boat, and why?

General investments:

What kinds of standard maintenance issues do you perform in your work?

How much have you spent in the past two years on repairing, replacing, or increasing your equipment (farm tools, fishing net, boat, etc.)?

Did you rely on any external sources of assistance (outside of the family) to pay for these things?

If yes, from where or from whom do you get financial help?

Floods:

Have you ever experienced a massive flood (*bonna*)?
 What did you experience? How did it affect you?
 What was the cause of the flood?
 How did you respond/recover?
 If another major flood were to strike, would you do the same things?
 If not, what would you do differently?
 Do you think you are especially at risk to floods?
 If so, then why?

Droughts:

Have you ever experienced drought?
 Please describe what happened. How did it affect you?
 What was the cause of the drought?
Farmers only --> How did you make up for the shortfall in water supply?
 How did you respond/recover? [help from friends/family, NGOs, government, picked up extra work, other]
 If another major drought occurs, would you do the same things?
 If not, what would you do differently?
 Do you think you are especially at risk of drought?
 If yes, then why?

General perceptions about water:

What is the most important issue regarding water that you face?
 What are the causes of this issue?
 Do you make this issue/problem known to anyone else? If so, who do you notify or complain to?
 Lots of people live along the river. Do you think that their activities affect you? Do you think they are aware of the water problems that you face?
 If not, why not?
 If so, where do you think they get this information?
 What difference, if any, do you think it would make to communicate/cooperate with other people who use the river water?

Appendix 2 – Raw Interview Data

ID	Location	Gender	Religion	Occupation	Status	Opinion of water
1	Khulna	Male	Hindu	Farmer	Wealthy	Not enough
2	Khulna	Male	Hindu	Farmer	Small holder	Not enough
3	Khulna	Male	Muslim	Land laborer	Landless	Good
4	Khulna	Female	Hindu	Farmer	Small holder	Fe and salt
5	Khulna	Female	Hindu	Land laborer	Landless	Not enough; Fe
6	Khulna	Male	Hindu	Boatman	Boat owner	Hazardous
7	Khulna	Male	Hindu	Boatman	Boat owner	Salty
8	Khulna	Male	Hindu	Boatman	Unknown	Reduced river depth
9	Khulna	Male	Hindu	Boatman	Unknown	No reply
10	Khulna	Male	Hindu	Fisherman	Unknown	Salty
11	Khulna	Male	Hindu	Fisherman	Unknown	Salty
12	Khulna	Male	Hindu	Fisherman	Unknown	Flood, salinity
13	Khulna	Male	Hindu	Fisherman	Unknown	Hazardous
14	Khulna	Male	Hindu	Fisherman	Unknown	Low level, salty
15	Khulna	Male	Hindu	Fisherman	Unknown	Increased erosion
16	Khulna	Male	Hindu	Fisherman	Unknown	Fewer fish
17	Khulna	Male	Hindu	Fisherman	Unknown	Salty
18	Khulna	Male	Hindu	Farmer	Wealthy	Limited to rainwater
19	Khulna	Male	Hindu	Farmer, trader	Leases land, owns a boat	Salty
20	Khulna	Male	Hindu	Farmer	Land owner	Salty
21	Khulna	Male	Hindu	Farmer	Small holder	Salty
22	Khulna	Male	Hindu	Boatman	Owens boat	Hazardous; salty
23	Khulna	Male	Hindu	Boatman	Owens boat	Hazardous
24	Khulna	Male	Muslim	Farmer	Land owner	Salty

ID	Location	Gender	Religion	Occupation	Status	Opinion of water
25	Khulna	Male	Hindu	Farmer	Leases land	Limited access
26	Khulna	Male	Muslim	Farmer, fisherman	Leases land	Limited access
27	Khulna	Male	Muslim	Farmer	Wealthy	Limited access
28	Khulna	Male	Muslim	Shrimp farmer and farm broker	Wealthy	Good
29	Khulna	Male	Muslim	Fisherman	Unknown	Reduced river depth; fewer fish
30	Khulna	Male	Muslim	Fisherman	Unknown	Reduced river depth; fewer fish
31	Khulna	Male	Hindu	Farmer, fisherman	Wealthy	Poor supply; polluted
32	Khulna	Male	Muslim	Fisherman, farmer	Poor	No reply
33	Khulna	Male	Muslim	Fish broker	Poor	Fewer fish, high salinity
34	Khulna	Male	Muslim	Boatman	Wealthy	Hazardous; polluted
35	Khulna	Male	Muslim	Boatman	Wealthy	Hazardous
36	Rajshahi	Male	Muslim	Fisherman, farm laborer	Poor	Turbid
37	Rajshahi	Male	Muslim	Boatman	Unknown	Hazardous
38	Rajshahi	Male	Muslim	Fisherman, boatman	Unknown	Variable water levels
39	Rajshahi	Male	Muslim	Boatman	Owens boat	Chars, erosion
40	Rajshahi	Male	Muslim	Fisherman, farmer	Unknown	Turbid; hazardous
41	Rajshahi	Male	Muslim	Fisherman	Unknown	Reduced river depth; fewer fish
42	Rajshahi	Male	Muslim	Fisherman	Poor	Shifting river
43	Rajshahi	Male	Muslim	Fisherman	Unknown	River drying up
44	Rajshahi	Male	Muslim	Fisherman	Unknown	Hazardous
45	Rajshahi	Male	Muslim	Boatman	Unknown	No opinion
46	Rajshahi	Male	Hindu	Fisherman	Unknown	Reduced river depth

ID	Location	Gender	Religion	Occupation	Status	Opinion of water
47	Rajshahi	Male	Hindu	Fisherman	Unknown	Reduced river depth
48	Rajshahi	Male	Muslim	Fisherman	Unknown	Silt deposition, char formation
49	Rajshahi	Male	Muslim	Fisherman	Unknown	Fewer fish
50	Rajshahi	Male	Muslim	Fisherman	Unknown	Silt deposition, char formation
51	Rajshahi	Male	Muslim	Boatman	Owens boat	Silt deposition, char formation
52	Rajshahi	Male	Muslim	Farmer	Small holder	River drying up, char formation
53	Rajshahi	Male	Muslim	Farmer	Small holder	River drying up
54	Rajshahi	Male	Muslim	Farmer	Unknown	Not enough
55	Rajshahi	Male	Muslim	Farmer	Leases land	River drying up
56	Rajshahi	Male	Muslim	Farmer	Unknown	River drying up
57	Rajshahi	Male	Muslim	Farmer	Leases land	High Fe content
58	Rajshahi	Male	Muslim	Farmer	Wealthy	Reduced river depth
59	Rajshahi	Male	Muslim	Farmer	Landless	Good
60	Rajshahi	Male	Muslim	Farmer	Small holder	No opinion
61	Rajshahi	Male	Muslim	Farmer	Small holder	Good
62	Rajshahi	Male	Muslim	Farmer	Unknown	Good
63	Rajshahi	Male	Muslim	Farmer	Leases land	River drying up

ID	Reason(s)	# of seasons	Water source	Use	Outside help?	If help, from where?
1	Saline water & siltation	2	Ponds	Irrigation	N	N/A
2	Saline river water	2	River	Irrigation	Y	Loan from rich people
3	Deep tube well	2	Groundwater, canal when not saline	Irrigation	Y	Government allowances
4	Shallow tube well, water layer absent	2	Ponds	Irrigation	N	N/A
5	Ponds are private	2	Canal, pond	Irrigation	Y	Loan from rich people
6	Strong currents during monsoon	4	River	Navigation	Y	Loan from committee
7	Seawater intrusion	4	River	Navigation	Y	Loan from committee
8	Farakka Barrage	4	River	Navigation	N/A	N/A
9	N/A	4	River	Navigation	Y	Loan from committee
10	Seawater intrusion	2	River	Fishing	Y	Loan from committee
11	Farakka Barrage	4	River	Fishing	N	N/A
12	Heavy rainfall, saltwater intrusion	4	River	Fishing	Y	Loan from committee
13	Storms, floods	2	River	Fishing	Y	Loan from committee
14	No reply	2	River	Fishing	Y	Loan from committee
15	More large boat traffic (steamers, trawlers)	4	River	Fishing	Y	Loan from rich people
16	Doesn't know	4	River	Fishing	N	N/A
17	Nature	4	River	Fishing	Y	Loan from committee or rich people
18	Other water is saline	1	Rain	Irrigation	N	N/A
19	Proximity to ocean	1	Rain	Irrigation	N	N/A
20	Proximity to ocean	1	Rain	Irrigation	Y	Loan, source not specified

ID	Reason(s)	# of seasons	Water source	Use	Outside help?	If help, from where?
21	Proximity to ocean	1	Rain & river water	Irrigation	Y	Loan from rich people
22	Storms; proximity to ocean	4	River	Navigation	Y	Loan from rich people
23	More storms and floods due to climate change	4	River	Navigation	Y	Loan from committee
24	Shallow tube well	2	River	Irrigation	Y	Loan from rich people
25	Influential people	2	River	Irrigation	N	N/A
26	Influential people	1	River	Irrigation	N	N/A
27	Shrimp farmers, muscle men	2	Rain & river water	Irrigation	N	N/A
28	He is a wealthy shrimp farmer	2	Rain & river water	Irrigation	N	N/A
29	Embankments cause river bed siltation; fewer fish due to use of nets and seawater intrusion/ increased salinity	2	River	Fishing	N	N/A
30	River pollution kills fish	4	River	Fishing	Y	Loan from committee and NGO
31	Poor sluice gate management because of shrimp farms; industrial waste from the city	3	River	Fishing	Y	Loan from committee
32	N/A	2	River	Fishing	Y	Loan from committee
33	Embankments and seawater intrusion	4	River	Fishing	N	N/A
34	Storms, floods, river erosion; industrial waste	4	River	Navigation	Y	Loan from committee

ID	Reason(s)	# of seasons	Water source	Use	Outside help?	If help, from where?
35	Storms	4	River	Navigation	N	N/A
36	Monsoon rains	4	River	Fishing	Y	Loan from NGO
37	Monsoon, India releasing water	4	River	Navigation	Y	Loan, source not specified
38	Seasonal rain	3	River	Fishing	N	N/A
39	Doesn't know	4	River	Navigation	Y	Loan from NGO
40	Monsoon rains bring silt from India; storms	3	River	Fishing	N	N/A
41	Farakka Barrage	4	River	Fishing	Y	Loan from NGO
42	Erosion	4	Ponds	Fishing	N	N/A
43	Farakka Barrage	4	River	Fishing	Y	Loan for fish trade
44	Monsoon season	3	River	Fishing	N	N/A
45	N/A	4	River	Navigation	N	N/A
46	Silt deposition	4	River	Fishing	N	N/A
47	Silt deposition due to Farakka Barrage	3	River	Fishing	Y	Loan from NGO and rich people
48	Farakka Barrage	4	River	Fishing	Y	Loan from NGO
49	Insufficient rain during monsoon	4	River	Fishing	Y	Loan from NGO
50	Farakka Barrage	4	River	Fishing	Y	Loan from NGO
51	Doesn't know	4	River	Navigation	Y	Family arranges money
52	Farakka Barrage	1	Groundwater	Irrigation	N	N/A
53	Farakka Barrage	1	Groundwater	Irrigation	N	N/A
54	Heat of the sun	1	Groundwater	Irrigation	N	N/A
55	Farakka Barrage	3	River	Irrigation	Y	Loan from NGO
56	Farakka Barrage	3	River	Irrigation	N	N/A

ID	Reason(s)	# of seasons	Water source	Use	Outside help?	If help, from where?
57	Deep tube well	3	Groundwater	Irrigation	Y	Loan from NGO
58	Farakka Barrage	3	River, groundwater, rain	Irrigation	N	N/A
59	Barendra project	3	River	Irrigation	N	N/A
60	N/A	3	Groundwater	Irrigation	N	N/A
61	Barendra project	3	River	Irrigation	Y	Loan from NGO
62	Barendra project	2	River	Irrigation	N	N/A
63	India holding back water	3	River	Irrigation	Y	Loan from NGO

ID	Flood comments?	Drought comments?	General	Complain?	Experience/observe impacts from others' water use?
1	Y	Y	Y	Y	Y
2	Y	Y	Y	Y	Y
3	Y	Y	Y	Y	NA
4	Y	Y	Y	Y	N
5	Y	N	Y	Y	N
6	Y	N	Y	N	Y
7	Y	N	Y	NA	N
8	Y	N	Y	N	N
9	Y	N	Y	N	Y
10	Y	Y	N	NA	NA
11	Y	Y	Y	N	Y
12	Y	Y	Y	Y	Y
13	Y	Y	Y	N	N
14	Y	Y	Y	N	N
15	N	Y	Y	NA	N
16	Y	N	Y	Y	N
17	Y	N	Y	NA	NA
18	Y	Y	Y	Y	NA
19	N	N	Y	N	NA
20	Y	Y	Y	NA	Y
21	Y	Y	Y	N	Y
22	Y	N	Y	N	N
23	Y	Y	Y	N	N
24	Y	Y	Y	NA	Y

ID	Flood comments?	Drought comments?	General	Complain?	Experience/observe impacts from others' water use?
25	N	N	Y	Y	N
26	N	Y	Y	Y	N
27	Y	Y	Y	Y	N
28	N	Y	N	NA	NA
29	Y	N	Y	N	Y
30	Y	N	Y	N	Y
31	Y	Y	Y	NA	Y
32	Y	N	Y	NA	N
33	Y	Y	Y	N	Y
34	Y	Y	Y	NA	Y
35	Y	Y	Y	NA	N
36	N	N	N	NA	NA
37	Y	N	Y	N	Y
38	Y	N	Y	N	N
39	Y	Y	Y	Y	Y
40	N	Y	Y	N	NA
41	Y	Y	Y	Y	Y
42	Y	N	Y	NA	NA
43	Y	N	Y	N	N
44	N	N	Y	N	Y
45	N	N	N	N	NA
46	Y	Y	Y	Y	N
47	Y	Y	Y	NA	N
48	Y	Y	Y	N	Y
49	N	Y	Y	N	Y

ID	Flood comments?	Drought comments?	General	Complain?	Experience/observe impacts from others' water use?
50	Y	Y	Y	N	Y
51	N	Y	Y	Y	NA
52	Y	N	N	NA	NA
53	Y	N	N	NA	NA
54	Y	Y	Y	N	NA
55	N	N	Y	N	Y
56	Y	Y	Y	N	Y
57	Y	N	Y	NA	Y
58	N	N	Y	N	Y
59	N	N	Y	N	NA
60	N	N	Y	N	Y
61	N	N	Y	N	NA
62	N	N	Y	NA	NA
63	N	N	Y	N	Y

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