Bangladesh: Lowest Riparian with the Most to Lose, Strongest Advocate of Basin-Wide Management

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Chapter summary

- Bangladesh faces its greatest potential threat on the Brahmaputra River from upper riparian activities, but its most immediate threats stem from internal challenges. The country's capacity constraints, dense population, and high dependence on external water sources exacerbate the effects of Brahmaputra riverbank erosion, flooding, and diminished dry season water flow and groundwater availability.

- As the lowest riparian in the Brahmaputra basin, Bangladesh is most at risk from the cumulative impacts of India's and China's self-interested river management, which shows little concern for the downstream ecosystem. India's planned River-Linking Project; the failed 2011 Teesta River accord, including current diversions of this Brahmaputra tributary; and India's consumption of Ganges River resources and the resulting lower dry-season flows and salinity intrusion are all regarded by Bangladesh as a cautionary precedent for what may happen with the Brahmaputra. Although China's dam building and lack of transparency also worry Bangladesh, Dhaka's fraught relations with New Delhi raise more complex and proximate concerns.

- There are, however, factors that mitigate some of Bangladesh's external fears. For example, both India and China share seasonal water flow and rainfall data to aid Bangladesh with flood forecasting. Also, under Prime Minister Narendra Modi, relations between India and Bangladesh have been reinvigorated, and both countries are optimistic that the Teesta agreement will be signed in 2016.

- As a capacity-constrained state that has long promoted multilateral approaches to augment its power, Bangladesh is the strongest advocate among the three key Brahmaputra riparians for cooperative multilateral management and development of the basin. It faces the greatest threat from the poor practices of upstream countries and has the most to gain from improved river management. Furthermore, Dhaka believes that multilateral cooperation would help produce much-needed regional economic integration with beneficial results for all three countries.

Introduction

Water is aptly characterized as "Bangladesh's blessing and curse":[188] Bangladesh gets too much water during the rainy season (June to October), resulting in flooding; and it gets too little water during the dry season (November to May), resulting in droughts. Flooding and droughts contribute to riverbank erosion, agricultural disruption, and migration. To give outsiders a sense of the landscape in Bangladesh, one water expert remarks, "The whole ecosystem of Bangladesh is water-based."[189] The confluence of three major rivers (Brahmaputra, Ganges, and Meghna) occurs in Bangladesh. Roughly 90 percent of the river catchment area for the country comes from outside its borders.

Although only 8 percent of the 580,000-square-kilometer basin area of the Brahmaputra is in Bangladesh,[190] it is Bangladesh's largest water system, followed by the Ganges, then the Meghna. The Brahmaputra annually provides approximately 65 percent of the country's river water. Upon entering Bangladesh from India's Assam state, the Brahmaputra is called the Jamuna[191] and travels through eastern Rangpur division.[192] It forms the boundary between Mymensingh and Dhaka divisions and Rajshahi division. See Figure 9 for a map of Bangladesh's river geography.

[188] International Rivers, "Bangladesh," https://www.internationalrivers.org/campaigns/bangladesh.

[189] CNA interview, Dhaka, 2015.

[190] South Asia Water Initiative, "Brahmaputra Focus Area Strategy: 2013-2017," 2015.

[191] The Brahmaputra is known as the Jamuna in Bangladesh. For consistency, this report uses the term "Brahmaputra" to identify the river throughout the basin.

[192] In India, the administrative level beneath national governance in India is the state, and in China it is the province. In Bangladesh, this level is called the "division."

Figure 9. Brahmaputra in Bangladesh

Source: Map drawn by Mike Markowitz, CNA, 2016. Composite relying on d-maps, "Bangladesh," http://www.d-maps.com/pays.php?num_pay=71&lang=en.

After it leaves India, the Brahmaputra runs for nearly 250 kilometers (or about 150 miles) through Bangladesh, before connecting with the Ganges River,[193] which empties into the Bay of Bengal through the Meghna River. The Teesta River—which is a tributary of the Brahmaputra and the cause of a heated political dispute between Bangladesh and India—crosses the northern Rangpur division before it merges with the Brahmaputra. The Teesta River is significant because a water-sharing agreement was drafted but not signed in 2011, which would have been only the second water-sharing agreement between the two countries.

[193] The Ganges is known as the Padma in Bangladesh. For consistency, this report uses the term "Ganges" to identify the river throughout the basin.

This chapter considers the Brahmaputra basin from Bangladesh's perspective. It is organized into three sections. The first begins at the domestic level of analysis by seeking to understand the predominant perceptions of internal challenges and threats in Bangladesh. The second section moves to the bilateral level of analysis by examining Bangladesh's perceptions of external threats from India and China. Both sections consider the factors that exacerbate these challenges at the domestic and bilateral levels. The third section examines the potential opportunities for multilateral cooperation that exist despite current obstacles.

Domestic analysis: The primacy of Bangladesh's internal challenges

This section examines Bangladesh's main concerns about water security as they apply specifically to the Brahmaputra. Overall, Bangladesh is more focused now on the Ganges basin than on the Brahmaputra basin, due to India's consumption of water resources from the Ganges River and the downstream impacts that are evident in southwestern Bangladesh.[194] Nevertheless, the Brahmaputra is still an important source of concern given the implications for the management of this largest source of water resources for Bangladesh. While much public discussion analyzes Dhaka's perceptions of threats emanating from India and China on the Brahmaputra, this section sets those issues aside and focuses instead on the many challenges that confront Bangladesh domestically in this river basin. These internal challenges raise the most immediate problems for Dhaka to address.

Internal challenges on the Brahmaputra

Riverbank erosion

The Brahmaputra is generally seen as a young river that "has yet to take its shape."[195] In fact, there is a separate segment of the Brahmaputra in Bangladesh known as the Old Brahmaputra that was created when the river changed its course in the late 18th or early 19th century,[196] likely due to an earthquake. Today, riverbank erosion is

[194] CNA interviews, Dhaka, 2015; Gareth Price et al., *Attitudes to Water in South Asia*, Chatham House, London: Royal Institute of International Affairs, Jun. 2014, 22, 24, 51.

[195] CNA interview, Dhaka, 2015.

[196] Richard F. Nyrop et al., *Area Handbook for Bangladesh*, DA Pam 550-175, Washington: Foreign Area Studies of the American University, 1975, 62.

particularly stark along the Brahmaputra and is a modern reminder of the river's continually changing geography.[197]

Riverbank erosion commonly occurs in the rainy season, due to high water flows and the natural process of the braided river. In particular, land in Kurigram and Gaibandha districts on the west bank and in Jamalpur on the east bank of the Brahmaputra is being lost as riverbanks collapse. Floods exacerbate this problem and entail severe impacts on human security; erosion renders an estimated 10,000-20,000 families homeless in Bangladesh every year.[198] Many have had to rebuild their homes, in some cases multiple times, due to erosion.[199] (See Figure 10 for a detailed subnational view of the Brahmaputra's course through Bangladesh.)

[197] A study by Bangladesh's Center for Environmental and Geographic Information Services found the effect of riverbank erosion increased the Brahmaputra's width from 8.5 km in 1973 to 12.2 km in 2009. A measurement in October 2015 found that the river was roughly 15 km wide at the time. Sources: Abu Bakar Siddique, "Historic Chilmari Port Disappears," *Dhaka Tribune*, Aug. 9, 2014; CNA interview, Dhaka, 2015.

[198] Quamrul lslam Siddique, "Integrated Water Resource Management in the Ganges, Brahmaputra, and Meghna River Basins in South Asia: Prospects and Challenges," Workshop on 'Policy Priorities for Sustainable Mountain Development' organized by the International Centre for Integrated Mountain Development (ICIMOD) in Nepal, Sep. 18-20, 2006, http://qisiddique.com/article.php; Bangladesh Water Development Board, cited in Abu Bakar Siddique, "Bangladesh to Tame Brahmaputra with Concrete Embankments," The Third Pole.net, Jun. 2, 2015.

[199] Abu Bakar Siddique, "Brahmaputra Erosion Hits People's Livelihood Hard," *Dhaka Tribune*, Oct. 26, 2013.

Figure 10. Brahmaputra in Bangladesh: The subnational view (by divisions and districts)

Source: Map drawn by Mike Markowitz, CNA, 2016. Composite relying on Wikitravel, "Bangladesh regions," http://wikitravel.org/upload/shared/archive/c/c8/20080824191509!Bangladesh_regions_map.svg; d-maps, "Bangladesh," http://www.d-maps.com/pays.php?num_pay=71&lang=en.

With impacts on people's homes, land, and livelihoods in Bangladesh, riverbank erosion on the Brahmaputra hurts the retention of local culture, provokes local protest,[200] and disrupts families, such as through the migration of males to find work elsewhere in the country. Many go to Dhaka—the most densely populated city in the world—thereby intensifying national challenges.

Flooding

As devastating as floods can be, they are not necessarily unwelcome in Bangladesh. Flooding provides much-needed replenishment of the soil—a process that benefits agriculture. However, Bangladesh's inability to accurately forecast heavy floods beyond three days in advance and its lack of water storage capacity have damaged or destroyed people's livelihoods and property. Reduced sanitation and educational resources are secondary impacts of flooding, especially in the *chars* (river islands). The Brahmaputra is the major cause of flood disasters in Bangladesh. In 2007, it reportedly "burst its banks" twice, killing 600 people and destroying crops in roughly 39 of Bangladesh's 64 districts.[201]

Diminished water flow in the dry season

Bangladesh as a whole sees wide pendulum swings from flooding to drought—all in the course of a year. Whereas reduced water flows in the Ganges have resulted in salinity intrusion and thus decreased cultivable land and fish stocks, water shortages from the Brahmaputra by comparison are not a major source of immediate concern. Nevertheless, Bangladesh is increasingly nervous about trends in the Ganges and their implications for the future supply of Brahmaputra resources in the dry season.

The Brahmaputra is Bangladesh's largest source of water and provides about 75 percent of its total water resources in the dry season.[202] Bangladesh needs nearly all of this water in the dry season to fulfill its national water resource requirements, such as irrigation and flushing out salinity.[203] After the Brahmaputra enters Bangladesh at Bahadurabad, the average monthly flow of the river during the rainy season (from June to October) is 1.3 million cubic feet per second (cusecs). By contrast, during the dry season (from November to May), the average monthly

[200] See the following Kurigram newspaper story for a picture of a human chain protesting insufficient official attention to the preservation of Chilmari Port: Abdul Wahed, "Human Chain Held to Protect Chilmari Port from Erosion in Kurigram," *Kurigram News*, Oct. 2, 2010.

[201] "Bangladesh: Precarious Lives of River Island Dwellers," IRIN, Mar. 18, 2008.

[202] CNA interview, Dhaka, 2015.

[203] Ibid.

minimum flow is 157,000 cusecs; yet, Bangladesh requires about 210,000 cusecs from the Brahmaputra to meet its national flow requirements.[204]

A critical requirement for the Brahmaputra in Bangladesh is pushing back the salinity that creeps up from the Bay of Bengal coastline. Essentially, decreases in Brahmaputra flow directly translate into increases in salinity. Whereas the Ganges is increasingly not providing enough water to repel saltwater intrusion in southwest Bangladesh, at present the southeast coastline of Bangladesh is protected due to freshwater supply from the Brahmaputra. Yet, Bangladesh sees the impact of the diminished flow of the Ganges on the salinity of the southwest coastline and worries about the negative implications of diminished flows of the Brahmaputra for the south-central and southeast coast.

Diminished groundwater availability in dry season

In terms of agriculture, the Brahmaputra is the main source of groundwater for Bangladesh during the dry season. Rice is a water-dependent crop, and Boro rice is cultivated in the dry season, with 80 percent of it grown using groundwater irrigation.[205] Northwest Bangladesh already has a problem with declining groundwater levels, because Brahmaputra water is being extracted by tube wells at a rate faster than it is being recharged.[206] Despite NGO adaptation activities,[207] farmers are not taking significant action to shift their crops away from rice cultivation and remain vulnerable to reduced groundwater availability in the dry season, which increases the threat of food insecurity for Bangladeshi citizens.[208] National government policy does not appear to be incentivizing farmers to effect meaningful change in agricultural and irrigation practices.

Fisheries also depend mostly on groundwater in the dry season, but fishermen are seeing diminishing availability of this resource.[209] A factor compounding this problem is the amount of arsenic that naturally occurs in the soil throughout Bangladesh: it is contaminating the dwindling supplies of groundwater and reducing

[204] CNA is grateful to a government official for kindly providing these data, 2016.

[205] CNA interview, Dhaka, 2015.

[206] "Bangladesh: 'Invisible Hazard' of Groundwater Depletion," IRIN, Dec. 13, 2011.

[207] NGO activities in Bangladesh are trying to help farmers adapt to diminishing availability of groundwater by encouraging the growth of maize and sunflower, which consume one-fifth of water demand and reap higher profits than rice, for example. CNA interview, Dhaka, 2015.

[208] National Research Council, Himalayan Glaciers: Climate Change, Water Resources, and Water Security, Washington, D.C.: The National Academies Press, 2012, 73, doi:10.17226/13449.

[209] CNA interviews, Dhaka, 2015.

water quality.[210] Another factor that hurts freshwater fish stocks in the low land and flood plains of the Brahmaputra basin is farmers' use of pesticides.

Factors that exacerbate Bangladesh's domestic challenges concerning the Brahmaputra

Several factors exacerbate Bangladesh's difficult domestic situation. These factors are not specific to the Brahmaputra itself, but form the context of vulnerability in Bangladesh's policy outlook. This section examines a handful of those stressors.

Growing, dense population

Of the three riparian countries studied in this report, Bangladesh is the most densely populated. In fact, it is one of the most densely populated countries in the world. Notwithstanding successful policies that have managed high rates of population growth since independence, Bangladesh has a population of nearly 170 million people, making it the eighth most populated country in the world.[211] More than 15 million people live in the capital, Dhaka, which is the densest urban area in the world, with approximately 112,700 people per square mile.[212] Clearly, rising populations require considerable water resources, especially in the context of environmental pressures.[213] While a constellation of factors motivate people to migrate, Bangladesh has seen internal migration of many citizens to Dhaka and elsewhere in the country when fishermen and farmers lose their livelihoods due to water stress and salinity intrusion impacts in the southwestern part of the country (i.e., the Ganges basin).[214] They often become day laborers and rickshaw drivers. Challenges regarding Brahmaputra water flows are likely to continue exacerbating overall population and migration trends in Bangladesh.

[210] Sara V. Flanagan et al., "Arsenic in Tube Well Water in Bangladesh: Health and Economic Impacts and Implications for Arsenic Mitigation," *Bulletin of the World Health Organization*, Sep. 14, 2012.

[211] CIA, "Country Comparison: Population," *The World Factbook*, July 2015.

[212] Dhaka has a population of 15,669,000 and a density (people per square mile) of 112,700. See data from *Demographia World Urban Areas: 11th Annual Edition: 2015* cited in Shane Croucher, "UN World Population Day 2015: These Are the 10 Most Densely Populated Cities on the Planet," *International Business Times*, Jul. 11, 2015.

[213] David Michel and Ricky Passarelli, "Conflict Basins: Powderkegs to Peacepipes," *SAIS Review of International Affairs* 35, No. 1 (Winter-Spring) 2015: 145.

[214] CNA interview, Dhaka, 2015.

Adverse natural circumstances and climate change

In addition to human pressures on resources, Bangladesh faces adverse environmental conditions. The country is prone to natural disasters, and climate change renders Bangladesh vulnerable due to its low-lying geography. Bangladesh is one of the "20 countries and regions most at risk"—and the only Asian country on this list—according to the Intergovernmental Panel on Climate Change (IPCC), the top international authority on climate change.[215] Adding to these environmental impacts, the IPCC finds with "very high confidence" that climate change produces socioeconomic impacts: specifically, it tends to "further entrench poverty."[216] The IPCC also projects that as many as 27 million Bangladeshi citizens could be at risk from sea level rise due to climate change by 2050. While sea level rise is generally considered to be a serious threat facing Bangladesh (especially in the Ganges River basin and coastal areas),[217] its impact will be magnified if the Brahmaputra's flows are reduced in the dry season and cannot help flush out salinity intrusion.

Capacity constraints

Despite a strong economic growth rate of roughly 6 percent annually, Bangladesh has the lowest gross domestic product (GDP) of the three riparian countries in this study. Although in mid-2015 the World Bank elevated Bangladesh from a low-income to a lower-middle income country, it lacks sufficient water management facilities (e.g., water storage in the dry season) and bureaucratic coherence to address its water problems. Considering how often floods occur and the country's flat terrain, Bangladesh needs better storage capacity solutions for excess water so that it can use the resource in the dry season. Furthermore, interagency coordination—for example, between the Ministry of Water Resources, the Ministry of Shipping, the Bangladesh Inland Water Transport Authority, and the Power Division—is reportedly difficult to achieve.[218]

[215] L. Olsson et al., "Livelihoods and Poverty," in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Impacts*, Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, edited by C.B. Field et al., Cambridge, UK, and New York, NY: Cambridge University Press, 2014, 810.

[216] Ibid.

[217] Susmita Dasgupta et al., "River Salinity and Climate Change: Evidence from Coastal Bangladesh," World Bank Group, WPS6817, Mar. 2014.

[218] CNA interview, Dhaka, 2015.

Bilateral analysis: India and China pose the greatest, but not most imminent, threats

At present, India and China do not appear determined to construct storage dams or divert the flow of the Brahmaputra River away from Bangladesh.[219] However, any reductions in water quality and flow from India and China will affect Bangladesh, especially in the dry season, and with cumulative effects on the country. Bangladesh views the two upper riparians—especially India—as problematic regarding its own water security, although the current upswing in bilateral relations with India under the Modi administration has mitigated some of Bangladesh's immediate fears.

Bangladesh-India: The view from Bangladesh

Sharing a history and a border with India has resulted in difficult bilateral ties due to disputes over territory, border crossings, immigration, and insurgencies. Bangladesh is surrounded by India on three sides and perceives itself as vulnerable on water security as on much else. Of the 57 rivers that enter Bangladesh, 54 come from India.[220] There is a water-sharing agreement on only one—the Ganges River. A much anticipated agreement on the Teesta and Feni Rivers failed to be concluded at the last minute in 2011 due to domestic politics in New Delhi, leaving a bad impression in Dhaka. This outcome reinforced Bangladeshis' view of India as an overbearing "big brother" in terms of its overall disposition and water management practices. Furthermore, the bilateral Joint Rivers Commission (JRC)—the only mechanism through which data sharing can be negotiated—is often criticized as being "in effect, two parallel national river commissions, instead of one joint commission."[221]

Beyond water disagreements, Bangladesh has had a complex relationship with India, believing that it exerts excessive influence on Dhaka's policies due to its dominance in the region.[222] As a result, the politicization of issues involving India has a long history in Bangladesh. There is a common view of India as representing the worst threat, given Bangladesh's geography vis-à-vis India. Particularly before the Modi

[219] For India's perspectives on the Brahmaputra, see the India chapter for this project by Satu Limaye. For China's perspectives, see the China chapter by Joel Wuthnow.

[220] The other three rivers come from Myanmar.

[221] Sundeep Waslekar, "India-Bangladesh Roundtable on Blue Peace in the Eastern Himalayas," Strategic Foresight Group, Jul. 1-2, 2013.

[222] Nilanthi Samaranayake, *The Long Littoral Project: Bay of Bengal—A Maritime Perspective on Indo-Pacific Security*, CNA, Sep. 2012, 29.

administration entered office, Dhaka felt that India's Border Security Force was being heavy-handed towards Bangladeshi citizens when policing the porous border.

Difficult bilateral relations have often been exacerbated by polarized domestic politics in Bangladesh, which are often depicted through a lens of either "pro-India" leadership (i.e., Sheikh Hasina of the Awami League) or "anti-India" leadership (i.e., Khaleda Zia, former prime minister and current opposition leader of the Bangladesh Nationalist Party). In addition, even those whose disposition may not necessarily be anti-India harbor doubts about New Delhi's ability to influence the water policies of Indian states—the result of which works against Bangladesh's interests.

The strongest evidence to support this view is that in 2011 Indian prime minister Manmohan Singh went to Bangladesh to sign the proposed Teesta water-sharing agreement but was unable to do so because he had failed to secure support from West Bengal chief minister Mamata Banerjee. This event subsequently hurt bilateral relations, including greater economic cooperation. At the time, Dhaka linked the Teesta pact with progress on giving New Delhi long-sought full transit rights across Bangladesh so that India can access its landlocked northeastern states.

Against this larger context and the importance of water resources as an issue in Bangladesh, a lack of effective water cooperation was a major hindrance to improving bilateral relations in the final years of the Singh administration. Under Modi, the relationship has been reset to some degree; progress has been seen in areas outside water management, such as the conclusion of a historic land boundary agreement and progress in power cooperation. Still, Bangladesh has concerns about India's current management of water resources in view of downstream impacts and future plans. Specifically, three issues have largely contributed to Bangladesh's perceptions of India as a threat: India's river-linking project, the failed Teesta agreement and diversions, and India's withdrawals from the Ganges River basin.

Threat perceptions

India's river-linking project

The prospect of India diverting rivers, specifically through its river-linking project (RLP), is what Bangladesh sees as the greatest potential threat to its own water security in the Brahmaputra. The RLP seeks to increase India's internal water security by connecting rivers with surplus river flow to those with deficit flow in order to guarantee optimal flow of water within India.[223] Based on CNA interviews and water security literature, Bangladesh is far more concerned about the RLP than it is about the possibility of water diversion by China. Specifically, Bangladesh fears India's

[223] For India's perspectives on the RLP, see the India chapter by Satu Limaye.

diversion of the Manas and Sankosh Rivers in the Brahmaputra would mean diversion of resources from the Brahmaputra basin to the Ganges basin. CNA interviews in Bangladesh found consensus that this project, if achieved, would be catastrophic to the country's water supply, the biodiversity of its already fragile ecosystem, and agriculture and fish stocks, while raising the potential for drought.

Even though India does not have immediate plans to implement the RLP in the Brahmaputra basin, the logistics of completing the RLP are daunting given the sheer engineering feat that would be required to divert rivers on such a wide geographic scale. In the words of one Bangladeshi water expert, India's RLP represents a "Herculean task."[224] In addition to the sheer logistical challenge, domestic water politics in India are difficult because even states are at odds with each other. Thus, gaining support from all stakeholders within India would delay the full implementation of this project.

Despite the low likelihood of India carrying out the RLP in the Brahmaputra in the near future, there are reasons for the salience of this threat in Bangladesh. First, Bangladesh's often difficult relationship with India heightens this baseline sense of concern. Second, Dhaka believes that India has previously acted against Bangladesh's interests with regard to water supplied through Indian barrages in the Ganges and Teesta Rivers and may do so again under the RLP. See Figure 8 in the India chapter of this project for a map of the RLP.[225]

As of 2016, India has made little progress on this effort. In fact, the previous Congress Party government was seen to have let the RLP stall because it was proposed under the previous BJP government. However, Bangladesh sees the current BJP government as being more determined to pursue this project. In fact, there has been some modest movement of the RLP under the Modi administration, albeit outside the Brahmaputra basin. In September 2015, the Godavari and the Krishna Rivers were finally linked in Andhra Pradesh. Rivers in Madhya Pradesh and Uttar Pradesh are the next targets of the RLP. As a result, Bangladesh's concerns are high, and most respondents believe that India will eventually carry out the RLP.

Teesta: Failed agreement and current diversions

Unlike the Indian RLP, which represents a potential threat, diversions of the Teesta River in India are of current concern to Bangladesh. A tributary of the Brahmaputra, the Teesta River begins in India's Sikkim state, traverses West Bengal state, then flows across Rangpur division in Bangladesh and into the Brahmaputra. Out of the

[224] CNA interview, Dhaka, 2015.

[225] For India's perspectives on the Brahmaputra, see the India chapter for this project by Satu Limaye.

rivers that Bangladesh shares with India, the Teesta ranks high in importance due to its role in supplying water for rice grown by farmers. As noted earlier, Indian prime minister Singh could not sign the proposed Teesta water-sharing agreement during a visit to Dhaka in 2011 because he had failed to secure support from West Bengal chief minister Mamata Banerjee. If signed and implemented, this would be only the second river water-sharing agreement between the countries.

Bangladesh sees West Bengal diverting large amounts of Teesta water through its Gazaldoba Barrage during the dry season for agricultural purposes.[226] Northwest Bangladesh has seen the detrimental impacts of lower river flow on agriculture, fisheries, and boat travel in the Teesta region. Last year, Bangladesh received roughly 300 cusecs on the Teesta in the dry season, compared with 5,500 cusecs only a few years ago.[227] Observers claim that the area looks like a desert, with homes once on the banks of the Teesta now on a sandbar.[228] For Teesta River stakeholders in Lalmonirhat district in Rangpur, the diminished flow of water in the dry season is already a major problem for farmers, who fault government agencies for the situation.[229] Moreover, the reduced river flow has human security impacts on the role of women in Bangladeshi society[230] and people's livelihoods in the dry season. Even Sugata Bose, an Indian member of parliament from West Bengal's Jadavpur Constituency, acknowledges that the fundamental problem with the Teesta River is "a shortage of water… [and] having to share what is, in fact, a very scarce resource."[231] Such a contest for Teesta resources on both sides of the border illustrates the need to finalize an equitable water-sharing accord.

India's current withdrawals from the Ganges River basin

Bangladesh's experiences with India *outside* the Brahmaputra—i.e., India's use of water resources in the Ganges River basin—magnify its threat perceptions about

[226] Md. Ataur Rahman, "Ensuring Proper River Flow is Essential to Ensure Better Functioning of the Blue Economy," in "Blue Economy: Future of Bangladesh," *Market Pulse* 102 (Jul. 2015): 44.

[227] CNA interviews, Dhaka, 2015; Md. Shariful Islam, "Water Scarcity and Conflict: A Bangladesh Perspective," *The Daily Star Forum* 5, Issue 6 (Jun. 2011).

[228] CNA interview, Dhaka, 2015.

[229] Åshild Kolås and Farzana Jahan, "Chapter 7: Stakeholder Mapping and Analysis," in Åshild Kolås et al., *Water Scarcity in Bangladesh: Transboundary Rivers, Conflict and Cooperation*, Oslo: Peace Research Institute Oslo (PRIO), 2013, 67.

[230] Water scarcity impacts gender advancement opportunities because females tend to be water carriers in Bangladesh. Often girls will drop out of school to perform the task of locating and bringing back water to the family. Paul Faeth and Erika Weinthal, "How Access to Clean Water Prevents Conflict," *Solutions Journal* 3, Issue 1 (Jan. 2012).

[231] Sugata Bose, "FPRC Interview with Prof. Sugata Bose (Part-2)," Diplomatically Speaking – Mahendra Gaur, Jan. 3, 2016, https://www.youtube.com/watch?v=UHL2pW6-M_E.

what India could eventually do *inside* the Brahmaputra basin. The water treaty that the two countries reached in 1996 for the Ganges River basin was a major breakthrough for bilateral relations as their first water-sharing accord. Dhaka was greatly concerned about West Bengal's diversion of water for desilting the Hooghly River, which was adversely impacting agriculture in Bangladesh. Given the importance of water for both countries, the treaty helped address a difficult situation at the time.[232]

Despite the Ganges accord, India's consumption of shared river resources continues to cause deep concern in Bangladesh, with many faulting India for not living up to its treaty obligations.[233] India's West Bengal state is seen as consuming the potential Ganges augmentation flows for itself, thereby not providing all the water it should under the treaty.[234] Article VIII states the need to cooperate on finding a solution to the problem of augmenting dry season flows; yet, 20 years later, there has been little progress on this front. On balance, the goodwill created by the treaty persists, and the consensus view is that the monitoring regime of scientists from both countries is working well. Still, Bangladesh sees India's current actions as acting against the spirit of the treaty—laid out in Article IX's clause about the principles of equity, fairness, and causing no harm—by providing less water through the Farakka Barrage in the dry season, increasing the likelihood of droughts across the border.[235]

In the years since signing the treaty in 1996, Bangladesh views the absence of flow guarantees and an arbitration clause as major shortcomings of the agreement.[236] As discussed earlier, southwestern Bangladesh is facing a significant problem of salinity intrusion.[237] Insufficient water levels from India do not allow the Ganges in

[232] Government of the People's Republic of Bangladesh, "Treaty between the Government of the People's Republic of Bangladesh and the Government of the Republic of India on Sharing of the Ganga/Ganges Waters at Farakka," New Delhi, Dec. 12, 1996, http://www.jrcb.gov.bd/attachment/Gganges_Water_Sharing_treaty,1996.pdf.

[233] CNA interviews, Dhaka, 2015; Kolås and Jahan, "Chapter 7: Stakeholder Mapping and Analysis," 2013, 66-67.

[234] CNA interviews, Dhaka, 2015; Siddique, "China to Give Brahmaputra Flow Data to Bangladesh," 2015; Mir Sajjad Hossain, Member, Joint Rivers Commission, Ministry of Water Resources, Bangladesh, "Ganges Water Treaty between Bangladesh and India, 1996 and Its Prospects for Sub-regional Cooperation," Mekong River Commission Summit, Apr. 2014, 44, http://www.mrcsummit.org/presentations/track3/1.3-b-Conges-water-treaty-MirSajjad.pdf.

[235] A.N.M. Muniruzzaman, "Water and Disaster Management in South Asia: Threats to Peace and Security," *South Asia Journal* 12 (Winter 2015).

[236] Hossain, "Ganges Water Treaty between Bangladesh and India, 1996," 2014, 44.

[237] A study by Bangladesh's Institute of Water Modelling (IWM) and the World Bank finds that freshwater supplies in coastal districts could drop significantly by 2050, affecting between

Bangladesh to flush out the salinity that creeps in from the Bay of Bengal. Impacts are already being seen with threats to drinking water in Gopalganj, for example.[238] With no flow guarantee or arbitration clauses and doubts about New Delhi's ability to restrain state water diversion activities, renewing the 30-year agreement which expires in 2026—only a decade from now—will be difficult unless such fundamental issues are addressed. When discussing the future of the Brahmaputra, experts in Bangladesh thus see an unsettling precedent in the Ganges basin. See Figure 11 for a map of the Ganges basin in India and southwestern Bangladesh.

Figure 11. Ganges, Farakka Barrage, and southwestern Bangladesh

Source: Map drawn by Mike Markowitz, CNA, 2016. Composite relying on d-maps, http://www.d-maps.com; Quamrul Islam Siddique, "Integrated Water Resource Management in the Ganges, Brahmaputra, and Meghna River Basins in South Asia: Prospects and Challenges," Workshop on 'Policy Priorities for Sustainable Mountain Development' organized by the International Centre for Integrated Mountain Development (ICIMOD) in Nepal, Sep. 18-20, 2006, http://qisiddique.com/article.php.

three to five million people. Pantho Rahaman, "Rising Salinity Threatens Bangladesh's Coastal Communities: Experts," Reuters, Oct. 13, 2015.

[238] Mashura Shammi et al., "Investigation of Salinity Occurrences in Kumar-Madhumati River of Gopalganj District, Bangladesh," *Journal of Nature Science and Sustainable Technology* 6, No. 4, 2012, 311-312.

Factors that mitigate threats from India

For all of Bangladesh's concerns, two factors mitigate its anxieties about current and potential threats from India: water cooperation with India and improved political relations.

Water cooperation with India

As discussed above, Bangladesh and India signed their only treaty on water sharing in 1996 over the Ganges. Even before this agreement, the two countries founded the Joint Rivers Commission (JRC) in 1972, soon after Bangladesh became independent. Bangladeshi and Indian representatives continue to meet and exchange information through the JRC. For example, the latest discussions about proportions of water resources sought in the Teesta River have occurred during the commission's meetings. Notwithstanding aforementioned criticisms of the JRC's effectiveness as a dialogue mechanism, an official in the Bangladesh government emphasizes that there has been "a tremendous amount of goodwill between the countries" on the discussion of water issues.[239] In fact, in November 2015, India's water resources minister Uma Bharati hosted Bangladesh's minister of water resources Anisul Islam Mahmud, who invited her to the next round of the JRC in Dhaka. During their meeting, Bharati stated that New Delhi is actively seeking to finalize the Teesta accord, including by reaching out to West Bengal chief minister Mamata Banerjee.[240]

Regarding the Brahmaputra, one saving grace is that India does not use much of the water flow compared with the Ganges.[241] Also, India cooperates on sharing flood forecasting data, which it provides to Bangladesh without charge. It shares water level and rainfall data on the Brahmaputra from a few stations in its territory, and since 2010 has agreed to share data twice a day during the monsoon season (June to October).[242] While a positive step, this data sharing arrangement is simple: India notifies Bangladesh how much rain has fallen in particular catchment areas so that Bangladesh can calculate the time before the water will arrive. As a result, Bangladesh can now forecast floods accurately up to three (sometimes even five) days in advance. While data sharing can be expanded, these interactions on water resources are beneficial to bilateral relations.

[239] CNA interview, Dhaka, 2015.

[240] "New Delhi Reassures Dhaka over Teesta Water-sharing Deal," bdnews24.com, Nov. 16, 2015.

[241] CNA interview, Dhaka, 2015.

[242] There is some question about whether data are only provided once a day and from April to October, based on varying interview responses. CNA interviews, Dhaka, 2015.

Recent positive trends in India-Bangladesh relations

Progress in bilateral relations, especially under the Modi administration, is helping mitigate some of Bangladesh's larger threat perceptions with regard to India. For example, in July 2014, the two countries saw their long-standing maritime boundary dispute resolved through the Permanent Court of Arbitration. Then Modi's visit to Bangladesh in June 2015 and the historic signing of the Land Boundary Accord, which had been delayed for decades, finally resolved the unsettled land border dispute. India is also trying to cultivate deeper, positive ties with Bangladesh through efforts such as selling electricity from Indian power plants and approving an additional $2 billion of development financing in 2016. On the Bangladeshi side, the Sheikh Hasina administration is generally seen as favorable to working with India on common security interests, such as counterterrorism and intelligence cooperation.

As a result of these developments in bilateral relations, there is much optimism in Dhaka that the two neighbors will finally sign the Teesta accord. Bangladeshi and Indian experts believe that the agreement may be concluded in late 2016, likely after the West Bengal elections so that the agreement does not become a lightning rod during Mamata Banerjee's reelection campaign.[243] Furthermore, Bangladesh has been reassured that New Delhi is working with Mamata Banerjee to seek her concurrence on the accord. The momentum following the election of the Modi administration in 2014 is still strong as of this writing. Finalization of the Teesta accord would be a notable indicator of how lasting this renewed foundation will be for closer Bangladesh-India ties.

Bangladesh-China: The view from Bangladesh

Threat perceptions

Not surprisingly, Bangladesh's overall relations with China are not as fraught as those with India. In addition to the absence of disputes with a neighbor, Bangladesh's relations with China are more positive because they give Dhaka more economic and military options than relying solely on New Delhi.[244] For example, China is Bangladesh's largest supplier of military equipment and is set to sell Bangladesh two submarines in the coming year. India, by contrast, has not supplied Dhaka with

[243] CNA interviews, Dhaka and New Delhi, 2015.

[244] Nilanthi Samaranayake, "China's Relations with the Smaller Countries of South Asia," *China and International Security: History, Strategy, and 21st Century Policy*, edited by Donovan Chau and Thomas Kane, Santa Barbara: Praeger, 2014, 226-227.

military equipment since the early years after independence in 1971, according to data from the Stockholm International Peace Research Institute (SIPRI).[245]

Bangladesh sees China as less of a direct threat to water security than India because most of the Brahmaputra is sourced farther south, within Indian borders. Nevertheless, poor management of upstream water resources without regard to the ecosystem or potential diversion activities by China are seen in Bangladesh as harmful to the entire Brahmaputra basin. A recurring theme across CNA interviews in Dhaka is that Bangladesh could face a worst-case scenario through the cumulative effect of India's current and feared activities and potential diversions and/or irresponsible upstream practices by China. Any reductions in the flow or quality of water coming from India and China will adversely affect Bangladesh, especially in the dry season.

Officially, Beijing continues to assure Dhaka that it has no plans to divert the Brahmaputra. Bangladeshi officials asked Chinese officials about this issue as recently as March 2015, and they were reassured that the dams are for the purpose of producing electricity.[246] Moreover, China is a cooperative partner with Bangladesh in the Brahmaputra even though the countries do not share a border. (This section will conclude with examples of such cooperation.)

Although this approach seems to satisfy Bangladesh at the present time, China's activities elsewhere, such as assertiveness in the South China Sea, call into question its verbal commitments to stability. Beyond assurances, Bangladesh wants China to be more transparent about its long-term intentions and plans in the basin: lack of clarity causes distrust.[247] Interestingly, interview respondents in Bangladesh do not doubt China's ability to construct storage dams or divert water to other Chinese rivers, despite the technical difficulties associated with doing so (examined in other chapters of this study).

Water cooperation with China

While not a neighboring riparian, China shares flood warning data with Bangladesh, as it does with India. Beijing charges New Delhi for this information, yet it does not

[245] SIPRI Arms Transfers Database, "Transfers of Major Conventional Weapons; Deals with Deliveries or Orders Made for Year Range 1971 to 2014," and "Trend Indicator Value Tables (TIV) of Arms Exports to Bangladesh, 1971-2014," Stockholm International Peace Research Institute (SIPRI), generated on Jan. 24, 2016.

[246] Siddique, "China to Give Brahmaputra Flow Data to Bangladesh," 2015.

[247] The implications of insufficient trust were seen in CNA's 2014 simulation on water security in South Asia. See Catherine Trentacoste et al., *Bone Dry and Flooding Soon: A Regional Water Management Game*, CNA, Oct. 2014, 17-18.

charge Dhaka. Beijing agreed to share data in 2005 to reduce the potential threat from natural disasters in Bangladesh.[248] China also agreed to help Bangladesh dredge its riverbeds and provide capacity building in this area.

In March 2015, Bangladesh updated cooperation with China through a memorandum of understanding (MOU) on data sharing on the Brahmaputra. China agreed to provide water flow data from three measuring stations in Tibet once a day, over email, during the monsoon season months from June to October.[249] China also agreed to provide rainfall data. These data are shared exclusively for the purpose of flood forecasting, because the underlying intent is disaster prevention.[250]

Although Bangladesh believed that China would begin the data sharing in June 2015,[251] as of late 2015 the data sharing had not begun.[252] A Bangladeshi official minimized the level of the March 2015 MOU by reasserting that it is only an "understanding" with China rather than an "agreement."[253] From time to time, Bangladesh gets data from China, but not as systematically as was sought in the MOU. Bangladesh is optimistic, however, that this process will be regularized soon. Nevertheless, this gray area in the understanding of the MOU demonstrates the need to go beyond MOU-level cooperation to formal agreements that would guarantee Bangladesh consistent access to Chinese water data.

[248] Excerpt from the 2010 Joint Statement: "(f) The two sides agreed to carry out sustainable cooperation on hydrological data sharing and flood control of river Yarluzangbu/Brahmaputra, in view of its necessity to the disaster reduction in Bangladesh. The two sides agreed to strengthen cooperation on water resources management, hydrological data sharing, flood control and disaster reduction, based on the exchange of letters between the Ministries of Water Resources of the two countries in 2005. At the request of the Bangladesh side, the Chinese side agreed to provide assistance for dredging of riverbeds and for capacity building through training of personnel." See Ministry of Foreign Affairs, the People's Republic of China, "Joint Statement Between the People's Republic of China and the People's Republic of Bangladesh," Mar. 22, 2010.

[249] Siddique, "China to Give Brahmaputra Flow Data to Bangladesh," 2015.

[250] CNA interview, Dhaka, 2015.

[251] Siddique, "China to Give Brahmaputra Flow Data to Bangladesh," 2015.

[252] CNA interview, Dhaka, 2015.

[253] Ibid.

Bangladesh's support of multilateral cooperation in the Brahmaputra basin

Of the three basin stakeholders, Bangladesh is the most interested in pursuing basin-wide cooperation. This is not surprising as Bangladesh has the most to lose, given its lowest position in the basin and the large extent to which rivers shape the country's topography. As one of the leaders in creating the South Asian Association for Regional Cooperation (SAARC), Bangladesh is a strong proponent of multilateral approaches.

Water experts in Bangladesh generally advocate integrated river basin management (IRBM), a school of thought that has gained support in water security studies.[254] The Danube, for example, is cited as a river basin where stakeholders have committed to supporting the principles of IRBM.[255] Bangladeshi experts and officials consistently report their desire to encourage this approach to basin management, given the Brahmaputra countries' own challenges and threat perceptions.

Bangladesh sees water cooperation as opening up greater possibilities for regional integration, such as through increased river navigation with India[256] and hydroelectric power generation with India and China. Bangladesh believes that its geographic location is key to achieving "connectivity," meaning connecting mainland India with its landlocked northeastern states as well as promoting interactions between China and South Asia and between South Asia and Southeast Asia. As a result, a retired Bangladeshi official envisages the Brahmaputra as a "river of cooperation" to

[254] The U.S. Water Partnership, launched by Secretary of State Hillary Clinton in 2012, features a definition of IRBM on its H2infO web portal from the Nature Conservancy: "The collaborative process of integrating the conservation, management, and development of water, land, and related resources across sectors within a given river basin. The purpose is to improve economic and social benefits derived from water resources in an equitable manner while preserving and, where necessary, restoring freshwater ecosystems." H2infO, "River Management," undated, http://www.h2info.us/explore/river?resource_keyword=&page=2.

[255] International Commission for the Protection of the Danube River (ICPDR), "15 Years of Managing the Danube Basin," undated, https://www.icpdr.org/main/publications/15-years-managing-danube-basin.

[256] River navigation between Assam, India and Bangladesh has a deep history, declining after the 1965 India-Pakistan war, which affected East Pakistan (Bangladesh): Tariq A. Karim, "Towards South Asian Regional Economic Integration: A Bangladeshi Perspective," *Huffington Post*, Sep. 30, 2015.

contrast the benefits of working together in the Brahmaputra with the more frequently heard narrative of river conflict and water wars.[257]

Regarding India, Bangladesh believes that trade and transportation opportunities can help improve Indian mainland connectivity to the country's northeast.[258] Specifically, the possibility for transit from Kolkata to Guwahati through Bangladesh on the Brahmaputra is seen as presenting a mutually beneficial opportunity for cooperation.[259] Bangladesh believes that it not only has the moral authority,[260] as lowest riparian, but the diplomatic justification to promote basin-wide cooperation with India on the Brahmaputra.[261] Under the 2011 Framework Agreement between India and Bangladesh, India agreed under Article 2 to "common basin management of common rivers for mutual benefit."[262] Because the two countries agreed to "provide necessary assistance to each other to enhance navigability and accessibility of river routes and ports," Bangladesh thinks it can draw on this bilateral agreement to encourage cooperation in the Brahmaputra basin.

Like India, China prefers to work bilaterally. Bangladesh and China signed a 2010 joint statement whereby they "agreed to enhance transport links."[263] Road and rail transit were the two methods discussed, given the obvious continental distance; yet the full spectrum of connectivity entails navigation along the Brahmaputra. Opportunities for cooperating on hydropower generation are also worth exploring. For example, the two countries might draw on China's dam-building expertise to help

[257] CNA discussion, Dhaka, 2015.

[258] Currently, most movement of goods and people occurs between a few land corridors. Modi's June 2015 summit to Bangladesh freed up another avenue by getting coastal shipping access to Chittagong and Mongla ports, whereas previously Indian ships needed to travel to Singapore or Colombo and transship goods instead of sailing directly to neighboring Bangladesh.

[259] CNA interviews, Dhaka, 2015.

[260] Trentacoste et al., *Bone Dry and Flooding Soon,* 2014.

[261] CNA interviews, Dhaka, 2015.

[262] Article 2 full text: "To enhance cooperation in sharing of the waters of common rivers, both Parties will explore the possibilities of common basin management of common rivers for mutual benefit. The Parties will cooperate in flood forecasting and control. They will cooperate and provide necessary assistance to each other to enhance navigability and accessibility of river routes and ports." See Government of India, Ministry of External Affairs, "Framework Agreement on Cooperation for Development between India and Bangladesh," Sep. 6, 2011.

[263] 2010 Joint Statement excerpt: "(d) The two sides agreed to enhance transport links and, in this connection, to continue to discuss the possibility of building road and rail links between the two countries." People's Republic of China, Ministry of Foreign Affairs, "Joint Statement Between the People's Republic of China and the People's Republic of Bangladesh," Mar. 22, 2010.

Bangladesh address its need to store monsoon water for use in the dry season. Although this idea was not specifically suggested by Bangladeshi interview respondents, they often expressed admiration for China's engineering and construction capabilities and may support such an idea if it were pursued cooperatively.

Given the openings for basin-wide cooperation that Bangladesh feels it has with India and China separately, the Bangladesh-China-India-Myanmar (BCIM) Forum for Regional Cooperation offers an existing multilateral framework that Bangladesh could use to encourage the two upper riparians in the Brahmaputra basin to cooperate with each other. Bangladesh participates in various multilateral organizations and frameworks such as BCIM, SAARC, and the Bangladesh-Bhutan-India-Nepal (BBIN) initiative. They are all oriented toward development and regional integration. Bangladeshi interview respondents did not suggest BCIM as a framework for Brahmaputra cooperation, but this venue holds the most promise because—unlike SAARC and BBIN—Bangladesh, India, and China are all equal members.

Started by China in 1999 as the Kunming Initiative to pursue regional connectivity and development, the Track 2 BCIM Forum for Regional Cooperation has progressed to gain Track 1 support for a BCIM Economic Corridor. The Joint Study Group (JSG) of the BCIM Economic Corridor is exploring the possibilities for regional integration, even listing the prospect for "cooperative undertakings" on "water resources [that] may be conserved, developed and tapped beneficially" and on "climate change challenges" in the minutes of the JSG's first meeting in 2013.[264] The JSG meetings have taken place so far in Bangladesh and China, and the next meeting is due to be held in India sometime in 2016. Despite India's and China's preference to work bilaterally, New Delhi remains formally committed to the BCIM Economic Corridor[265] while Beijing continues to be an active proponent of BCIM.

The interactions arising from Bangladesh's bilateral efforts to encourage India and China to work for basin-wide development and cooperation in the Brahmaputra could lay the foundation for what Bangladeshi experts envision as a Brahmaputra Basin Organization, a Brahmaputra Commission, or a Brahmaputra River Basin Authority.[266] This formal body would be the most ambitious means of managing and developing the Brahmaputra basin. It would involve all riparians as equal parties,

[264] Consulate General of India, Guangzhou, "Minutes of the First Meeting of the Joint Study Group of BCIM Economic Corridor," Dec. 18-19, 2013, http://cgiguangzhou.gov.in/news/news_detail/60.

[265] Patricia Uberoi, "Problems and Prospects of the BCIM Economic Corridor," *China Report* 52, No. 1, 19-44 (2016), 30-31, http://chr.sagepub.com/content/52/1/19.abstract.

[266] CNA interviews, Dhaka, 2015.

require regular interaction and communication, and specify a dispute-settlement mechanism.[267] Before the situation in the Brahmaputra worsens, Dhaka, as the lowest riparian, could launch a serious effort to encourage New Delhi and Beijing to consider forming a "Brahmaputra Basin Commission."

Because two of the basin riparians are nuclear-armed and have a border dispute, the creation of a formal commission could be a confidence-building measure that preserves communication and insulates water interactions from political-military crises. The Permanent Indus Commission between India and Pakistan is seen as having such utility, despite the multiple conflicts that have broken out since the Indus Waters Treaty was signed in 1960.[268] Creating such an organization to facilitate basin-wide water-sharing and development in the Brahmaputra would probably take at least a decade. Yet, Bangladesh is the most eager of the riparians to see basin-wide cooperation materialize in the Brahmaputra and believes it has the diplomatic justification and moral authority to encourage this course of action if it chooses.

[267] For example, the Permanent Indus Commission is the body that was created to implement the 1960 Indus Waters Treaty. Drawing on IRBM principles, the Strategic Foresight Group in India also lends weight to the creation of a multilateral water management body by devising a detailed, hypothetical Himalayan River Commission that also includes Nepal. Strategic Foresight Group, *Himalayan Solutions: Co-operation and Security in River Basins*, Mumbai: Lifon Industries, 2011, 30-33.

[268] Jessica Troell and Erika Weinthal, "Harnessing Water Management for More Effective Peacebuilding: Lessons Learned," in *Water and Post-Conflict Peacebuilding*, E. Weinthal, J. Troell, and M. Nakayama, eds., London: Earthscan, 2014, 436.