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Costanza Rampini

Abstract

The Yarlung-Tsangpo-Brahmaputra (YTB) is one of the largest rivers in China and India. In the past decade, both countries have mobilised scientific and engineering capacities to speed up dam construction on their respective stretches of the river and harness its enormous hydropower potential. In the absence of a formal water agreement between the two superpowers, many have raised concerns about regarding the intensification of Sino-Indian tensions over the YTB. This is particularly worrisome, given that the river crosses a disputed border between China and India, and dams along its course threaten to compound longstanding tensions over Tibet and China's growing regional influence. This chapter begins by briefly discussing Chinese and Indian hydropower ambitions along the YTB. Afterwards, it explores key events which led to the straining of Sino-Indian relationships over the YTB and to the militarisation of its flows. It then highlights the extent to which China and India already cooperate over this transboundary river, and asks whether the impacts of climate change on the YTB might precipitate further collaboration between the two neighbours. Finally, this chapter concludes by reflecting on the role of Sino-Indian hydropolitics in shaping the future of the Greater Himalayan region and its mighty rivers.

Introduction

The Yarlung-Tsangpo-Brahmaputra River (YTB) is one of the world's largest river systems (Pahuja and Goswami 2006). Originating in the Angsi Glacier in Tibet, the basin spreads over more than 500,000 km^2 of land in China, India, Bhutan, and Bangladesh, though over 80 per cent of it lies in China and India (Mohammed et. al 2017). In India, the YTB drains the northeastern region, with over 85 per cent of the sub-basin shared between the states of Arunachal Pradesh and Assam. After cutting through the plains of Assam, the YTB enters Bangladesh, where it meets the Padma and Meghna Rivers before flowing into the Bay of Bengal (See Figure 12.1) (Bandyopadhyay et al. 2016). Approximately 130 million people live within the YTB river basin, many of whom are rural, poor, and rely on the river for their sustenance and livelihoods (Jiang et al. 2017). Indeed, in Northeast India, the YTB is often referred to as the 'lifeline' of the region (Vagholikar and Das 2010). As the YTB rapidly descends from the Himalayan Mountains to the plains of Assam, it traverses steep slopes and gathers tremendous energy, which gets dissipated in the form of intense summer floods, especially in India and Bangladesh (Bora 2004; Bandyopadhyay et al. 2016).

INSERT FIGURE 12.1 HERE

Figure 12.1: The Yarlung-Tsangpo-Brahmaputra river system (Pfly 2011, licensed under Creative Commons Attribution-Share Alike 3.0 Unported).

The energy that the YTB gains throughout its course also puts the river at the centre of China and India's recent renewable energy development strategies. Both countries are mobilising their scientific and engineering capacities to dam their respective stretches of the river and harness its hydropower potential. China has already completed the Zangmu Dam along the

main stem of the Yarlung Tsangpo, and rumours of large-scale water diversion schemes targeting the river have emerged. Similarly, the Indian central government has expedited the clearance of big dams along the Indian stretches of the YTB and its tributaries, partly in an effort to counter Chinese hydro-ambitions. As both countries speed up efforts to develop the hydropower potential of the YTB, and in the absence of a formal water agreement between China and India, many have raised concerns about the intensification of Sino-Indian tensions. This situation is particularly worrisome, given that the YTB crosses an already disputed border[1] between the two countries, and hydropower development along its course threatens to compound longstanding tensions over Tibet and China's growing regional influence.

This chapter aims to shed light on the relationship between China and India over this shared river and attenuate fears of an imminent 'water war' between Asia's superpowers. It begins by discussing the countries' respective plans to develop the YTB, and then explains how Sino-Indian hydropolitics along the river are embedded in a larger set of tensions between the two countries. Next, the chapter highlights the extent to which India and China already cooperate over the YTB and asks whether climate change impacts on the river might precipitate further collaboration. Finally, the chapter concludes by reflecting on the role of Sino-Indian hydropolitics in shaping the future of the Himalayan region and its mighty rivers.

Chinese and Indian hydropower ambitions along the YTB

Despite the YTB's immense hydropower potential – the river alone possesses nearly 40 per cent of India's entire assessed hydropower potential – until recently, it remained one of the

[1] China and India have disputed borders along three fronts: The western front in the Kashmir and Aksai Chin region, the middle front along the borders of Himachal Pradesh and Uttaranchal, and the eastern front, where China claims the state of Arunachal Pradesh (Panda 2017).

last great undammed rivers in the world (CEA 2015). Since the early 2000s, however, both China and India have begun building dams along its course in an effort to meet increasing energy demands, and in response to mounting pressures to reduce their greenhouse gas emissions.

China has constructed several dams along tributaries of the YTB, such as the Pangduo and Zhikong Dams on the Lhasa River. In 2014, it completed the Zangmu Dam (510 MW), its first dam along the YTB main stem (Alam et al. 2016). Additionally, China's Twelfth Five Year Plan (2011–15) outlined plans for three new dams along the river that are now under construction – one in Dagu (640 MW), another at Jiacha (320 MW), and a third of unconfirmed capacity at Jiexu (Krishnan 2013). While the Thirteenth Five Year Plan (2016–2020) promises 74.6 billion US dollars (USD) of investments in new installed hydropower capacity (Koleski 2017), it mentions no specific projects and Chinese media have reported that the government will first focus on building new dams in Tibet that are not along the YTB (Walker 2016). Still, as China completes construction of these dams, its hydropower efforts are bound to shift towards the YTB, especially towards a site known as the 'Great Bend' where the YTB waters drop 1,400 m just before crossing into India (He 2011). The Chinese government has assured India that, because of their small scale, dams along the Chinese stretch of YTB would have no downstream transboundary impacts. Indian officials, however, continue to voice concerns over China's lack of transparency about its schemes for this shared river (Tandon 2019). Perhaps even more concerning to Indian officials than Chinese dams along the YTB is China's controversial multi-billion-USD plan to divert water from its southern regions to its more arid regions, a project known as the South-North Water Transfer. Segments of this diversion scheme have been completed or are under construction, but the western route, which included schemes to divert the

flows of the YTB, was seemingly scrapped due to debates over its technical and financial viability (Fan 2018).

Rather than adopting a forthright attitude with the Chinese government over the issue of hydropower development and water diversion schemes along the YTB, the Indian government has instead expedited the approval of big dams along its own stretches of the river. As of 2012, the state government of Arunachal Pradesh had cleared 140 new dam projects for construction along the YTB and its tributaries for a total installed capacity of over 40 GW (Vagholikar and Das 2010). Besides increasing its energy supply, India is also using hydropower development to establish first-user rights to the flows of the YTB (Kurian 2013; Bhattacharya 2018). In other words, despite the lack of any water treaty between China and India that upholds these specific rights, India is building dams to appeal to the well-known water doctrine of prior-appropriation, which holds that the first user of water has the right to continue using that same quantity of water, and subsequent users cannot interfere with their ability to do so (Lazerwitz 1993). Any future Chinese dam or diversion scheme along the YTB could affect the capacity of existing Indian dams downstream to generate hydropower – that is, unless China respects the prior-appropriation rights of pre-existing Indian dams.

Overall, China's and India's respective interests in developing the YTB have led to speculations about the potential of a 'water war' between the two countries, as they each race to tap the hydropower potential of the river. Specifically, many are concerned that their respective hydro-ambitions will exacerbate other long-standing Sino-Indian conflicts in the region (Chellaney 2011). The following section further explores the ways in which Sino-Indian hydropolitics along the YTB are complicated by existing conflicts between the two countries, both in the immediate region and beyond. It begins by explaining the Sino-Indian border dispute

along the McMahon Line and tensions over Tibet's independence. It then explores the evolution of Sino-Indian relations since the election of Narendra Modi as Indian Prime Minister in 2014.

YTB hydropolitics in the Sino-Indian political context

The eastern border dispute and Tibet

There are 310 international rivers in the world, each with their own set of challenges when it comes to the management of their transboundary flows (McCracken and Wolf 2019). In the case of the YTB, water diplomacy between China and India is complicated by the fact that the river crosses one of the disputed boundaries between the two countries, known as the McMahon Line. The McMahon Line, which separates the Indian state of Arunachal Pradesh from Tibet, was negotiated in 1914 by representatives of the new Republic of China, the Tibetan government, and the British government. India and the international community continue to recognise it as the legal border between Northeast India and today's Tibet Autonomous Region in China (Panda 2017). However, since gaining control over Tibet in the mid-twentieth century, China has contested the border, arguing that Tibet was not an independent state and could not sign territorial treaties (Panda 2017). This has led both China and India to establish a permanent military presence on their respective sides of the contested line and, in 1962, the border became the site of the last Sino-Indian War. Formal border talks between China and India started in 1981 and are now entering their 22nd round, but they have yielded no accord. Indeed, resolving the McMahon border dispute would require that China and India first reach an agreement over the Tibetan question.

The issue of Tibet's independence has been a sore topic between India and China since 1951, when China established *de facto* control over the Tibetan territory (Panda 2017). Then in

April 1959, days before the Tibetan revolt against Chinese troops in Lhasa, the Dalai Lama fled the Tibetan capital and travelled on foot to Arunachal Pradesh, where he was granted asylum by the Indian government. Today, India is home to the Dalai Lama, the Tibetan-government-in-exile, and over 94,000 Tibetans – the largest settlement outside of Tibet (Central Tibetan Administration 2019). While Indian officials often cited cultural kinship as a reason for supporting Tibet, they were also wary of the fact that if China asserted control over Tibet, the territorial buffer between the two countries would be lost and this could re-open border negotiations along the McMahon Line (Garver 2001). Additionally, it meant that China would control vast natural resources in the Tibetan Plateau, including the headwaters of all of Asia's main rivers (Garver 2001). Eventually, in October 1962, territorial disputes, growing tensions over the Tibetan issue, and Cold War rivalries culminated in the last Sino-Indian war, which was partially fought along the disputed McMahon Line (Panda 2017).

India lost the war but maintained sovereignty over Arunachal Pradesh. Since then, and especially since the beginning of the border talks in 1981, tensions between China and India over their disputed eastern border and the Tibetan issue have de-escalated, while other forms of bilateral relations have improved (Singh 2018). However, these unresolved conflicts remain the main stumbling blocks to any form of true Sino-Indian collaboration or treaty over the YTB, because they have led to the securitisation of its flows (R. Bhattacharjee, personal communication, 28 June 2019). As a result of the border issue, the waters of the YTB have become a matter of national security for both India and China, meaning that hydrological data about the basin is often classified as pertaining to national defence and not available to researchers (Bandyopadhyay and Ghosh 2009, Bhambri and Bolch 2009). Similarly, due to restricted access to stretches of the YTB in both countries, the basin is considerably under-

researched compared to other Asian rivers, and the data sets that exist have large gaps, often coinciding with key geopolitical events such as the 1962 war (Ray et al. 2015; Rampini 2016).

Modi's stance on China and border disputes

Since the mid-1980s, India and China have made no significant progress in resolving their eastern border dispute, leaving little hope for Sino-Indian cooperation over the YTB. However, the election of Narendra Modi as the 14th Prime Minister of India in May 2014 seemed to signal a change in Sino-Indian relationships and India's approach to boundary disputes. During his time as Chief Minister of Gujarat (2001–2014), Modi developed close ties with China and Chinese investors, and many hoped that his election would bring Asia's superpowers closer (R. Bhattacharjee, personal communication, 28 June 2019). At the same time, during his campaign, Modi promised to take a tough line on the border issue (Burke 2014). Both factors suggested that, more than any of his predecessors, Modi had the necessary attributes to initiate a bilateral water dialogue between India and China over the shared YTB, and perhaps even bring up the subject of hydropower development along its flows.

However, despite an increase in bilateral trade between two countries, many argue that Sino-Indian tensions have slightly risen since Modi's election. In 2016, China opposed India's bid to join the Nuclear Supplier's Group, and it put a technical hold on India's request to add three Pakistani-based individuals to the United Nations Security Council list of global terrorists (Singh 2018). Additionally, Modi's government has formally objected to China's One Belt One Road (OBOR) initiative, which aims to revitalise its relationships with countries along the ancient silk road via infrastructure development and trade agreements. India has long been wary of China's growing influence in Asia, which it has not been able to replicate via its own

initiatives such as Modi's Act East policy and Link West strategy (Panda 2017). Moreover, India specifically opposes the China-Pakistan Economic Corridor component of the OBOR initiative because it includes projects in the Kashmir region, which is disputed by Pakistan and India (MEA 2017).

Among the recent flare-ups between China and India since Modi took office, the 2017 Doklam standoff has had by far the greatest impacts on bilateral relations over the YTB. The Doklam Plateau is a territory disputed by China and Bhutan that lies near the Northeast region of India and within the YTB river basin. In June 2017, Chinese troops moved into the plateau to presumably extend an existing road, though many interpreted the military incursion as an attempt to weaken India's long-standing relationships with Bhutan (Panda and Baruah 2019). In response, India took the international community by surprise and sent its troops to Doklam to face off with Chinese troops on Bhutanese territory (Blank 2017). The episode initially raised fears of a wider escalation between Asia's superpowers, but the standoff was resolved two months later, as both nations agreed to withdraw their troops from the plateau (Blank 2017). Less than a year later, Prime Minister Modi and President Xi Jinping held the first-ever bilateral informal summit in Wuhan, in part to restore positive Sino-Indian relations in the aftermath of Doklam (Godbole 2018). While the 2018 Wuhan Summit re-established the *status quo* and the countries' tacit understanding not to let boundary issues complicate other bilateral relationships (Panda and Baruah 2019), the Doklam episode revived Sino-Indian tensions over their disputed borders and the shared YTB River. Indeed, during and following the standoff, China stopped sharing hydrological data with India from its stations along the YTB, which it had been providing every summer according to a Memorandum of Understanding (MoU) signed between the two countries in 2002 (see next section).

Overall, despite initial optimism about Modi's relationship with China and his tough stance on border issues, under his term, Sino-Indian relationships have seesawed, and the two countries are no closer to coming to a resolution over their borders. Additionally, despite portraying himself as strongman of Indian politics, Modi has never directly brought up hydropower development along the YTB with his Chinese counterpart, and his heavy-handed reaction to the Doklam episode threatened to put an end to the only form of Sino-India water-diplomacy that is currently taking place along this shared river.

Sino-Indian hydro-diplomacy along the YTB

Despite the potential for transboundary rivers to stoke conflict between riparian countries, historical examples of positive water diplomacy and cooperation outnumber international water conflicts (Wolf 2003). This section highlights two examples of Sino-Indian cooperation along the YTB and emphasises the need for more such efforts, given the threat that climate change poses to the flows of the YTB and the communities that rely on them.

Data sharing and the Joint Expert Level Mechanism on Trans-border Rivers

As of today, there is no international water treaty governing the YTB or guiding the countries in the river basin as they compete over its uses and development. Additionally, China and India both refused to sign the 1997 United Nations Convention on the Law of Non-Navigational Uses of International Watercourses, which provides a framework to ensure the equitable and reasonable utilisation of transboundary rivers (McCaffrey 2008; see also Biba, this volume). In sum, there are no international legal instruments requiring the countries of the YTB basin to cooperate regarding this shared resource (Bandyopadhyay et al. 2016). Bangladesh, as

the lowest riparian country in the basin, is in an especially precarious position. The legal limbo also casts doubt on whether China would even recognise India's first-user rights along the YTB.

Nonetheless, while there exists no legal framework to negotiate Sino-Indian relations over the YTB, the two countries are engaged in a tenuous collaboration over the issue of flood forecasting along the river. Thanks to a MoU signed in 2002, the Indian Central Water Commission has been receiving flood season hydrological data from Chinese authorities twice a day from 1 June to 1 October. As part of the MoU, and despite the fact that data from the YTB is often classified as pertaining to national defence, the Chinese government has agreed to provide water level, discharge, and rainfall data from three stations along the Chinese stretch of the Yarlung Tsangpo in Nugesha, Yangcun, and Nuxia (NPCMT 2011; MOWR 2017). The data are then disseminated by the Indian Central Water Commission to other agencies, such as the Assam State Disaster Management Authority, to help improve flood preparedness and response efforts **(**M. Irshad, personal communication, 23 June 2019). This is significant because during the summer months, the waters of the YTB cause devastating floods in Northeast India, particularly in the state of Assam, where 40 per cent of the land is vulnerable to riverine flooding (NRSC 2016). The provision of hydrological data from the upper reaches of the YTB basin is thus an important step in improving early warning systems and emergency preparedness protocols in the region.

Starting in 2006, the Chinese and Indian governments also set up a Joint Expert Level Mechanism (ELM) on Trans-border Rivers. As part of this ELM, expert groups from both countries meet on a yearly basis to discuss flood emergency management and the governance of their shared rivers, including the YTB (MOWR 2017). The expert groups are led by the Commissioner of the Indian Ministry of Water Resources, and by the Director of the

International Economic and Technical Cooperation and Exchange Centre of the Chinese Ministry of Water Resources, respectively (NPCMT, 2011). While these yearly bilateral meetings serve to create the image of a "cordial and friendly atmosphere" between the two countries over the issue of transboundary rivers (Embassy of the PRC in India 2019: online), they have yielded little results in terms of actual collaboration and shared governance.

The most notable development occurred in December 2013, when the Chinese government agreed to extend the flood data sharing period with India by two weeks, starting on 15 May rather than 1 June (MEA 2013). Though heavy floods along the YTB generally occur between June and August as a result of the monsoon rains, the first pulse of floods can arrive as early as late April. Therefore, extending the data sharing period will become increasingly necessary as a result of climate change impacts in the basin (J. Gupta, personal communication, 27 June 2019). Unfortunately, in the aftermath of the Doklam standoff, Chinese officials stopped sharing hydrological data from the YTB with India for the remainder of the 2017 monsoon season, and no joint ELM meeting over transboundary rivers was held that year. Chinese officials explained that they were unable to share flood data due to upgrades to their stations along the river (PTI 2018), and data sharing has since resumed. Nonetheless, the episode served as a stark reminder that Sino-Indian cooperation along the YTB is inextricably linked to Sino-Indian relations along their disputed eastern border and in the broader Asian region.

The Brahmaputra Dialogue

Given the lack of a formal water treaty to help govern the YTB, some have suggested the need for a transnational autonomous river basin organisation, similar to the Mekong River Commission, that could help foster the integrated management of the river and avoid the

competitive exploitation of its flows by the basin countries (Hilton 2014; Bandyopadhyay et al. 2016). The Brahmaputra Dialogue, which began in 2013, is a notable attempt to foster this type of transnational water diplomacy along the YTB.

Also known as the *Transboundary Policy Dialogue for Improved Water Governance in the Brahmaputra River*, the Brahmaputra Dialogue was initiated by the South Asia Consortium for Interdisciplinary Water Resources Studies as a Track 3 dialogue involving relevant civil society stakeholders from the Brahmaputra basin countries.[2] The dialogue began with two main objectives: 1) initiating a shared data collection effort to identify key concerns and assess the regional knowledge base in the YTB and 2) identifying key stakeholders in the basin and fostering a multilateral dialogue amongst them (M. D. Surie, personal communication, 24 July 2019). In its first phase (2013–15), the dialogue was supported by seed funding from the Asia Foundation in Delhi, and only included stakeholders from India and Bangladesh (M. D. Surie, personal communication, 24 July 2019). Dr. Anamika Barua, one of the founders and current organiser of the dialogue, explained that they initially doubted Chinese stakeholders would participate in the forum, so they prioritised inviting Indian and Bangladeshi actors. However, by the end of the first phase, they decided to extend the invitation to Chinese scientists from Yunnan University, who eagerly accepted to participate in future workshops (A. Barua, personal communication, 20 June 2019). At the same time, the World Bank offered to fund the next

[2] This refers to the different tracks of diplomacy. *Track 1* describes diplomatic initiatives involving official actors, such as heads of state, diplomats, and high-ranking government officials. *Track 2* refers to informal diplomatic interventions that include retired government officials, regional and local leaders, academics, and influential non-governmental actors. Track 3 diplomacy, also known as 'people-to-people' diplomacy, takes place at the grassroots level and does not involve official actors (Bohmelt 2010; Wasike et al. 2016).

phases of the Dialogue, while also expressing its desire to see the forum move from a bilateral to a multilateral approach (Barua 2018a).

As a result, the second phase (2014–15) and third phase (2015–17) of the dialogue involved Bhutanese and Chinese stakeholders, and workshops where held in all four basin countries. Chinese participants included researchers from Yunnan University, Shanghai Institutes for International Studies, and Fudan University, amongst others (Barua 2018b; A. Barua, personal communication, 20 June 2019). The dialogue also shifted from a Track 3 to a Track 2–1.5 process, including not only academics and civil society actors, but also researchers working for government institutions as well as former and current government officials (Barua 2018a). The dialogue is now entering its fourth phase, and the World Bank has signalled its willingness to continue funding this multilateral effort (A. Barua, personal communication, 20 June 2019).

Still, the dialogue needs to surmount several challenges in order for it to be effective at promoting the integrated management of the YTB. First, the dialogue has no real capacity or formal mechanism to affect water policy in the basin (Barua 2018a). Additionally, it is difficult to quantify its impacts, which limits the organisers' capacity to find donors willing to support these transnational multi-stakeholder workshops (Barua 2018a; A. Barua, personal communication, 20 June 2019). And while the dialogue has managed to successfully include Chinese academics, organisers have been unable to identify Chinese civil society organisations working on the YTB river (J. Gupta, personal communication, 27 June 2019). This is due to the fact that the Tibetan reaches of the YTB are sparsely populated, and that Chinese civil society organisations are restricted in their capacity to work in this remote and political sensitive region (Liu 2014). Additionally, no Tibet-based researcher has been invited to participate in the forum thus far (A. Barua, personal communication, 20 June 2019). Finally, while the topic of

hydropower development has come up during the Dialogue workshops (Barua 2018b), it is not at the core of these efforts. This is in part due to Sino-Indian tensions over the issue, but also because of frictions between the Indian government and Indian civil society members over dam-building efforts along the YTB. This friction also explains why, as the dialogue moves increasingly towards a Track 2–1.5 process with more government officials' involvement, it has become harder to bring civil society actors to the table (M. D. Surie, personal communication, 24 July 2019).

Overall, the Brahmaputra Dialogue is the first water diplomacy platform which focuses exclusively on the YTB river basin and has successfully managed to include stakeholders from all four countries in this watershed. Other multilateral forums have attempted a similar task in the past, but they were often unable to get participation from Chinese stakeholders and they were not limited to the YTB river alone (Barua 2018a). The dialogue is still in its early stages and it is too soon to evaluate whether it will be able to foster the integrated management of the YTB River among China, Indian, Bhutan, and Bangladesh. Still, Dr. Anamika Barua, a current organiser of the dialogue for the World Bank, argues that the platform has already built trust between the participating stakeholders and increased the number of positive Sino-Indian interactions over the YTB (Barua 2018b; A. Barua, personal communication, 20 June 2019).

The common threat of climate change on Asia's water towers

Sino-Indian cooperation over the management of the YTB is even more imperative now, given the predicted impacts of climate change in the river basin. The flows of the YTB and the ferocity of its floods are highly dependent on the melting of Himalayan snow and ice as well as the arrival of summer monsoon rains (Goswami 1985). According to the IPCC Fifth Assessment

Report, as human activities drive up surface temperatures, the Himalayas could experience between 15 per cent and 78 per cent glacier mass losses by 2100 (Jiménez Cisneros et al. 2014). As glaciers retreat, glacier-fed rivers such as the YTB will first experience an increase in runoff, as more glacial melt swells their flows (Baraer et al. 2012). Climate models also suggest that warming temperatures will increase the frequency of heavy rain events during the monsoon season (Hijioka et al. 2014). Together, an increase in glacial melt from shrinking glaciers combined with an increase in extreme rains during the monsoon season will exacerbate floods for people living in the YTB basin, especially in Assam and Bangladesh (Mohammed et al. 2017). In the long term, as glaciers continue to shrink, the YTB could experience a near 20 per cent decrease in mean upstream water supply between 2046 and 2065 (Immerzeel et al. 2010; Immerzeel et al. 2013), threatening the livelihoods of communities that rely on the YTB flows (Eriksson et al. 2009). Additionally, reduced river runoff jeopardises the success of Chinese and Indian dam-building efforts along the YTB, since hydroelectricity generation depends on river flows.

Given the predicted impacts of climate change on the YTB, it is essential that China and India collaborate to develop a shared adaptation plan for the basin (Ahmad 2019). Additionally, their respective dam building efforts, if coordinated, could represent a unique opportunity to manage and regulate the flows of the YTB in a way that reduces flood severity throughout the basin (Rampini 2016). The extension of the hydrological data sharing period between China and India could serve as a blueprint for further collaboration in the context of climate change. Indeed, as warmer temperatures alter the flow of the river, it will be key for the two countries to cooperate outside of the summer flood season (J. Gupta, personal communication, 27 June 2019).

For now, the only opportunities for Chinese and Indian researchers to meet and discuss the impacts of climate change on the YTB are multilateral platforms such as the Intergovernmental Panel on Climate Change and the Hindu Kush Himalayan Monitoring and Assessment Programme led by the International Centre for Integrated Mountain Development. However, in the context of the Brahmaputra Dialogue, the Indian Institute of Technology in Guwahati (Assam), and Yunnan University have recently signed a MoU to jointly look at the impacts of climate change on water availability and accessibility in the YTB basin. While researchers engaged in this MoU are restricted from sharing their raw discharge data, they will be able to share precipitation, wind speed, and humidity data, and compare the outputs of their climate models (A. Barua, personal communication, 20 June 2019). This marks the first joint project between a Chinese and Indian institution to focus specifically on the impacts of climate change on the YTB river.

Discussion and conclusion

The YTB is a massive and complex river system that joins together the fates of China, India, Bhutan, and Bangladesh. Though its flows have remained largely undeveloped, the immense hydropower generation potential of the river has not gone unnoticed, and Asia's two superpowers are now turning their dam-building gaze towards the river. The development of transboundary rivers can strain relations between riparian countries (McCracken and Wolf 2019), and dam-building efforts along the YTB have already caused some friction between China and India, prompting warnings of an imminent 'water war' between the two giants (Chellaney 2011). Moreover, China-Indian relations over hydropower development of the YBT are complicated by the fact that, as the YTB flows from the Himalayas to the Bay of Bengal, it crosses the territory of Tibet and the disputed eastern Sino-Indian border. As a result, the flows of the YTB are

inextricably linked to broader geopolitical conflicts between China and India, such as the issue of Tibet's independence.

Since the 1980s, China and India have made no progress in resolving their border disputes, and both governments have made it clear that they consider these issues, and the question of Tibet, as peripheral to their bilateral relations. However, any meaningful collaboration between China and India over the shared governance of the YTB will require the resolution of these long-standing conflicts, which have led to the militarisation of stretches of the YTB and the securitisation of its flows (R. Bhattacharjee, personal communication, 28 June 2019). At the same time, while government-to-government hydro-diplomacy over the YTB may be unachievable at this time, the relationship between China and India along their shared eastern border and over the YTB is predominantly stable. In fact, Sino-Indian collaboration over the YTB, while still extremely tenuous, has slightly increased since 2013, when China agreed to extend its annual sharing of flow data with India by two weeks. Indeed, China's willingness to share YTB flow data with its downstream riparian neighbours is a crucial step in creating a shared vision for the river, which is imperative given the predicted impacts of climate change on the basin.

Additionally, the relative stability of Sino-Indian relationships in this transboundary region has paved the way for the start of the Brahmaputra Dialogue. As it is, the forum has no executive power to foster the integrated management of the YTB, nor to resolve competing claims between the basin countries. Additionally, its success and continuity are dependent on the maintenance of stable international relationships between China and India, as well as the organisers' capacity to secure funding for these multilateral forums. Still, the forum is the very first platform focused on the YTB that has managed to involve Chinese stakeholders, and the

organisers hope that, with time, it could usher in the formation of a transnational and autonomous YTB River basin organisation (A. Barua, personal communication, 20 June 2019).

Overall, while Indian media often portray hydropower development along the YTB as an active area of conflict between China and India (Jiang et. al 2017), relations between the two countries over this shared river are mostly stable. While geopolitical events, such as the succession of the Dalai Lama, could precipitate new developments in the region and in Sino-Indian hydropolitics, it seems more probable that both countries will continue to pursue their own hydro-ambitions without attempting to develop an integrated vision for the river – and with significant implications for Bangladesh, which sits as the lowest riparian country in the basin.

References

Ahmad, O. (2019, February 12). Water dangers loom for South Asia. *thethirdpole.net*, https://www.thethirdpole.net/2019/02/12/water-dangers-loom-for-south-asia/. Accessed 15 June 2020.

Alam, S., Ali, M. M., Islam, Z. (2016). Future streamflow of Brahmaputra River basin under synthetic climate change scenarios. *Journal of Hydrologic Engineering*, *21*(11), 05016027.

Barua, A. (2018a). Water diplomacy as an approach to regional cooperation in South Asia: A case from the Brahmaputra basin. *Journal of Hydrology*, *567*, 60–70.

Barua, A. (2018b, December 27). Best of 2018: Talking to China about the Brahmaputra. *thethirdpole.net*, https://www.thethirdpole.net/2018/12/27/best-of-2018-talking-to-china-about-the-brahmaputra/. Accessed 15 June 2020.

Bandyopadhyay, J., & Ghosh, N. (2009). Holistic engineering and hydro-diplomacy in the Ganges-Brahmaputra-Meghna basin. *Economic and Political Weekly*, *44*(45), 50–60.

Bandyopadhyay, J., Ghosh, N., Mahanta, C. (2016). *IRBM for Brahmaputra sub-basin water governance, environmental security and human well-being*. New Delhi: Observer Research Foundation.

Baraer, M., Mark, B. G., McKenzie, J. M., Condom, T., Bury, J., Huh, K., Portocarrero, C., Gomez, J., Rathay, S. (2012). Glacier recession and water resources in Peru's Cordillera Blanca. *Journal of Glaciology*, *58*(207), 134–150.

Bhambri, R., & Bolch, T. (2009). Glacier mapping: A review with special reference to the Indian Himalayas. *Progress in Physical Geography 33*, 672–704.

Bhattacharya, S. (2018, July 23). *China's hydro ambitions and the Brahmaputra*. Institute for Defence Studies and Analyses. https://idsa.in/system/files/backgrounder/b-china-hydro-ambitions-and-the-brahmaputra.pdf. Accessed 15 June 2020.

Blank, J. (2017, September 8). What were China's objectives in the Doklam dispute? *The RAND Blog*, https://www.rand.org/blog/2017/09/what-were-chinas-objectives-in-the-doklam-dispute.html. Accessed 15 June 2020.

Bohmelt, T. (2010). The effectiveness of tracks of diplomacy strategies in third-party interventions. *Journal of Peace Research*, *47*(2), 167–178.

Bora, A. K. (2004). Fluvial geomorphology. In V. P. Singh, N. Sharma, C. S. P. Ojha (Eds.), *The Brahmaputra basin water resources* (pp. 88–112). Netherlands: Kluwer Academic Publishers.

Burke, J. (2014, April 7). India election begins as north-east's voters kick off world's largest poll. *The Guardian*, https://www.theguardian.com/world/2014/apr/07/india-election-voters-world-largest-poll-modi-rahul-gandhi-bjp-congress. Accessed 15 June 2020.

Central Electric Authority (CEA) (2015). Review of performance of hydropower stations 2014–15. New Delhi: Government of India, Ministry of Power. http://www.cea.nic.in/reports/annual/hydroreview/hydro_review-2014.pdf. Accessed 15 June 2020.

Central Tibetan Administration (2019). About CTA: Tibet in exile. https://tibet.net/about-cta/tibet-in-exile/. Accessed 15 June 2020.

Chellaney, B. (2011). *Water: Asia's new battleground*. Washington: Georgetown University Press.

Embassy of the PRC in India (2019, June 20). The 12th Meeting of China-India Expert Level Mechanism on Trans-Border Rivers was held in India. *Embassy News*, http://in.china-embassy.org/eng/embassy_news/t1674079.htm. Accessed 15 June 2020.

Eriksson, M., Jianchu, X., Shrestha, A. B., Vaidya, R. A., Nepal, S., Sanstrom, K. (2009). The changing Himalayas: Impact of climate change on water resources and livelihoods in the Greater Himalayas. International Centre for Integrated Mountain Development. http://lib.icimod.org/record/26471. Accessed 15 June 2020.

Fan, X. (2018, January 17). Opinion: The 'madcap' scheme to divert the Brahmaputra. *chinadialogue*, https://www.chinadialogue.net/blog/10350-The-madcap-scheme-to-divert-the-Brahmaputra/en. Accessed 15 June 2020.

Garver, J. W. (2001). *Protracted contest: Sino-Indian rivalry in the twentieth century*. Seattle: University of Washington Press.

Godbole, S. (2018, May 23). Wuhan Summit: An important signal of intent by India and China. *Brookings Up Front*, https://www.brookings.edu/blog/up-front/2018/05/23/wuhan-summit-an-important-signal-of-intent-by-india-and-china/. Accessed 15 June 2020.

Goswami, D. C. (1985). Brahmaputra River, Assam, India: Physiography, basin denudation, and channel aggradation. *Water Resources Research*, 21(7), 959–978.

He, H. (2011, January 17). A new era for Tibet's rivers. *thethirdpole.net*, https://www.thethirdpole.net/2011/01/17/a-new-era-for-tibets-rivers/. Accessed 15 June 2020.

Hijioka, Y., Lin, E., Pereira, J. J., Corlett, R. T., Cui, X., Insarov, G. E., Lasco, R. D., Lindgren, E., Surjan, A. (2014). Asia. In V.R. Barros, C. B. Field, D. J. Dokken, M. D. Mastrandrea, K. J. Mach, T. E. Bilir, M. Chatterjee, K. L. Ebi, Y. O. Estrada, R. C. Genova, B. Girma, E. S. Kissel, A. N. Levy, S. MacCracken, P. R. Mastrandrea, L. L. White (Eds.), *Climate change 2014: Impacts, adaptation, and vulnerability. Part B: Regional aspects* (pp. 1327–1370). New York: Cambridge University Press.

Hilton, I. (2014). Introduction. In *Brahmaputra: Towards unity* (pp. 4–6). thethirdpole.net. https://chinadialogue-production.s3.amazonaws.com/uploads/content/file_en/6797/brahmaputra-v13.pdf. Accessed 15 June 2020.

Immerzeel, W. W., Pellicciotti, F., Bierkens, M. F. P. (2013). Rising river flows throughout the twenty-first century in two Himalayan glacierized watersheds. *Nature Geoscience*, *6*, 742–745.

Immerzeel, W. W., van Beek, L. P. H., Bierkens, M. F. P. (2010). Climate change will affect the Asian water towers. *Science*, *328*, 1382–1385.

Jiang, H., Qiang, M., Lin, P., Wen, Q., Xia, B., An, N. (2017). Framing the Brahmaputra River hydropower development: Different concerns in riparian and international media reporting. *Water Policy*, *19*(3): 496–512.

Jiménez Cisneros, B. E., Oki, T., Arnell, N. W., Benito, G., Cogley, J. G., Döll, P., Jiang, T., Mwakalila, S. S. (2014). Freshwater resources. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, M. Chatterjee, K. L. Ebi, Y. O. Estrada, R. C. Genova, B. Girma, E. S. Kissel, A. N. Levy, S. MacCracken, P. R. Mastrandrea, L. L. White (Eds.),

Climate change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects (pp. 229–269). New York: Cambridge University Press.

Koleski, K. (2017). The 13th Five-Year Plan. U.S.-China Economic and Security Review Commission. https://www.uscc.gov/research/13th-five-year-plan. Accessed 15 June 2020.

Krishnan, A. (2013, January 30). China gives go-ahead for three new Brahmaputra dams. *The Hindu*. https://www.thehindu.com/news/international/China-gives-go-ahead-for-three-new-Brahmaputra-dams/article12323702.ece. Accessed 15 June 2020.

Kurian, N. (2013). Uncharted waters: Navigating the downstream debate on China's water policy. In P. J. Das, C. Mahanta, K. J. Joy, S. Paranjape, S. Vispute (Eds.) *Water conflicts in Northeast India: A compendium of case studies* (pp. 58–64). Pune: Forum for Policy Dialogue on Water Conflicts in India.

Lazerwitz, D. J. (1993). The flow of international water law: The International Law Commission's Law of the Non-Navigational Uses of International Watercourses. *Indiana Journal of Global Legal Studies, 1*(1), Article 12.

Liu, J. (2014). The role of civil society in China's anti-dam campaigns. In *Brahmaputra: Towards unity* (pp. 70–73). thethirdpole.net. https://chinadialogue-production.s3.amazonaws.com/uploads/content/file_en/6797/brahmaputra-v13.pdf. Accessed 15 June 2020.

McCaffrey, S. C. (2008). Convention on the law of the non-navigational uses of international watercourses: Introductory note. United Nations Audiovisual Library of International Law. https://legal.un.org/avl/pdf/ha/clnuiw/clnuiw_e.pdf. Accessed 15 June 2020.

McCracken, M., & Wolf, A. (2019). Updating the register of international river basins of the world. *International Journal of Water Resources Development*, *35*(5), 732–782.

Ministry of External Affairs (MEA) (2013, October 23). Memorandum of understanding between the Ministry of Water Resources, the Republic of India and the Ministry of Water Resources, the People's Republic of China on strengthening cooperation on trans-border rivers. https://www.mea.gov.in/bilateral-documents.htm?dtl/22368. Accessed 15 June 2020.

Ministry of External Affairs (MEA) (2017, May 13). Official spokesperson's response to a query on participation of India in OBOR/BRI Forum. https://mea.gov.in/media-briefings.htm?dtl/28463/Official_Spokespersons_response_to_a_query_on_participation_of_India_in_OBORBRI_Forum. Accessed 15 June 2020.

Mohammed, K., Islam, A. S., Islam, G. M. T., Alfieri, L, Bala, S. K., Khan, M. J. U. (2017). Extreme flows and water availability of the Brahmaputra River under 1.5 and 2 °C global warming scenarios. *Climatic Change, 145*, 159–175.

Ministry of Water Resources, Government of India (MOWR) (2017). India-China cooperation. http://mowr.gov.in/international-cooperation/bilateral-cooperation-with-neighbouring-countries/india-china-cooperation. Accessed 15 June 2020.

National Portal Content Management Team (NPCMT) (2011). International Cooperation. https://archive.india.gov.in/sectors/water_resources/index.php?id=6. Accessed 15 June 2020.

National Remote Sensing Center (NRSC) (2016). Flood hazard atlas for Assam state (1998–2015). http://asdma.gov.in/pdf/publication/Flood_Hazard_Atlas2016.pdf Accessed 15 June 2020.

Pahuja, S., & Goswami, D. (2006). A fluvial geomorphology perspective on the knowledge base of the Brahmaputra. Background Paper #3 for The World Bank Strategy Report "Development and Growth in Northeast India: The Natural Resources, Water, and Environment Nexus". http://web.worldbank.org/archive/website01062/WEB/0__CO-62.HTM

Panda, J. P. (2017). *India-China relations: Politics of resources, identity, and authority in a multipolar world order*. London: Routledge.

Panda, J. P., & Baruah, A. G. (2019). Foreseeing India-China relations: The 'compromised context' of rapprochement. East-West Center. https://www.eastwestcenter.org/publications/foreseeing-india-china-relations-the-compromised-context-rapprochement. Accessed 15 June 2020.

Pfly, 2011. "File: Ganges-Brahmaputra-Meghna basins.jpg." Licensed under Creative Commons Attribution-Share Alike 3.0 Unported. Wikimedia Commons: The free media repository. Retrieved from https://commons.wikimedia.org/wiki/File:Ganges-Brahmaputra-Meghna_basins.jpg

Press Trust of India (PTI) (2018, March 28). Indian team in China holds talks on trans-border rivers. *The Hindu*, https://www.thehindu.com/news/international/indian-team-in-china-holds-talks-on-trans-border-rivers/article23370737.ece. Accessed 15 June 2020.

Ray, P. A., Yang, Y. E., Wi, S., Khalil, A., Chatikavanij, V., Brown, C. (2015). Room for improvement: Hydroclimatic challenges to poverty-reducing development of the Brahmaputra River basin. *Environmental Science and Policy, 54*, 64–80.

Rampini, C. (2016). *Impacts of hydropower development along the Brahmaputra River in Northeast India on the resilience of downstream communities to climate change impacts*. PhD dissertation. UC Santa Cruz.

Singh, P. K. (2018). Resurfacing of divergence in India-China relations. In M. S. Prathiba (Ed.), *China's rising strategic ambitions in Asia* (pp. 87–112). New Delhi: Pentagon Press.

Svensson, J. (2011, June 24). China, India and Brahmaputra. *iSikkim*, http://isikkim.com/2011-06-china-india-and-brahmaputra-243/

Tandon, A. (2019, September 2). China: Brahmaputra dams won't alter flow. *The Tribune*, https://www.tribuneindia.com/news/archive/nation/china-brahmaputra-dams-won-t-alter-flow-826802. Accessed 15 June 2020.

Vagholikar, N., & Das, P. J. (2010). Damming Northeast India: Juggernaut of hydropower projects threatens social and environmental security of the region. Kalpavriksh, Aaranyak, and ActionAid India. https://www.indiawaterportal.org/sites/indiawaterportal.org/files/Damming%20Northeast%20India_%20Kalpavriksh_%20Aaranyak_ActionAid%20India_2010.pdf. Accessed 15 June 2020.

Walker, B. (2016, March 21). China plans more dams and mega infrastructure in Tibet. *thethirdpole.net*, https://www.thethirdpole.net/2016/03/21/china-plans-more-hydro-projects-and-mega-infrastructure-in-tibet/. Accessed 15 June 2020.

Wasike, S., Okoth, P. G., Were, E. (2016). The nature of track three diplomacy and its influence on cross-border security relations between Kenya and Somalia. *International Journal of Managerial Studies and Research, 4*(7), 1–12.

Wolf, A. (2003). Conflict and cooperation: Survey of the past and reflection for the future. In F. A. Hassan, M. Reuss, J. Trottier, C. Bernhardt, A. Wolf, J. Mohamed-Katerere, P. van der Zaag (Eds.), *History and future of shared water resources*. UNESCO.