

Tsangpo-Brahmaputra: A Perception Study from Riparian Perspectives

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Abstract

Trans-boundary River water has been a constant source of contention since the ancient times. As worldwide water scarcity is an increasing trend, trans-boundary water issues have become more critical. The Yarlung Tsangpo-Brahmaputra is an important river that runs through China, India, and Bangladesh. Recently, it has been emerging as a great concern for India and Bangladesh. As a middle riparian country, India is concerned about the Chinese activities further upstream. On the other hand, Bangladesh is concerned about China's and India's upstream activities on the Yarlung Tsangpo-Brahmaputra, as it is the lowest riparian country. Each of the three countries has their own riparian perception and their own views to explain and justify their riparian activities and concerns. This paper will broadly analyze all three perspectives, their concerns, and anxieties, placing them in the context of their riparian location. It will also provide some suggestions based on the core principles of equitable and logical water sharing to deal with the present riparian tension and ensure basin-wide water management. All three riparian countries' should accept the principle of equitable distribution of Tsangpo-Brahmaputra river water. A Tsangpo-Brahmaputra river basin commission or some kind of commission can be formed with the authority to ensure equitable distribution of water among the co-riparian countries, namely, Bangladesh, China, and India.

Keywords: Yarlung Tsangpo, Brahmaputra, hydropower, divert, dynamics

1. Introduction

The Yarlung Tsangpo-Brahmaputra is a trans-boundary river connecting Bangladesh, India, and China, and is one of the longest rivers in the world. It is also one of the largest in terms of basin area and water flow. Originating at the Angsi Glacier in Western Tibet and named Yarlung Tsangpo, it flows across the Southern Tibet valley, breaking through the Himalayas and passing into India-held Arunachal Pradesh, which China calls Southern Tibet and claims it as its own, where it is known as Dhiang or Siang. Then, it flows southwest through Assam taking the name Brahmaputra, and runs south through Bangladesh as the Brahmaputra-Jamuna. From there it runs southward to meet the lower Ganges, which is known as Padma in Bangladesh. It then curves southeast to join the Meghna River and finally flows into the Bay of Bengal. Its upper stream passes through China, its midstream passes through Arunachal Pradesh and Assam in India and then its lower stream passes through Bangladesh.

China, India, and Bangladesh are all highly dependent on this river for life, livelihood, agriculture, economy, and power generation. Consequently, the lower riparian countries are sensitive to any upstream diversion or other human interference that may disrupt the natural flow of the river water to their territory. In this context, the authorities in India and Bangladesh have recently become very much concerned about the activities of China on the Tsangpo-Brahmaputra. In 2009, China began building a U.S. \$ 1.5 billion dam known as the Zangmu Hydropower Station on the foremost stream on the middle reaches of the Brahmaputra; China planned to reroute water from the Brahmaputra to its arid north to meet its growing water demand. As a middle riparian country with a large catchment area on Brahmaputra, India has already constructed a number of dams and has plans for more. Both China and India endeavor to make the preeminent use of their catchment of the Brahmaputra. China has blocked a tributary of the Brahmaputra River in Tibet as part of the construction of its most expensive hydropower project. This action has raised concern in India, more so as there is no bilateral or multilateral treaty or agreement on the Brahmaputra River Basin.

All these activities affect Bangladesh which is highly dependent on the water of rivers of external origin. Indeed, it finds itself vulnerable as 54 among 57 trans-boundary rivers enter into Bangladesh from India while no river runs from Bangladesh to India. Thus, Bangladesh is concerned about India's River Linking Projects (Note-1), unresolved Teesta issue (Note-2), salinity intrusion, and generally not getting enough water flow from the Ganges River. This tension is exacerbated by the scarcity of international agreements. There is only one water-sharing agreement: the Ganges Water Sharing Treaty between India and Bangladesh which does not contain any guarantee clause for a minimum amount of water flow to Bangladesh. Bangladeshi authorities are further worried by the Chinese activities on the uppermost stream of the Brahmaputra, though it is not clear at this moment about the probable impact of the dam on India and Bangladesh. Many analysts assume that it may reduce the downstream water flow to the point when the Brahmaputra may dry up in the long run. The crucial importance of the water for China, India, and Bangladesh makes this question politically extremely sensitive and may threaten regional stability.

This paper attempts to analyze the riparian position of all three countries of the Tsangpo-Brahmaputra basin, their perspectives, concerns, and probable consequences from their respective points of view. It also offers some probable ways to avoid long-lasting regional tension and instability and provides solutions to resolve the issue amicably.

2. Literature Review

Not much has been written so far about the Bangladesh-India-China water-sharing relationship in the context of Brahmaputra river water. A few scholarly writings have been done by Bangladeshi and Indian scholars. Most academic authors have taken either a lower riparian perspective or an upper riparian perspective. Scholars who have carried out studies based on lower riparian perspectives have focused mainly on the probable negative consequences of upstream human interferences on the common rivers, including the Brahmaputra, on the lower-riparian countries. This school of thought has painted Himalayan watershed as a competitive dam-building region, and China is in the most comfortable position, as major Asian Rivers have originated in China. They fear that China's greater consumption requirements of water and transfer of water to distant places will ultimately hurt the lower riparian countries. That is highly likely to generate inter-riparian tensions and environmental and other concerns in India and Bangladesh. Some writings by the scholars belonging to this school predict a disastrous impact on lower riparian countries. They are also worried about the riparian relations among these countries. As a case in point, the Institute for Defense Studies and Analyses (IDSA 2010) expressed its concern and fear that the issue of the Brahmaputra river water can emerge as a key factor in determining the future relationship among the Yarlung-Tsangpo-Brahmaputra basin countries, namely, Bangladesh, China, and India. Malhotra (2014) suggested that it may have a devastating impact on future riparian relationship. Rao (2014) used the Mekong River Project and its negative effects for Vietnam, Thailand, Laos, and Cambodia as an example for possible consequences of the Brahmaputra hydropower project. Peng, (2015) expressed his concern about China's future strategy about trans-border river issues. All of these authors urge for the necessity of mutual cooperation among the riparian countries for a better management of sharing of the river water and for strengthened regional stability (Chellaney 2012; IDSA 2010; Mahapatra & Ratha 2016; Malhotra 2014; Peng 2015; Rao 2014; Samarnayeke et al., 2016).

Another school of thought represents the upper riparian perspective. The scholars and practitioners belonging to this school have made the point that China has no plan to divert Brahmaputra's water and that even if it does divert water, its effect on the lower stream will be negligible. They argue that China's efforts in the dam-building projects in Tibet represent her desire to ensure sustained economic growth. It does not reflect at all China's plan to be the hegemonic power in the region. But because China refused to sign water management treaties, China's unilateral actions may cause suspicion and provide an excuse for others to accuse China of using water as a weapon (Hanzo 2012; Zhang 2015). Hanzo (2012) has added that this situation might influence India to take more unilateral steps that might have negative effects for the lowest riparian country, Bangladesh.

Our present study will focus on not any particular perspective but on all three of the riparian perspectives (upper, middle and lowest riparian) and will try to expose this issue from their riparian position.

3. Yarlung Tsangpo River and the Uppermost Riparian Perspective

Yarlung Tsangpo-Brahmaputra is a Trans-boundary river and one of the foremost rivers in Asia. From its source in Tibet in China (as India has recognized Tibet as an integral part of China in the early 1950s), it flows eastward in Tibet for 2,200 Km. China occupies 50% of its total basin area while India holds 34% and Bangladesh 8%. (Samaranayeke, Limaye & Wuthnow, 2016).

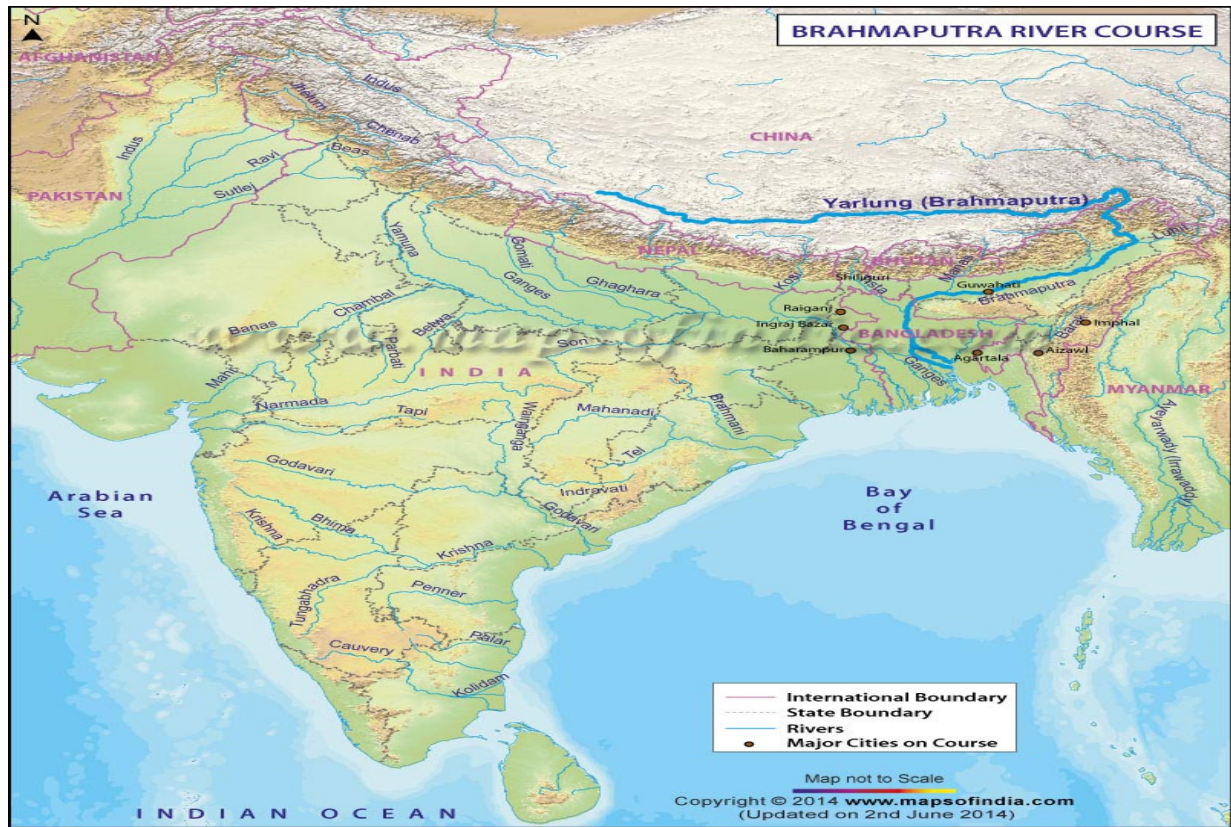


Figure 1. Tsangpo-Brahmaputra river course

Source: www.mapsofindia.com/maps/rivers/brahmaputra.html

Approximately 20% of the world’s population lives in China with only about 7% of the water resources. Contaminated river water exacerbates the problem further for China. According to China’s Ministry of Environmental Protection, a quarter of China’s river water is not good for drinking, agricultural, or even industrial use (Christopher, 2013). In this context, the Yarlung Tsangpo, the upper Brahmaputra, represents a huge source of clean water in China. Because of its geological and high altitude complex area and delicate ecology, it is incompatible for farming, population distribution, and transportation. For centuries, people have moved from one place to another using porters and pack animals. In 1950, the region barely had wheeled vehicles and the principal rivers had no bridge. Industrialization began only after 1952 (Goldscheider, 1995). Compared to the geographical location and ecology of the Brahmaputra basin area, Tibet is comparatively backward in terms of agriculture and developmental growth, even for utilizing river wealth, owing to its adverse atmosphere.

Table 1. Comparison of Geographical and Social Conditions between Chinese portion and the middle and lower portion of the Yarlung Tsangpo-Brahmaputra River

River	Length	Drainage Area km ²	Average		River Drop m	Energy Reserve 10 Thousand kw	Population 10 Thousand	Population Density person/km ²	Arable Land km ²
			Annual Runoff million m ³	100					
‘Yarlung Tsangpo’ Portion of the									
the	Tsangpo	1,905	345,083	1,654	8,435	11,350	237	6.9	1,225
yarlung-Brahmaputra River									
‘Brahmaputra’ Portion of the									
Tsangpo	740	125,312	2,000	—	3,000	3,184	54.1	33.521	
yarlung-Brahmaputra River									

Source: Peng, 2015.

Table 1 shows that, in Tibet, the Tsangpo portion of the river drop is very high, as it is located in mountainous area. Because of its delicate ecology, the population density as well as the arable land is very low and limited. But it has unfathomable deepness and strong river flow, so the most probable benefit to be realized from this river water is through power generation. China has a huge need for energy because of its giant population and rapid and high economic growth. So, China can make good use of Tsangpo river water to reduce her dependence on coal-based/thermal power, which accounts for 68% of China’s total power supply. China expects to cut the proportion of fossil fuel in the country’s energy segment to 15% by 2020 (Wirsing, 2012). Thus, meeting the rising energy demand in consistence with China’s development goals will require boosting its hydropower generation and other environment-friendly sources. The International Energy Agency has projected that between 2012 and 2035, the energy needs will increase by 60%. So far, coal has accounted for 70% of the country’s total electricity generation. In order to reach its energy goals while reducing the contamination created by coal, China must double the production of hydroelectric power (Turner, Shifflett & Batten, 2013). Given massive recent scientific progress in hydropower generation, this technology will be very useful for China’s development. This is also true for the economic development of Tibet, which consumes the least amount of hydropower while it has the highest potential for hydropower generation among all major rivers in China.

3.1 Chinese Concern about the Yarlung Tsangpo River

China’s ongoing rising economic growth is facing risks due to the shortage of clean water and growing need for energy. China has a huge need for energy to build cities and industries. Chinese authorities also desire to reduce greenhouse gas emission as smog blankets more and more Chinese cities. It is estimated that by 2025, approximately 350 million people, equal to the total U.S population, will live in urban areas (Turner et al. 2013). The water distribution is quite uneven. While in southern regions, 700 million people receive four fifths of total freshwater reserves, only one fifth of total fresh water remains for the 500 million people of the northern regions. So, China has to ensure sufficient water for its northern regions from all possible sources (Mahapatra & Ratha, 2016).

Another important issue is Tibet which is relatively less developed region. In 2010, 17% of the population of Tibet did not have any access to electricity (Peng, 2015). In 2010 the then Chinese President, Hu Jintao, and other higher-ranking leaders took additional steps to improve the living standards of the people of Tibet (Vasudeva, 2012). In such a situation, apparently, China has only one alternative to non-fossil fuel and that is by producing hydro electric power by using river water. Moreover, due to the Tibetan plateau 90 percent of the area of Xinjiang as well as Gobi Desert of north and Taklimakan Desert of south are inappropriate for human settlement as the Indian Ocean monsoon is inaccessible there (Chen, 2017). Besides, as the Yellow River in the northwestern part of China’s Gobi Desert in Xinjiang and Gansu runs dry for most of the time, it is exacerbating China’s water scarcity problem (Vasudeva, 2012). According to Wang Guangqian, a scholar at the Chinese Academy of Sciences, the water usage has been augmented in the lower reaches of Yangtze and Yellow River. People of the Northwest china are facing trouble because of the desertification and extraction of ground water. So, it’s necessary to divert water resources of Tibetan Plateau to solve the North China problem (Yangtso, 2014). Chinese engineers plan 1,000 km Tibet-Xinjiang water tunnel to make Xinjiang desert bloom. About 10 to 15

billion tones of water will be carried from Yarlung-Tsangpo River to the Taklimakan Desert each year which is approximately a quarter of the annual flow of the Yellow River (Chen, 2017). Thus, Tsangpo-Brahmaputra is an attractive source for water diversion and hydropower for China.

China has intended for dozens of dams and distraction structures to redirect water of the trans-boundary rivers. The red lines in Figure 2 indicate China's water diversion projects.

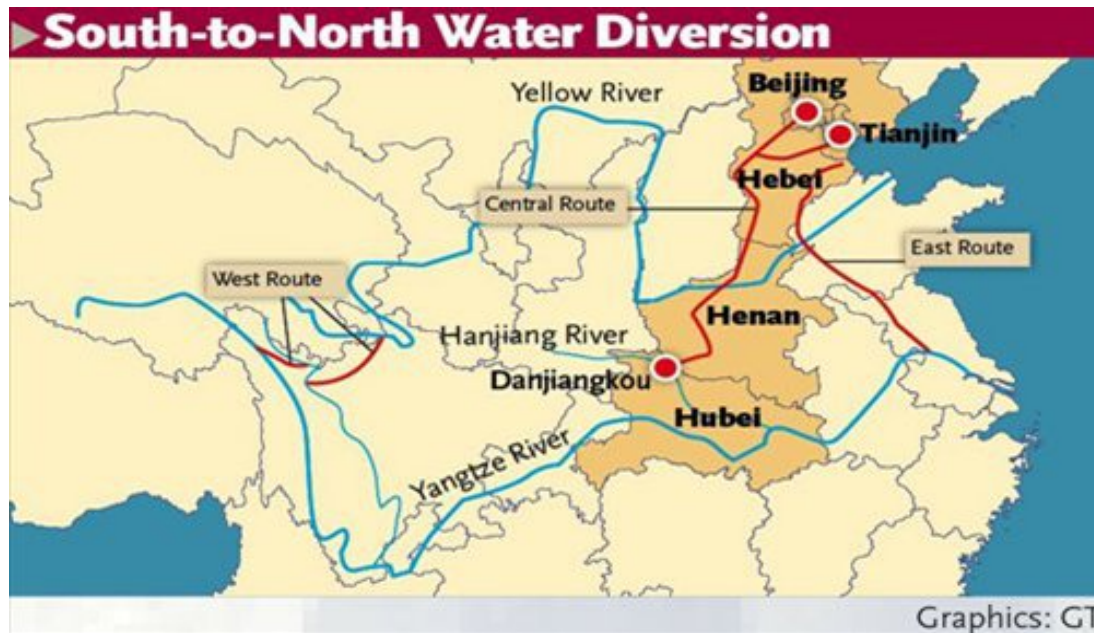


Figure 2. The water diversion projects of China

Source: Global Times, 21 June 2017.

China's Twelfth Five Year Plan on energy development aimed at building five major dams on the middle reaches of Brahmaputra during 2010-2021 which have an overall capability of 3,000 megawatts, accounting for about 3% of the total hydropower potential of the Brahmaputra (Jiang, Qiang, Lin, Xia & An Nan, 2017). On November 23, 2014, China opened a dam on the Brahmaputra that is the biggest hydropower project in Tibet for power generation. The first generating unit is Zangmu Hydropower station, placed in the middle reaches of the Yarlung Tsangpo, which is situated at more than 3,300 meters above the sea level with an aptitude to generate 510MW of electricity. China claims that the project will solve Tibet's power shortage (Rashid, 2014). According to Wang Dehua, the Director of South Asia Study Center of Shanghai international Relations Research Center, it would be a great waste of hydropower resource if the dam was not built. He is also hopeful that building dam may also help the downstream countries to control flooding of the river (Huang, 2014). Besides, it is assumed that it will play a significant role for the irrigation in the southwestern part of China because China can stock up about 2,200 cubic meters (m^3) of water per habitant compared to over 5,000 m^3 of water storage per habitant in the United States and Australia and the official figures of a mere 200 m^3 in India and 150 m^3 in Pakistan (Pomeranz, 2013).

3.2 China's Explanation and Justification of Its Position

The Chinese government has been trying to dismiss lower riparian countries' concern as well as to clarify its position, by saying that this project is a run-of-the-river and that they had no intention of harming the lower riparian states. It is not a barrage that will divert water from the upper Brahmaputra River (Rashid 2014). Moreover, the reservoir capacity of the dam is less than 0.02% of the average annual runoff of the Brahmaputra (Weijia, 2016). Chinese Foreign Ministry spokeswoman, Hua Chunying, told reporters, "The hydropower stations China builds will not affect the flood prevention and ecological system of downstream areas" (The Daily Star; Nov 25, 2014).

But Chinese authorities acknowledge that several Indian media are trying to give the whole matter a new shape by linking the blockage with India's recent water dispute with Pakistan; China temporarily blocked a tributary of Brahmaputra as a part of their project. China assumed that they were trying to create a false impression that

China was intentionally doing this in support of Pakistan. But as the dam-building project started long before the India-Pakistan issue, these two issues could not be linked in any way. Moreover, China has trans-boundary relations with other countries on several rivers. So, had China intended to use the water of Brahmaputra as a political weapon, it would have run the risk of hampering its riparian relationship with other countries also. Therefore, lower riparian countries have no reason to be worried about China's upstream activities (Weijia, 2016).

4. Yarlung Tsangpo-Brahmaputra and Middle Riparian Perspectives

India has around 17% of the world's population but it has less than 4% of the world's water resources. India is a country dependent on rivers as one third of its surface water comes from rivers lying outside of India which creates additional strain on India (Christopher, 2013). India is a middle-riparian country with a huge catchment on Brahmaputra. The environment is not as delicate as in Tibet and is extremely good for irrigation, shipping, as well as for utilizing river resources because of its plain basin area. Its yearly runoff is 585.6 billion cubic meters, which is the biggest in India and accounts for nearly one third of India's total runoff (Peng, 2015). Approximately 31.84 million people live along the Brahmaputra basin in India (Peng, 2015). This river provides water, food, and energy for all of these people. It is a grand provider of livelihood, fishing, irrigation, industrial production, shipping, and also of power generation as India lacks enough oil and gas reserve. According to India's official water resource information system, India is planning to build 16 dams in the Brahmaputra basin and some of these are now under construction (Limaye, 2016). India is the world's sixth largest energy consumer and seventh in hydropower generation. Although only 19.9% hydropower potential has been developed so far; the Brahmaputra River water can be a grand source for hydropower generation (Wirsing, 2012).

4.1 Indian Concerns about the Brahmaputra River

Successive Indian governments have expressed their deep concern over the damming of the Brahmaputra by China as it is one of the largest Himalayan Rivers and a lifeline to some of India's distant, arable, farm-dependent northeastern states. According to the World Resource Institute, it has been estimated that India is on the verge of enormous water scarcity due to inadequate supply of water for urban households and economic necessities. Roughly 224 million Indians at present are short of adequate levels of safe drinking water (Rivere, 2015). If the flow of the Brahmaputra is obstructed, the per capita amount of available fresh water in India will deplete rapidly. Moreover, climate change-induced glacial melting is highly likely to diminish the stream of the Ganges in the dry season sooner or later. That is going to place a serious burden on India and will make it more dependent on the Brahmaputra. The Brahmaputra River basin accounts for almost 30% of the total water resources and about 40% of the total hydropower potential in India. Chinese plans to build 20 hydroelectric dams and its prospective Grand Western Water Diversion Plan (redirecting water to the arid north) gives rise to Indian fears that upstream China will turn off the tap that makes up 30% of its water supply (Hill, 2015).

India has articulated enormous fears, assuming that its northeastern states might be vulnerable as the development might cause both untimely flooding and lack of water (The Financial Express; Oct 2, 2016). Economic growth and an increasing population create a rising demand for power generation in India. To meet the growing demand for energy, India has built eight hydropower stations on the Brahmaputra River, two of which are located in Arunachal Pradesh, which China calls Southern Tibet and claims as its own. India has planned to build another 19 hydropower stations; 14 of them are to be located in Arunachal Pradesh (Southern Tibet). All of them are supposed to play a key role in solving the energy crisis of India (Peng, 2015). The hydropower capacity of Brahmaputra is 29.725 million KW, accounting for 45% of the total hydropower reserves of the river (Peng, 2015). Indian authority is frightened that China's hydroelectric scheme may diminish the flow of the Brahmaputra and will thereby make India's own hydropower projects non-functional. According to Brahma Chellaney, an Indian scholar of Strategic Studies at the Center for Policy Research, New Delhi, Chinese intensive farming projects require waters, creating an additional reason to increasingly turn its attention to water reserves of the Tibetan Plateau. Besides, China is presently considering massive inter-basin water transfer projects with the goal of redirecting the flow of waters from the Tibetan Plateau toward the northern region (Rashid, 2014).

Moreover, China has not signed any bilateral accord regarding the consumption of water resources with any of its neighbors. China also did not sign the 1997 UN Convention on the Law of the Sea (UNCLOS) and the Non-Navigational Uses of International Waterways. India's concern about the Brahmaputra dam has been amplified first by Chinese rejection to share information claiming them as "internal matters" and followed by releasing contradictory information through government officials (Hill, 2015).

4.2 Expert Reports on Upper Stream Activities and Their Impact on India

China is constructing several dams on all of the foremost rivers of the Tibetan Plateau which has given China a hold on water for almost 40% of the global population (Ramachandran, 2015). Ed Grembine, a Visiting International Scientist with the Chinese Academy of Science in Kunming, projected that rapid and countless dam-building projects may turn the Himalayas into the most dammed region in the World over the next 20 years (Vidal, 2013). Reports on the seismic condition of the Tibetan Plateau note that Tibet's delicate ecology might lead to receding glaciers in Tibet and might have a disastrous ecological impact by causing the gradual death of the Himalayan Rivers (Vasudeva, 2012). According to Indian Water Resource Secretary, Ramaswamy Iyer, "China's dams on the Brahmaputra may be run-of-the-river, but they are a matter of greatest concern to lower riparian countries" (Mahapatra & Ratha, 2016). Such run-of-the-river projects are progressively shaping into silent intervention. Iyer also thought that it might bring about a catastrophe for the aquatic life downstream and displace people living in the region (Nowshin, 2015). Qin Hue, a professor in the School of Human Ties and Social Science of Tsinghua University, acknowledged that the intended damming project will have a cascading effect, leading to a natural disaster in the lower reaches of the Brahmaputra (Vasudeva, 2012).

People of Northeast India who depend on Brahmaputra's water for agriculture will be helpless if any kind of upstream activities causes ecological disturbances and affect industrial or agricultural sectors, fishing, shipping, and ultimately, the total economy of the region. Several hydroelectric projects of China are placed in an earthquake-prone area and extremely close to the geological fault line where the Indian plate collides with the Eurasian plate. In case of another disaster similar to the colossal earthquake of 2008, huge areas of Assam and Arunachal Pradesh would suffer devastating ecological effects and would be submerged (Mahapatra & Ratha, 2016).

Fishing is an important feature of livelihood for the people adjacent to the Brahmaputra River in China, India, and Bangladesh. Both the Porto Primavera Dam in Brazil and the Pak Mun case study blocked fish migration and reduced stream fish catch, affecting livelihoods of the fishing community around the area (Smith, 2016). Many people believe that a similar thing can happen with the Brahmaputra River.

Finally, the Brahmaputra River accounts for 44.20% of India's hydropower. Even a small decrease in the present reliance on coal for power generation would make India completely dependent on Brahmaputra (Peng 2015). Thus, any diversion and interference with the natural flow are likely to create hurdles for India in power generation.

5. Brahmaputra River and Lowest Riparian Perspective

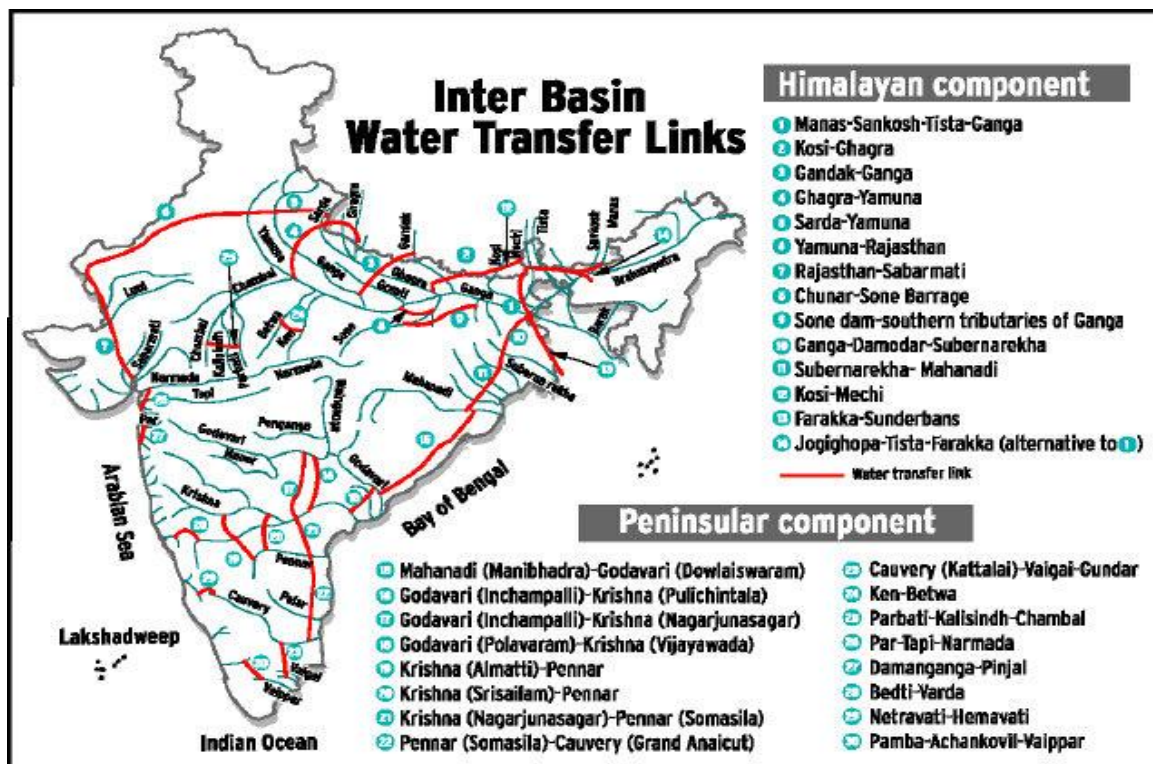
Bangladesh, with 2.15% of the world's population and .24% of water resources, is almost entirely dependent on cross-boundary water flows (Christopher, 2013). The economic structure of Bangladesh is still largely based on agriculture and extremely water reliant. As the lowest riparian and agrarian country, Bangladesh is dependent on river water for human consumption, irrigation, livestock, forestry, fisheries, transportation and conservation of biodiversity. In Bangladesh, Brahmaputra River accounts for 49% of total river water and in dry season it ensures 75% of available water. By 2020, Bangladesh is going to be a home to 200 million people. Thus, to ensure the food security, Bangladesh will have to boost its agricultural yield by 2% percent per year. To handle this situation, Bangladesh needs to rely on surface water from the rivers of Ganges, Brahmaputra, and Meghna (Rashid, 2014). The staple foods in Bangladesh are rice and wheat and the cultivation of both of these crops is highly water dependent. Every year, the yearly standard flood moisture and fresh sediment provides land fertility and helps to uphold the plain grassland and associated wildlife. Rapid industrialization and rising population are increasing the water needs in this region. Bangladesh is dependent on upper riparian streams for 92% of its surface water which requires continuous river flows to satisfy its agricultural needs (Kolas et al., 2013). The annual flow of the Brahmaputra from India to Bangladesh is 537.2 BCM (Rasul 2015). 67 percent of total annual flow comes from Brahmaputra while 18 percent comes from Ganges and 15 percent from other rivers (Rahman & Varis, 2012). As Bangladesh is facing water shortages from the River Ganga (Ganges) to drive back/flush out saline water intrusion from the Bay of Bengal coastline in South West Bangladesh, the Brahmaputra plays a central role by providing fresh water and directly reducing the salinity of water.

5.1 Bangladesh's Concern about the Brahmaputra River

Bangladesh is the lowest riparian country and the livelihood of millions of people in Bangladesh depends on the river water. Water scarcity in Bangladesh is threatening the country's biodiversity since more than 50 rivers are on the verge of drying up. Of the entire river water, Bangladesh receives about 51% during normal wet season and about 90% in dry season from the Brahmaputra and its tributaries (Smith, 2016). China and India's upstream activities on Brahmaputra have caused serious concern in Bangladesh because Bangladesh is already facing

several internal challenges raised in the Brahmaputra basin. Bangladesh is facing the problem of heavy flood and river bank erosion while at the same time ground water depletion and diminished water flow in the dry season creating complexities for people living in the Brahmaputra basin area. The land in Kurigram and Gaibandha on the west bank and in Jamalpur on the east bank is gradually being lost due to the intense water flow in monsoon that braided the river naturally. Excessive water flow in the monsoon often destroys crops, farm land and villages. In 2007, the river Brahmaputra burst into banks and destroyed the crops of around 39 villages (Samaranayeke, 2016). While crops are often destroyed due to excessive flood in the monsoon, the local people try their best to use the Brahmaputra river water in drier months especially for rice production. But water flow during the dry season is much less than the wet season. The average monthly flow of Brahmaputra at Bahadurabad in the monsoon is 1.3 million cubic feet per second whereas in the lean period it amounts to 157,000 cusecs though Bangladesh needs 210,000 cusecs from Brahmaputra. Besides, Bangladesh is also facing ground water depletion problem although 80 percent of the cultivation of Boro Rice depends on ground-based water irrigation (Samaranayeke, 2016). In this situation, it is assumed that Chinese upstream activities on Brahmaputra might diminish the river flow in India which will eventually affect Bangladesh and will increase the internal challenges in Brahmaputra basin intensely.

Besides, Bangladesh authority is deeply concerned about India’s River Linking Project (RLP) as it fears that India’s diversion of the water of Manas and Sonkosh Rivers in the Brahmaputra might shift water resource from the Brahmaputra to the Ganges basin (Samaranayeke, 2016).



Source: National Water Development Agency

Figure 3. India’s river linking projects

Source: www.thehindubusinessline.com

Despite the fact that this project has not been implemented yet in any visible way, Bangladesh has already expressed its worry and anxiety that India will sooner or later implement the RLP. India’s proposed RLP, if implemented in full, will make Bangladesh far more vulnerable than the prospect of water diversion by China (Samaranayeke, 2016). According to the scientists working for the Bangladesh government, even a 10% drop in the flow of water will have an adverse effect on the farming sector (Vidal, 2013). In addition to this, Bangladesh is also suffering from typical climate change effects causing a rise of the sea level. According to the Intergovernmental Panel on Climate Change (IPCC), the top international authority on climate change estimation, by 2050 the rise of sea level may put 27 million Bangladeshi citizens at serious risk. The consequence will be dramatic if the reduced water flow makes the Brahmaputra unable to flush out intruding saline water especially

in South West Bangladesh (Samaranayeke, 2016). In this situation, China's \$1.5 billion Brahmaputra dam, known as Zangmu Hydropower Station, adds to Bangladesh's concerns because any diversion can have drastic negative effect on agriculture, fishing, industrial, and in many other sectors. Bangladesh, being the lowest riparian and a developing country, is most at risk. Inevitably, any reduction in the flow and quality of water of the common rivers coming from India and China will affect the climate, cultivation, occupation, navigation, flora and fauna and economic life of Bangladesh adversely.

5.2 Upstream Activities by China and India on Tsangpo-Brahmaputra River and Consequences on the Lowest Riparian Bangladesh

Recently, China and India both have emerged as the two biggest geopolitical forces in the region. Both countries are going ahead with their emerging economies with huge population. Both are constructing hydro-power dams and diversion projects to meet their increasing demand for energy. It looks like both China and India have engaged themselves in hydro-power race. This could be disastrous for ecology, fishing, farming above all for indigenous people living in the downstream as they think it will largely affect their lives and livelihoods.

Being short of water management facilities and lacking the ability to store water for dry seasons, Bangladesh experiences wide swings from flooding to drought throughout the year. Moreover, Bangladesh is helpless as it has no capability to avert floods. China's and India's massive dam building projects would presumably worsen the water flow downstream. China has more hydropower dams than any other country in the world and considered as the most aggressive dam builder. Chinese diversion of the Brahmaputra, which is known as the Jamuna River in Bangladesh, will likely to have the most severe consequences for Bangladesh, a much poorer nation than India (Nowshin, 2015). On the other hand, Arunachal Pradesh government has signed approximately 168 memoranda of understanding with public and private dam building companies to construct medium-sized and large dams in the state. It is not only the concern of Bangladesh but also the communities of Arunachal Pradesh, Manipur, and Assam. It has led to a great deal of fear among local communities in these northeast Indian states. The obsession of the Indian government with hydropower, in some cases, has caused more alarm than the Chinese dam building projects further upstream (Rahman, 2016).

In addition, India's giant river-linking project is a matter of anxiety for Bangladesh. India wants to divert water from the areas of surplus to the areas of deficit. *The Guardian* reported that India intended to divert one third of the flow of Brahmaputra and other rivers to South Indian Rivers to provide 173 billion Cubic meters of water a year (Pakistan Defence; Nov 24, 2016). Water experts think that any change in the natural flow of rivers will submerge forest, have an effect on fisheries, and may shrink the water supply to downstream Bangladesh.

In Bangladesh, agriculture, which plays an important role in the development of rural people, depends considerably on Brahmaputra for ground water in dry season. The Brahmaputra alone supplies 1,106 billion m³ water per year which is around half of Bangladesh's Trans-boundary water (Chellaney, 2012). It also plays a vital role in the cultivation of the main crop, Boro Rice, as it is cultivated in the dry season. Any kind of reduction in the flow of the Brahmaputra may hamper the agricultural growth and food security of millions of Bangladeshis. It is in the lowest lying position than India and China and it has lack of fund and technology to protect itself. The Report, *Himalayan Challenge: Water Security in the Emerging Asia* says, "A decrease in water supply by 22 percent in the next two decades, rising sea level and increasing population might push Bangladesh to the risk of food security, outbreak of water-borne diseases, and loss of biodiversity" (Ray, 2010).

6. Cooperation and Negotiation: Way for Solution

Given the sensitivity of the situation, analysts and water experts suggested for cooperation among these three riparian countries to solve this issue. Neither China nor India has signed the UN convention on watercourse. Thus, finding a way that accommodates different interests and more balanced approach to solve the Brahmaputra issue is of utmost necessity. As a way toward this process, cooperation of all parties can be achieved through mutual trust building, sharing resources, data and information, coordination of development projects. Rahman & Varis (2015), Huang (2014), have given importance to integrated, cooperative and comprehensive basin-wide water management based on water convention and international laws to sort out this problem. Bhattarai, on the other hand, gave emphasis on exchange of data, information and incorporated river management to protect ecology and interest of these countries. In addition to this, many have suggested that, China, India and Bangladesh can also settle on a tripartite basis through meaningful dialogue and mutual understanding to share the Brahmaputra River water. For example, on March 22, 2016, China and five other countries along the Lancang-Mekong River – Vietnam, Cambodia, Laos, Thailand and Myanmar -- reached an agreement (Kumar, 2016). Such efforts can also be effective for building cooperative relationship among the co-riparian countries of the Brahmaputra Basin. Moreover, a Himalayan River Commission like the Mekong River Commission (MRC)

can be set up for sustainable water management and sharing of water resources (Rashid, 2014). Finally, as China and India are suspicious of each other due to their 1962 border war, Bangladesh can take initiatives to encourage both China and India for cooperation on the Brahmaputra issue. For this, they have to grow a deeper people-to-people relationship and common unified language to build confidence among each other and understand the challenges on the way to regional stability and ecological balance (Hill, 2015).

7. Conclusion

While the whole world is concerned about the issue of global water scarcity and thinking to take distinct efforts to deal with it, China and India draw the world attention because of their massive dam and diversion projects on Brahmaputra without showing any concern for the lower riparian countries. This issue may also turn into a major cause for regional unrest. According to UN estimates, more than half of the global population is going to live in acute water crisis by 2025. China and India will be the most sufferers because of their breakneck economy, mounting industrialization, giant population and a great requirement for food (Nowshin, 2015). This projection can also be a stimulus for both China and India's future obsession about river water that can shape up riparian relationship among these three countries. Wirsing (2012) and Hazarika (2015) warn that the competition to gain access to the Brahmaputra River may affect the future relationship between India and China. Many analysts even think that Sino-Indian disputes have shifted from land to water and are going to take the center stage in politics (Vidal, 2013). One other notable factor is that India, as a lower riparian compared to China, is concerned about Chinese dam and diversion projects as it is dependent on China for about half of its water coming from there while Bangladesh is also anxious about India's massive dam building projects and diversion plans. As the lowest riparian country, it runs the risk of losing the most. So, China and India should try to understand lower riparian's point of view as India in particular, is they are highly dependent on upper riparian China for water (Vidal, 2013). In the present world, many countries have been facing serious water disputes over Trans-boundary Rivers with neighboring countries and have been trying to deal with these issues through cooperation and negotiation. China, India and Bangladesh cannot deny this crucial issue and must find a way out of the disputes through mutual understanding to solve this issue and ensure regional stability. Besides, it can also be a good opportunity for both China and India to end all their mistrusts and start their relationship afresh.

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Notes

Note1. India has a grand design to transfer water of the Ganges and Brahmaputra Basins to western and southern India which, if implemented, can be fatal for both Bangladesh and India. Bangladeshi water experts think that Indian design of interlinking waters of the Himalayan Rivers [Ganges-Meghna-Brahmaputra] with those of peninsular India's rivers will turn Bangladesh into a semi-arid region (Rashid, 2014).

Note2. Bangladesh is on negotiation with India to sign the long-cherished Teesta water sharing treaty for almost three decades.

Note3. Teesta River originates from the eastern Himalayas, Sikkim, of India. By several rivulets, it flows up to Teesta bazaar, then meets the Rangeet River, changes its course and flows towards West Bengal. It emerges at Sivoke of North Bengal, crosses the Bangladesh-India border and then joins the Brahmaputra. It covers almost all of Sikkim, Darjeeling of West Bengal in India and in Bangladesh it flows through five districts of Rangpur Division. For details please see Khalid, Imam. 2010. "Bangladesh Water Concern", *A Research Journal of South Asian Studies*, 25(1), 73-87 and Islam, M.F. 2016. "Water Use and Poverty Reduction", *New Frontiers in Regional Science: Asian Perspectives* 8, xxix, 171, p.71

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