

*A K M Nazrul Islam*

## **WATER SECURITY CONUNDRUM IN BANGLADESH**

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### **Abstract**

At the global level, use of water has increased significantly and it is on the rise, while its availability and access have reduced. Water is inherently linked to the growing challenges of the present day civilisation that include food security, health, economic growth, and poverty alleviation. In Bangladesh, availability of and access to water have appeared to be a significant obstruction to the survival and livelihood of its people and, sustainable economic growth of the country. Being the lowest riparian country in the Eastern Himalayan River systems, the water ecosystem of Bangladesh is vulnerable to unilateral upstream actions since a major share of surface water in the country comes from outside the border. This paper highlights that the main reason of Bangladesh water crises is the low flows of water due to upstream intervention by India which significantly affects surface water availability in Bangladesh during the dry period. Thus, during the dry period there always remains a gap between the need and availability. There is an increasing dependence on the use of groundwater which is depleting very fast due to over exploitation by a huge population. Climate change is likely to worsen the situation further. Due to severe gaps between the demand and supply of water there is a distressing impact on the live and livelihood of the population of Bangladesh which are manifested on the environment/non-traditional security sphere of the country. These, in course of time are likely to be posing severe threat to the security and stability of the country. The paper concludes that the management of common water resources taking into account the totality of Bangladesh-India common rivers could hardly be achieved without the involvement of all other stake holders which may include the Eastern Himalayan River systems co-basin states, particularly Nepal and Bhutan.

### **1. Introduction**

Water security is an emerging concept. As a security concern, water is beginning to gain attention worldwide. This is due to the fact that water is an indispensable constituent of life supporting systems and it also has a major role

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**A K M Nazrul Islam** is Research Director at Bangladesh Institute of International and Strategic Studies (BISS). His e-mail address is: nazrul1845@yahoo.com

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in poverty alleviation and local food security.<sup>1</sup> In recent days, use of water has significantly increased all over the world and it is on the rise. On the other hand, availability of and access to water have reduced. The absence or shortage of water can seriously disrupt the very survival of any living being. The situation of demand and supply of water depicts a crisis today and portrays an apprehension for the days to come. Water security involves the sustainable use and protection of water systems, the protection against water related hazards (floods and droughts), the sustainable development of water resources and the safeguarding of (access to) water functions and services for humans and the environment<sup>2</sup>. Water is inherently linked to the growing challenges of the present day civilisation, including food security, health, economic growth, and poverty alleviation. Population increase and economic growth have impelled higher demands for the water resources available and the countries are having an increasingly difficult time in managing, allocating and protecting the water that exists. In a country like Bangladesh, declining availability of and access to water are significant obstruction to the survival and livelihood of its people and sustainable economic growth of the country. Climate change is likely to worsen the situation further. According to the Intergovernmental Panel on Climate Change, by 2050, more than one billion people in Asia alone are projected to experience negative impacts on water resources as a result of climate change.<sup>3</sup> Experts project that reduced access to fresh water will lead to a range of consequences, including impaired food production, loss of livelihood security, large-scale migration within and across borders, and increased geopolitical tensions and instabilities.<sup>4</sup>

Bangladesh is one of the most populous country of the world with relatively small land mass of 147,570 square kilometres (km) and a huge population of 160 million.<sup>5</sup> With over 1,084 people per square km, it is the most densely populated country in the world, barring a few city states. Bangladesh's steady economic growth over the years has created many environmental challenges, particularly in urban and industrialized areas. While security of water in Bangladesh is threatened mostly by current land-use developments and over-utilization of

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<sup>1</sup> "New Dimensions in Water Security: Water, Society and Ecosystem Services in the 21<sup>st</sup> Century", Food and Agriculture Organization of the United Nations, Rome, 2000, available at <ftp://ftp.fao.org/agl/aglw/docs/misc25.pdf> accessed on 12 December 2011.

<sup>2</sup> Bart Schultz and Stefan Uhlenbrook, '*Water Security: What Does it Mean, What May it Imply?*', Discussion Draft Paper for the session on Water Security, 13 June 2007, Delft, The Netherlands.

<sup>3</sup> "Asia's Next Challenge: Securing the Region's Water Future", available at [http://asiasociety.org/files/pdf/Water SecurityReport.pdf](http://asiasociety.org/files/pdf/Water%20SecurityReport.pdf) accessed on 20 December 2011.

<sup>4</sup> *Ibid.*

<sup>5</sup> The World Bank, available at <http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20535285~menuPK:1192694~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html> accessed on 30 March 2010.

groundwater, the growing industrialization process is compounding the situation further as it increases water demands, pollution and unsustainable use of natural resources, including groundwater and surface water bodies. The unpredictable contingencies, such as drought, floods, earthquakes etc. can also affect water security in a negative and dangerous way. Furthermore, the water ecosystem of Bangladesh is vulnerable to unilateral upstream actions since a major share of surface water in the country comes from outside the border. It is a matter of concern that due to lack of trust and non-transparency between the two Eastern Himalayan River basin countries i.e., Bangladesh and India, there exists no formal water sharing arrangement except the water-sharing agreement of the river Ganges signed in 1996. Under the circumstances, as a lower riparian country Bangladesh is likely to face severe water crisis in the coming days due to random contamination of surface and ground water, absence of comprehensive water sharing arrangement with neighbouring countries, and lack of comprehensive water management system.<sup>6</sup> This paper will premise the water situation of Bangladesh and make an effort to identify the sources of water, the gap between the supply and demand of water, effects due to the rising gap between demand and supply and, their security implications. The paper will also touch upon the management aspect including trans-national cooperation.

## **2. Sources of Water in Bangladesh**

Bangladesh is the lowest riparian in the Eastern Himalayan River systems – the Ganges, the Brahmaputra and the Meghna commonly known as the GBM. The Brahmaputra and the Ganges enter Bangladesh from the north and west and, flows south and east-southeast respectively to their confluence at Aricha, about 70 km west of Dhaka in central Bangladesh; and then flows south as the Padma River for about a further 100 km to its confluence with the Meghna River at Chandpur. The Meghna River flows southwest, draining eastern Bangladesh and the bordering north-eastern states of India to join the Padma River at Chandpur. The Meghna then flows south for another 160 km before finally discharging into the Bay of Bengal. Thus, most of Bangladesh is flood plain of the GBM river system. Except some hills in the northeast and southeast, about 80 per cent of the landmass of Bangladesh<sup>7</sup> is alluvial deltaic plain with an average elevation above sea-level of only 10 meters that is formed by more than 250 rivers, and their numerous tributaries and distributaries. These include no less than 57 international/trans-boundary rivers of which 54 flow into the country through India. These rivers carry an enormous discharge of water from the Himalayas. The

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<sup>6</sup> Md. Shariful Islam, “Water Scarcity and Conflict: A Bangladesh perspective”, available at <http://www.thedailystar.net/forum/2011/june/water.htm> accessed on 20 December 2011.

<sup>7</sup> “Geography of Bangladesh”, available at <http://worldfacts.us/Bangladesh-geography.htm> accessed on 17 April 2011.

combined flow of these rivers discharges under the name of Meghna into the north-eastern corner of the Bay of Bengal. Being in the combined catchment area of the GBM river basin, it drains 92 per cent of the flow out into the Bay of Bengal, which is the major cause of flooding.<sup>8</sup> As a result of flat topography of the floodplain, between 20-68 per cent of the country is flooded each year by overflowing rivers during monsoon when the rainfall within the country is also very high.<sup>9</sup> Bangladesh has a tropical monsoon climate with significant variations in rainfall and temperature throughout the country. About 80 per cent of the total rainfall occurs in the monsoon, and the average annual precipitation over the country is 2320 mm.<sup>10</sup>

The most discharges of the three main rivers – the Ganges, the Brahmaputra and the Meghna occur generally during the monsoon period of Bangladesh and the combined discharge is among the highest in the world. Peak discharges are of the order of 100000 m<sup>3</sup>/s in the Brahmaputra, 75000 m<sup>3</sup>/s in the Ganges, 20000 m<sup>3</sup>/s in the upper Meghna and 160000 m<sup>3</sup>/s in the lower Meghna.<sup>11</sup> On an average, almost 1106 km<sup>3</sup> of water crosses the borders of Bangladesh annually, of which 85 per cent between June and October. Around 54 per cent (599 km<sup>3</sup>) is contributed by the Brahmaputra, 31 per cent (344 km<sup>3</sup>) by the Ganges and nearly 15 per cent (163 km<sup>3</sup>) by the tributaries of the Meghna and other minor rivers.<sup>12</sup> The internal renewable water resources are estimated at 105 km<sup>3</sup>/year. The overlap being considered negligible though includes 84 km<sup>3</sup> of surface water produced internally, as stream flows from rainfall and about 21 km<sup>3</sup> of groundwater resources produced within the country. Part of the groundwater comes from the infiltration of surface water with an external origin. Since annual cross-border river flows and entering groundwater are estimated to be 1105.64 km<sup>3</sup>, the total renewable water resources are therefore estimated at 1210.64 km<sup>3</sup>.<sup>13</sup>

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<sup>8</sup> National Plan for Disaster Management 2008-2015 (Final Draft for Approval), Disaster Management Bureau, Ministry of Food and Disaster Management, Government of Bangladesh, May 2008, available at [http://www.dmb.gov.bd/reports/National%20Plan%20for%20Disaster%20Management-Final%20draft%20\(12%20August%202008\).pdf](http://www.dmb.gov.bd/reports/National%20Plan%20for%20Disaster%20Management-Final%20draft%20(12%20August%202008).pdf) accessed on 03 January 2009.

<sup>9</sup> Shardul Agrawala *et al.*, *Development and Climate Change in Bangladesh: Focus on Coastal Flooding and the Sundarbans*, Organization for Economic Co-operation and Development (OECD), 2003, available at [http://www.adaptationlearning.net/profiles/country/files/OECD2003\\_BangladeshCoastalFlooding.pdf](http://www.adaptationlearning.net/profiles/country/files/OECD2003_BangladeshCoastalFlooding.pdf) accessed on 25 July 2009.

<sup>10</sup> FAO: Aquastat, available at <http://www.fao.org/nr/water/aquastat/countries/bangladesh/index.stm> accessed on 25 June 2011.

<sup>11</sup> “Water Profile of Bangladesh”, *The Encyclopedia of Earth*, available at [http://www.eoearth.org/article/Water\\_profile\\_of\\_Bangladesh](http://www.eoearth.org/article/Water_profile_of_Bangladesh) accessed on 25 July 2011.

<sup>12</sup> *Ibid.*

<sup>13</sup> FAO: Aquastat, *op.cit.*

In Bangladesh, groundwater source is the most widely used water source. About 97 per cent of the rural population and 82 per cent of the urban population are dependent on groundwater source.<sup>14</sup> The properties of the groundwater storage reservoir and the volume of annual recharge dictate the availability of groundwater resources in Bangladesh. Key factors which determine groundwater availability include the capacity of the country's aquifers to store water, and the characteristics which govern economic withdrawal of groundwater for irrigation, domestic and industrial needs.<sup>15</sup> The source of recharge is rainfall, flooding, and stream flow in rivers. The quaternary alluvium of Bangladesh constitutes a huge aquifer with reasonably good transmission and storage properties. Heavy rainfall and inundation during the monsoon help the aquifers to be substantially recharged annually.<sup>16</sup>

### 3. Gap between the Demand and Supply of Water

Around 1 per cent of total water resources in Bangladesh is withdrawn for human uses annually; of the total withdrawals, 86 per cent is used for agriculture, 12 per cent for domestic water supply and 2 per cent for industrial sector.<sup>17</sup> Sources of water used in agriculture in Bangladesh are: surface water 30.8 per cent and ground water 69.2 per cent.<sup>18</sup> Notwithstanding the fact that Bangladesh is among the countries having the highest per capita volume of surface water, a large proportion of the population of the country is yet to gain access to safe sources of drinking water due to local and/or seasonal water shortages and, due to natural and man-made forms of water pollution. According to a recently published United Nations Population Fund (UNFPA) report, about 80 per cent of the total population in Bangladesh has access to an improved source of water.<sup>19</sup> The most widely used groundwater source is depleting very fast due to over exploitation. This is creating huge gaps between water demand and water supply. In the capital city of Dhaka, the Water and Sewerage Authority (WASA) has a capacity to supply 1.27 billion litres per day against a demand of 1.6 billion litres for its residents.<sup>20</sup> The Dhaka WASA has 237 deep tube wells, 3 treatment plants,

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<sup>14</sup> Khondaker Azharul Haq, "Water Management in Dhaka", *International Journal of Water Resources Development*, Vol. 2, No. 2, 2006, p. 296

<sup>15</sup> FAO: Aquastat, *op.cit.*

<sup>16</sup> *Ibid.*

<sup>17</sup> "COUNTRY PROFILE – Bangladesh", World Resources Institute, *Water Resources and Freshwater Ecosystems*, available at <http://www.wri.org/project/earthtrends/text/water-resources/country-profile-14.html> accessed on 20 July 2010.

<sup>18</sup> "Acute Water Crisis in Bangladesh", *Perspective*, available at <http://www.perspectivebd.com/acute-water-crisis-in-bangladesh-impact-on-living/> accessed on 12 September 2011.

<sup>19</sup> "Population 16.44cr", *The Daily Star*, Dhaka, 21 October 2010.

<sup>20</sup> "Bangladesh Water Crisis", available at <http://gurumia.com/2010/03/29/bangladesh-water-crisis/> accessed on 21 July 2010.

1,610 km of water lines, 171,855 water line connections, 38 overhead tanks, and 1,643 roadside taps. Even then, there remains a gap between the demand and supply which stands at a staggering .33 billion litres a day.<sup>21</sup> Due to the acute water supply situation in Dhaka during the dry season, deployment of military in aid to WASA has now become a regular phenomenon for the last couple of years. The most alarming fact is that, in Dhaka, the groundwater level is dropping by three metres a year. According to the Dhaka WASA, the groundwater table was at 11.3m below the surface in the 1970s and at 20m in the 1980s.<sup>22</sup> However, a study conducted by Bangladesh Agricultural Development Corporation (BADC) in 2007 reveals that in 1996, the groundwater level was 26.60 metres below the surface which by 2007, had gone down to 61.18 metres.<sup>23</sup> This means a fall of about 35 metres in just 11 years. BADC researchers have blamed the city's increasing population and little recharging of groundwater over the years for this unwanted precarious situation. Dhaka being a fast growing city due to its increasing number of population, most of the wetlands and river banks have been encroached in the recent times for construction which is barring full recharging of groundwater during the monsoons.

In the rural areas of Bangladesh, since the 1960s, about 1.2 million hand pump tube wells have been installed by government authorities and six times as many tube wells have been installed by private individuals, NGOs and other agencies.<sup>24</sup> Every year, a number of water pumps/ tube wells are being abandoned, and new pumps/ tube wells are constructed/ installed as they fail to lift desired amount of water or marked unsafe or contaminated for consumption. In the dry season, most of the surface water sources of Bangladesh get dried up and water flow in majority of the rivers remain at a level which is significantly low. Consequently, huge gap is created between the demand and supply. Water flow is required for averting siltation of rivers all over the country especially in the dry season, which affects navigability, and increases incidences of flood. There is also a critical need for minimum flow of water in the rivers to ward off intrusion of salinity in the coastal areas; it is important for habitants in those areas for agriculture, forestry and biodiversity, and also for availability of drinking water. In reality during the lean period there always remains a gap between the need and availability. This predicament of the country is largely contributed by the prevailing natural problem in the GBM river system that has

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<sup>21</sup> Available at [www.itt.com/waterbook/Bangladesh.asp](http://www.itt.com/waterbook/Bangladesh.asp) - Cached - accessed on 20 July 2010.

<sup>22</sup> Available at <http://www.downtoearth.org.in/node/4641> accessed on 23 December 2011.

<sup>23</sup> *Ibid.*

<sup>24</sup> "Access to Safe Drinking Water", available at [www.pravdabangladesh.wordpress.com/access-to-safe-drinking-water](http://www.pravdabangladesh.wordpress.com/access-to-safe-drinking-water) accessed on 21 July 2010.

been aggravated by various development activities like, flood control and irrigation projects particularly, dams and barrages on the upstream of common rivers.

#### **4. Effects Due to the Rising Gap between the Demand and Supply of Water**

Due to gaps between the demand and supply of water in Bangladesh, severe consequences are already visible on various fields. The growing process of deforestation precipitated by the pressure of ever increasing population, poverty and energy deficiency are disrupting the natural equilibrium of environment rapidly and ruthlessly with devastating effects, among others, on the rivers. As most of the Eastern Himalayan River systems finally discharge into the Bay of Bengal flowing through Bangladesh, the country faces the major brunt of these devastating effects. To this is added the ever deteriorating and increasingly unpredictable impacts of climate change. As a lower riparian country Bangladesh is the worst victim of all these.

Notwithstanding the fact that Bangladesh is a riverine country, it is gradually turning into a water-scarce country. Among the sources of surface water, many rivers are virtually becoming extinct and polluted as well, which means they do not or cannot provide usable freshwater. Among about 250 rivers that once crisscrossed the country, many are facing the crisis of existence.<sup>25</sup> Surface water sources e.g. rivers, lakes, marshes etc due to over extraction of water, are becoming polluted, dry and losing navigability in many cases. The situation in Bangladesh, especially in the cities, with respect to water hazard and contamination is appalling. Factories and residents discharge harmful chemicals and toxic wastes into the rivers. The four rivers surrounding Dhaka city have already become dead seriously hampering the life of the people dependent on the rivers and likely to worsen day by day. In the last twenty years, a convergence of unregulated industrial expansion, rural-to-city migration, encroachment of the rivers, overloaded infrastructure, confusion about institutional responsibility for the quality of Dhaka's waterbodies, and very ineffective enforcement of environmental regulations have all taken their toll on surface water quality.<sup>26</sup> The rivers in the rest of the country are suffering similar disasters. The latest study of BIWTA reveals that 117 rivers are either dead or have lost navigability which include Brahmaputra, Padma, Mahananda, Meghna, Titas, Dhaleswari, Bhairab, Sitalakkhya, Turag, etc.<sup>27</sup> In Dhaka city alone, everyday about 2 million tons of waste is dumped into the surrounding rivers; each year about 2.4 billion tons of

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<sup>25</sup> Md. Asadullah Khan, "Water Security Hampers Development", *The Daily Star*, 26 September 2010.

<sup>26</sup> "Dhaka Environment and Water Project" available at [http://www.doe-bd.org/DEW%20Project%20Limited%20ESA%20%20ESMF\\_Main.pdf](http://www.doe-bd.org/DEW%20Project%20Limited%20ESA%20%20ESMF_Main.pdf) accessed on 12 December 2011.

<sup>27</sup> Md. Shariful Islam, *op.cit.*

sediment from the Himalayas is carried by the rivers of Bangladesh into the Bay of Bengal.<sup>28</sup>

Beside the necessity of water for direct consumption and industrial use, it is also required for any kind of food production activity. Agricultural production of the country is suffering huge difficulties due to non-availability of water during the dry period. In Bangladesh, agricultural activities are mainly confined in the rural parts of the country. River water had been the primary source of irrigation since the ancient times. With the rising demand of water in agriculture as well as reduction of water in the rivers due to interventions in the up streams, initially agriculture was badly affected. By last three decades, farmers switched over to costliest means of using ground water through installing shallow and deep tube wells. But the yearly recharge of the aquifers is less than before. As a result, growing dependence on ground water is lowering the water table, making arsenic contamination - a pervasive health hazard.

Long deprivation of water may give rise to deadly social instability. This is already visible in many areas of the country. There are people often waiting for long hours in long queues just for a bucket of water whereas many areas have been suffering continuously from water-logging. A good example is the Bhavadaha of Jessore district in the southwest part of the country. In the coastal southern areas of the country due to tidal surge many flood protection embankments have been washed away. Consequently, people are continuously suffering from water-logging and facing the acute crisis of drinking and usable water which they have to collect far away from their home. Due to the nature of society and culture there are also other social crises associated with poor access to safe drinking water in Bangladesh.

## 5. Security Implications

Owing to increasing water crises in Bangladesh there is a distressing impact on the live and livelihood of a huge population of the country. These are quite visible on the environment/non-traditional security sphere of the country which may in course of time are likely to be posing severe threats to the security and stability of the country. Some of these are discussed in the succeeding paragraphs.

### *Outbreak of Epidemics*

As water is becoming polluted, it is no wonder that the country risks outbreak of epidemics of waterborne diseases. It has been witnessed on many occasions during and the aftermaths of disasters like flood, or cyclone as natural

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<sup>28</sup> "Acute Water Crisis in Bangladesh: Impact on Living" available at [perspectivebd.com](http://perspectivebd.com) accessed on 21 July 2011.



disasters are a regular incidence in the country. In Bangladesh, about 1,10,000 children die a year because of waterborne diseases.<sup>29</sup>

### *Arsenic Poisoning*

Bangladesh has become a victim of arsenic poisoning due to over exploitation of groundwater. This is an emerging threat to public health. Water is being contaminated with arsenic frequently, because of the high arsenic contents in the soil. Now-a-days, arsenic poisoning has become a grave concern, as it affects the people physically, economically, and psychologically.<sup>30</sup> A recent survey by the Bangladesh Bureau of Statistics and the United Nations Children's Emergency Fund (UNICEF) showed that 12.6 per cent of Bangladesh households, or about 20 million people, still drink water containing arsenic above the government's recommendation of no more than 50 micrograms per litre.<sup>31</sup> Groundwater of 61 surveyed districts out of total 64 is contaminated with arsenic. According to the World Health Organization, arsenic-contaminated water directly affects the health of 35 million people in Bangladesh.<sup>32</sup> Some basic data about arsenic contamination in Bangladesh is given below:

**Table 1**

*Basic data about arsenic contamination in Bangladesh*

<ul style="list-style-type: none"> <li>• Estimated number of tube wells in Bangladesh: 8,600,000</li> <li>• Tube wells tested for arsenic 4,750,000</li> <li>• Tube wells marked green (safe) 3,300,000</li> <li>• Tube wells marked red (unsafe) 1,400,000</li> <li>• Estimated total villages in country 87,319</li> <li>• Villages screened 54,041</li> <li>• Villages where &lt; 40 per cent of the wells are contaminated 37,332</li> <li>• Villages where 40-80 per cent of the wells are contaminated 8,331</li> <li>• Villages where 80-99 per cent of the wells are contaminated 6,062</li> <li>• Villages where all wells contaminated 2,316</li> </ul>
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Source: Arsenic Mitigation in Bangladesh, UNICEF, available at: <http://www.unicef.org/bangladesh/Arsenic.pdf>. accessed on 01 April 2010.

### *Difficulties in Groundwater-based Irrigation System*

Bangladesh is an agricultural country and heavily relies on irrigation system for its agricultural production. For the last couple of decades the irrigation system

<sup>29</sup> "Some 1,10,000 Children Die of Waterborne Diseases Annually in Bangladesh", *The China Daily*, 09 November 2008.

<sup>30</sup> Arsenic results in skin lesions, swollen limbs and loss of feeling in the hands and legs. Long-term exposure to arsenic can also lead to cancer; possible organs which may be affected are lungs, bladder and kidneys.

<sup>31</sup> Available at <http://www.reuters.com/article/idUSTRE62L35P20100322> accessed on 20 July 2011.

<sup>32</sup> *Ibid.*

in the country is mostly groundwater-based due to non-availability of surface water sources. This groundwater-based irrigation system is experiencing difficulties in different parts of the country as shallow aquifer level is getting out of reach due to fast depletion of groundwater table. Shallow tube-wells (STWs) now cannot draw water for about 46 per cent irrigated cropland during dry season, says data from survey and monitoring of groundwater project and groundwater zoning map of Bangladesh. According to 2006-07 irrigation survey report of the government, around 10 million farmers had overwhelming dependence on STWs for almost 70 per cent of 47.8 lakh hectares of irrigated cropland in the season. The groundwater zoning map of BADC prepared in 2006 shows that a record high of 78 per cent irrigated cropland in Pabna has become critical for STW operation. The percentage of irrigated cropland critical for STW operation, and unable to draw water by STWs are shown in the table 2 and 3 below:

**Table 2**

*Percentage of irrigated cropland critical for STW operation*

Percentage of irrigated cropland critical for STW operation	Districts
78	Pabna
75	Comilla
60	Kushtia and Naogaon
55	Mymensingh and Cox's Bazar
50	Joypurhat
49	Chittagong
45	Bogra and Rajbari
30	Jhenidah, Netrakona, Gazipur and Narayanganj

Source: Prepared by author from the data available in: "Groundwater Depletion Hampers Irrigation", *The Daily Star*, 09 March 2008.

**Table 3**

*Percentage of irrigated cropland unable to draw water by STWs*

Percentage of irrigated cropland unable to draw water by STWs	Districts
28	Sherpur
20	Jamalpur and Tangail
18	Natore
16	Manikganj
15	Dhaka, Narsingdi and Sirajganj
10	Rajshahi, Chapainawabganj, Kishoreganj and Munshiganj

Source: Prepared by author from the data available in: "Groundwater Depletion Hampers Irrigation", *The Daily Star*, 09 March 2008.

### *Food Security*

Bangladesh being a food deficit country, its security of food is facing severe challenges due to the non-availability of water required for food production during the harvesting season. The price hike in food items has severely endangered the country and its huge population. Already in the international market, food prices are going high. In the country, food price remains stable if there is a bumper production. Again a bumper production depends largely on timely availability of required irrigation water. Here, indirectly, water shortage is largely responsible for adverse impact on food price in the market. Climate change and rising temperatures have now badly disturbed food production patterns and have deepened food insecurity further. Due to changes in the seasonal weather patterns large populations of the country who are dependent on rain-fed subsistence farming are facing the negative impacts on their food production. For producing more food, groundwater is being excessively used; on the other hand, fertilizer effluents get washed into surface water sources and seep into groundwater thereby polluting them continuously.

### *Rising Salinity*

Rising salinity in water is a growing problem in Bangladesh, especially in the country's coastal areas. Increase in salinity in water is endangering humans, plants and other life-forms. About 53 per cent of the coastal areas is negatively affected by salinity.<sup>33</sup> The main cause for the salinity is the reduced flow of the rivers of the affected areas which lost their navigability over the years due to withdrawal of water during dry season at the upstream of the Ganges. This has been further aggravated by the introduction of shrimp cultivation in the 1970s. According to Government's Soil Resource Development Institute, salinity caused by growing shrimp cultivation over the last three and half decades, damaged the soil fertility of more than one million hectares of coastal arable land that could have yielded 2.5 million tons of rice.<sup>34</sup> Large areas are converted into shrimp enclosures which are obviously saltwater ponds. To lessen their expenses, farmers create channels from the estuaries to drain saltwater into their respective ponds. Once entered, the saltwater destroys the fundamental element of the soil by gradual salt sedimentation into the land. In the process, it destroys water (surface ones), ground water and the dependent flora and fauna. Shrimp cultivation is also blamed for salinity in ground water pumped out by deep tube wells and withering of trees, several aquatic plants, weeds, and local fish species.

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<sup>33</sup> S A Haque, "Salinity Problems and Crop Production in the Coastal Areas of Bangladesh", available at [www.pakbs.org/pjbot/PDFs/38\(5\)/PJB38\(5\)1359.pdf](http://www.pakbs.org/pjbot/PDFs/38(5)/PJB38(5)1359.pdf) accessed on 25 May 2011.

<sup>34</sup> "Shrimp Farming Deals Major Blow to South", *The Daily Star*, Dhaka, 26 May 2011.

### *Earthquake Risks*

As groundwater is overexploited and surface water is destroyed, the soil below the earth becomes hollow; as a result, the land overburdened with people and infrastructure, becomes very much vulnerable to earthquakes. Recently, on 11 September 2010, a quake of 4.8 magnitude rocked the capital city of Dhaka. The observatory at Bangladesh University of Engineering and Technology (BUET) recorded 86 tremors of over four magnitude during January 2006 to May 2009. Another four earthquakes took place with magnitude of over five during the period. According to a seismic zoning map prepared by BUET, 43 per cent areas in Bangladesh are rated high risk, 41 per cent moderate and 16 per cent low in terms of earthquake risk.<sup>35</sup>

### *Emergence of Inter-State Conflicts*

The implications of water crisis may well be visible on the traditional security sphere. Due to severe shortage of water, many kind of social instability are very much likely to arise for Bangladesh both at the national and regional levels. Such developments in the past generated a number of inter-state disputes. Examples are abound, e.g. Turkey, Syria, and Iraq have conflicts over the Euphrates and Tigris rivers; the Jordan River conflict among Israel, Lebanon, Jordan and the Palestinian territories; in Africa, the Nile River-related conflicts among Egypt, Ethiopia, and Sudan. Emergence of such kinds of conflicts may not be unusual in the South Asian region. A specific mention may be made of Bangladesh-India dispute over the Farakka Barrage, which in course of time, turned out to be the most stumbling block in the way of co-operation between the two countries. The dispute persisted for more than a quarter of a century and thwarted all efforts at cooperation between the two countries in managing and developing the common water resources of the Ganges and other fifty three rivers that flow from India through Bangladesh and empty into the Bay of Bengal.<sup>36</sup>

## **6. Management Aspects including Trans-national Cooperation**

Conventionally, management of water resources has been associated with the need to cater for human requirements in terms of drinking water, food and other tangible goods.<sup>37</sup> In recent times, management of water resources has become a critical issue owing to the growing demand in the backdrop of reduced availability and access. Lenton said that water management means different

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<sup>35</sup> Helemul Alam, "Bangladesh Runs High Quake Risk", *The Daily Star*, Dhaka, 12 August 2009.

<sup>36</sup> For details on the dynamics of conflict between Bangladesh and India on the distribution of Ganges water, see, A. K. M. Abdus Sabur and Mohammad Humayun Kabir, *Conflict Management and Sub-Regional Co-operation in ASEAN: Relevance for SAARC*, Dhaka: Academic Press and Publishers Limited, 2000, pp.65-67.

<sup>37</sup> Available at <ftp://ftp.fao.org/agl/aglw/docs/misc25.pdf> accessed on 11 December 2011.

things to different people, ranging from a household to a global perspective. For example, he noted, a farmer focuses on how to maximize yield with the water available to increase profits, while national policymakers consider how to ensure food security for citizens while minimizing water used by agriculture so that other needs can be met.<sup>38</sup> Since the pre-independence period, the governments in Bangladesh had taken various plans like national water management plan, integrated coastal management plan, haor master plan, national water resources management plan etc. The Ground Water Management Ordinance, 1985 was endorsed by the government to manage the ground water resources for agricultural production. The government in 1992 adopted the National Environmental Policy, appended with an implementation programme. This policy embraces 15 development sectors including agriculture, industry, health and sanitation, energy, water, land, forest, fisheries and livestock, coastal and marine environment, and others. In 1999, the National Water Policy (NWP) was adopted which covered almost all important issues regarding water resources management along with the issue of trans-boundary water management and most of the global concerns. One of the most important goals of the National Water Policy is to address issues related to the harnessing and development of all forms of surface water and groundwater, and management of these resources in an efficient and equitable manner.

The activities in the water sector in Bangladesh, had traditionally been focused on flood control, drainage and irrigation to support the agriculture sector, and in that process those had neglected role of water in other sectors such as fisheries, navigation, domestic water supply and sanitation, industrial water supply, recreation, ecology and nature, hydropower and disaster management.<sup>39</sup> Bangladesh being a flood prone country, without a doubt, there is an increased need for flood management and flood protection. Flood management and flood protection schemes may have to protect both rural and urban areas of the flood prone zones. Generally, the government has its roles and responsibilities in respect of policy, legislation and the major regulation and protection works. In addition, other agencies including the local level government, farmers and other stakeholders may each have their roles and responsibilities. National Water Policy of 1999 calls for decentralization and emphasizes the participation of communities in planning, development, operation and maintenance of water supply and sanitation facilities through local government and community-based

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<sup>38</sup> Available at <http://waterforfood.nebraska.edu/wfi-in-the-news/no-single-solution-for-water-food-security> accessed on 11 December 2011.

<sup>39</sup> Summary Proceedings of Panel Discussion on *Managing Water Security: Ganga-Brahmaputra Basin*, organised by Bangladesh Institute of International and Strategic Studies at Dhaka on 16 June 2010, available at, <http://www.biiss.org/proceedingwsm.pdf> accessed on 11 December 2011.

organizations.<sup>40</sup> However, in the practical field there always remains a gap and it is often not clear who is responsible for which part of such projects/ facilities. Therefore, the efforts undertaken by the government and other stakeholders should be comprehensive, well coordinated and farsighted to deal with this problem.

In last twenty years the government of Bangladesh has undertaken substantial number of flood management and flood protection projects with the assistance of International Agencies and donor countries. The government has taken a number of steps such as afforestation of the foreshore to protect against tidal surges. An Integrated Coastal Zone Management Programme is underway to take care of many pressing problems unique to Coastal areas of Bangladesh. The government is working to increase future inflow of fresh water through the Gorai river system to the south- western part of the country in order to reduce the effect of salinity. It is also interesting to note that there are increasing trends of efforts undertaken in research activities for inventing new agricultural products for coastal and salinity-prone areas, to devise environment-friendly variety of crop, determine suitable agriculture production areas and invent agriculture variety in the wake of climate change.

As regards dredging of the rivers, not much effort could be spared by the government in the past. However, the Bangladesh government has recently undertaken a capital dredging project involving Taka 11,000 crore to reclaim 53 rivers from encroachers. Under this capital project, the Bangladesh Inland Water Transport Authority (BIWTA) has procured few dredgers to strengthen its existing dredging capacity and many more are on the pipeline.<sup>41</sup>

To mitigate the arsenic crisis of the country the government of Bangladesh has initiated various actions through the Department of Public Health Engineering (DPHE), local administration and local government. UNICEF has the largest arsenic response programme in Bangladesh and is working with the DPHE. With a view to increasing people's access to safe drinking water free from arsenic and pathogen in rural communities, the DPHE has undertaken a project entitled 'Bangladesh Water Supply Program Project' with assistance from the World Bank.<sup>42</sup> In this regard, an integrated approach is essential involving expertise in mobilizing community, testing water quality, designing appropriate safe water option, and identifying the patients while giving proper advice on safe water and nutrition as well as medical care.<sup>43</sup>

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<sup>40</sup> Pravadbangladesh, *op. cit.*

<sup>41</sup> *The Financial Express*, Dhaka, 17 January 2012.

<sup>42</sup> *The New Nation*, Dhaka, 28 March 2010.

<sup>43</sup> Available at [http://www.buet.ac.bd/itn/pages/apsudocs/position\\_papers\\_annexes.pdf](http://www.buet.ac.bd/itn/pages/apsudocs/position_papers_annexes.pdf) accessed on 13 December 2011.

At the regional level, during a Summit Meeting on 12 December 1996, Prime Minister of Bangladesh Sheikh Hasina and her Indian counterpart Deve Gowda signed a Treaty that envisages the sharing of Ganges water between the two countries for the next 30 years.<sup>44</sup> Under the agreement, Bangladesh will receive a 50 per cent share of the Ganges water when the water flow at Farakka is less than 70,000 cusecs. If the flow rises beyond that level, Bangladesh is guaranteed 35,000 cusecs; if it passes the 75,000 cusec mark, India is guaranteed 40,000 cusecs.<sup>45</sup> The Treaty also stipulated that the countries would conclude long term sharing agreements with regard to other transboundary rivers, of which the sharing issue of the Teesta River was accorded the first priority. Accordingly, it was expected that the rest of the disputes between Bangladesh and India over the distribution of the waters of other rivers could also be settled amicably. Unfortunately, no progress has been made in the last one and half decades. However, in a Joint Communique issued at the end of Prime Minister Sheikh Hasina's state visit to India from January 10-13, 2010, Dr. Manmohan Singh, Prime Minister of India emphasised that the two Prime Ministers agreed to put in place a comprehensive framework of cooperation for development between the two countries, which would include cooperation in water resources. In practice, the Communique<sup>46</sup> dealt with immediate issues like the lean season flows of the Teesta River as well as the long-standing issues like the management of common water resources taking into account the totality of Bangladesh-India common rivers.

Meanwhile, since the end of 2008, the Indian government has resumed the process of construction of the Tipaimukh Dam once again which was first initiated in 2003 and stalled amidst violent national and international protests in 2007. The Tipaimukh Dam is 500m downstream from the confluence of the Barak, the second largest drainage system to the northeast of India and a km north of Jakiganj in Sylhet, Bangladesh, and the Tuivai river in the southwestern corner of Manipur, India. If the dam is constructed, the districts of eastern Bangladesh and surroundings will be immediately affected and experts fear that immense natural disasters are likely to take place which would be incomparable. Added to this is the India's river linking concept, aimed at intra-basin and inter-basin water transfers throughout the country. The project involves massive withdrawal of waters at upstream. The project has raised serious concern in Bangladesh as diversion of water from common rivers through construction of

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<sup>44</sup> A. K. M. Abdus Sabur and Mohammad Humayun Kabir, *op.cit.*, pp.82-83.

<sup>45</sup> 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, Joint Rivers Commission Bangladesh, Ministry of Water Resources, Government of the People's Republic of Bangladesh, available at: <http://jrjb.gov.bd/treaty.html> accessed on 17 April 2010.

<sup>46</sup> For the text of the Joint Communique, see, <http://www.thedailystar.net/newDesign/news-details.php?nid=121706> accessed on 31 March 2010.

barrages, particularly on the tributary and distributaries of the Brahmaputra River would have severe implications for the availability of fresh water. Experts estimated that diverting just 10 to 20 per cent of water of the Brahmaputra River in India could cause 100 Bangladeshi rivers to dry.<sup>47</sup>

Though, a process of cooperation in the management of water resources of Bangladesh-India common rivers between the two countries was initiated by the Joint Communique issued in 2010, the much awaited Teesta river accord could not be signed during Prime Minister Manmohan Singh's Dhaka visit in September 2011. It was due to last-minute opposition from the West Bengal Chief Minister Mamata Banerjee. So, in last forty years since the independence of Bangladesh, out of 54 major rivers, water-sharing agreement of only one river - the Ganges was signed in 1996 between the two countries. As such, the hope that was generated that through transforming the issues of conflict into those of cooperation, substantive progress would be achieved in relation to the cooperative management of the waters of common rivers of Bangladesh and India remains to be seen. The signing of the long standing water sharing accords could facilitate addressing a host of developmental issues pertaining to agriculture, forestry, biodiversity, physical infrastructure, industry, resource depletion, sustaining the ecosystem, management of the environmental degradation and so on of the two neighbours.

## 7. Conclusion

It is a general understanding that Bangladesh will not suffer from water shortage as it is a country of about 250 rivers. The reality on the ground is quite different; it gets much water during monsoon, while during the dry season it suffers from shortage of water. The country has little or no control over the flow of water coming from outside during monsoon but faces growing challenges during the dry season that include arsenic contamination, salinity, ground water shortage as well as shortages in natural environmental water requirements and so on. Thus, realities are becoming harsher day by day as the country increasingly faces water crises which are becoming worse by the adverse impacts of climate change.

As discussed, the main reason of its water crises is the low flows of water due to upstream intervention by India which significantly affects surface water availability during the dry period. The major problems faced by Bangladesh due to water shortages include loss of navigation and transportation, loss of irrigation water for agriculture, degradation of ecological qualities, hampering industrial activities, arsenic contamination in the underground water, excessive sedimentation, river bank erosion, etc. As end result of all these, there is a distressing impact on the live and livelihood of the huge population of the

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<sup>47</sup> Pravadbangladesh, *op. cit.*



country. Bangladesh being the downstream country, any water management programme undertaken by it is unlikely to be fully effective without the close cooperation from the upper riparian countries, particularly India.

The right of Bangladesh's population to safe and clean drinking water and sanitation is greatly denied due to the prevailing condition though in a 2010 resolution, the United Nations General Assembly recognised "the right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of the right to life".<sup>48</sup> In a country like Bangladesh laden with too much population and too much vulnerability to natural disasters, the situation is and will be quite grim when water shortage gets a tighter grip. Bangladesh's water security situation is further compounded by the unforeseen impacts the Tipaimukh Dam on the Barak would have on the northeastern part of the country, and the probability of unimaginable disaster the country might suffer if India starts implementing the river-linking project. Under such circumstances it is crucial for Bangladesh to put into effect water-sharing agreements with India for all the transboundary rivers.

With the signing of the Bangladesh-India agreement in the Summit Meeting of January 2010, the stage has already been set to work on the water-sharing agreement for all the 54 transboundary rivers in phases encompassing a wide-ranging framework of cooperation in the management of common water resources for mutual benefits. However, despite efforts undertaken by the government of both the countries, the much awaited Teesta river accord is yet to be signed. Therefore, the management of common water resources taking into account the totality of Bangladesh-India common rivers could hardly be achieved without the involvement of all other stake holders. Under such a complex scenario, all other stake holders including the Eastern Himalayan River systems co-basin states particularly Nepal and Bhutan may also have to be involved in the process of water-sharing arrangement of the transboundary rivers. It will definitely widen the scope of cooperation among these South Asian states in terms of exploring the common water resources and putting into effect a well integrated water management system for the benefit of millions of people of the region. The efforts of all the Eastern Himalayan River systems co-basin states should focus on to work toward a framework for management functions that will integrate consideration of the present and future, of economics and environmental preservation, of technology and building the capacities, of growth, and of food and water security therefore, overall sustainability of the region.

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<sup>48</sup> Available at [http://www.orsam.org.tr/tr/tr Uploads/OrtadoguBulteni/ 2012611\\_orsamwaterbulletin79.pdf](http://www.orsam.org.tr/tr/tr Uploads/OrtadoguBulteni/ 2012611_orsamwaterbulletin79.pdf) accessed on 21 December 2011.