

Water Scarcity and Conflict in Bangladesh: A Literature Review

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Abstract

The water scarcity is a threat to sound life of people. The relationship between water scarcity and conflict is now becoming a vital issue on the globe. Bangladesh is a river-reign country and has to share its rivers with neighboring countries. Meanwhile, it has completed only one agreement, the Ganges agreement, with India and the water of rest of the rivers are shared without any agreement. In international arena, trans-boundary River disputes often postpone or consume time even with an agreement, hence most of the time it remains unimplemented. The main challenge is the intra-state conflict that a country faces before the conflict transmits to state vs. state level. The objective of the research is to assess the challenges related to water scarcity in Bangladesh and their impacts, especially on livelihoods and socio-economic conditions. The main objective of the paper is to assess the relationship between water scarcity and conflict (violent conflict) in terms of intra-state in Bangladesh. The method of the study is qualitative. The study is based on secondary data. The study follows the qualitative analysis by nature. The study has found that water scarcity and conflict have a relationship in terms of intra-state conflict and this relationship is increasing day by day. Violent conflict exists in the country but not in a significant way. The structure of the violent conflict already lies down in many regards.

Key words: Water, Scarcity & Conflict

Introduction

We cannot imagine, even a single day, without water because it is indispensable for human existence. The scarcity of water is a threat to sound life of the people. It is assumed that contaminated water, as well as increased salinity, is seriously affecting human life. In January 2015 World Economic Forum concerned that water crisis is the number one global risk on the basis of effect to society. Researchers revealed that only two and half percent of the water in the globe is safe and rest of the water is salty (Barlow & Clarke, 2017). In the world, there are 650 million people having no access to pure water (Boulton, 2016). The demand of fresh water for mounting population is increasing day by day.

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Water must be viewed as human rights, argued by scholars, like Maude Barlow (Rashid, 2014). Water crisis of Bangladesh is also increasing with the demand of the modernization and the pace of the population growth. Bangladesh is a river region, lower riparian, sound natural resourceful country. It is mostly depending on natural sources of water for living, cultivating and industrial uses. The main source of water in Bangladesh is surface water (Ahmed & Roy, 2007). Besides, Bangladesh has internationally shared rivers where fifty four with Indian¹ and three with Myanmar (Sood, & Mathukumalli, 2011). All these rivers are contributing to forming almost 230 rivers in the country. Unexpectedly it has only one river water sharing agreement (the Ganges water agreement in 1996) with India² and none with Myanmar. In Bangladesh, international rivers are also a major water contributor from the time immemorial to the present time. But in the time of dry season, almost 7 to 8 months, it does not get sufficient water which creates a scarcity of water in the country and there also remains a tension with the India in this regard (Afroz, 2013).

In the dry season, Bangladesh faces scarcity of water, but in rainy season it is over flooded, due to the climate change, dams constructed by the India and contamination by the industrial wastage and waste of water in daily use (Ahmed, 2006; Kibria, 2015 and SOS-arsenic.net, 2015). The effect of scarcity has already been felt in every corner of our social life, especially in the river bank, twelve coastal district of Bay of Bengal and urban areas e.g. decreasing the fish stock, people are losing their jobs, increasing internal displaced persons, increasing slums in the city, increasing water-related disease, scarcity of safe water, and so on. Scholars say that while the impending for international conflict over water categorically exists, international water crisis are frequently resolved peacefully. The tangible for water conflict is intra-national (within-country). Water crisis is, always interrelated with social, economic, political and environmental factors, for instance, the situation of conflict present, the application of rule of law, or economic well-being, not ever just about water. So, the country's structure is forming in such a way where the conflict itself exists. If we want to deal with it, we should need to know the reality of these entire sectors with special attention to the scarcity and conflict. However, the research position in this regard is to identify the relationship between the water scarcity and conflict, especial attention to the intra-state conflict that Bangladesh faces now.

¹According to the Banglapedia, Bangladesh has shared fifty five river with India and three with Myanmar. To see the details: http://en.banglapedia.org/index.php?title=Ganges_Water_Sharing.

² Ganges Water Agreement: <https://treaties.un.org/doc/Publication/UNTS/Volume%201066/volume-1066-I-16210-English.pdf>.

Water Scarcity and Conflict: A Review of the Literature

After investigation of literature, it has been found that there is a plenty of literature available in the academic field related to water and conflict that are covering the area of security, inter-state and intra-state conflict, natural calamity e.g. drought, climate change and resource scarcity related conflict in where some research has been found related to scarcity of conflict. In general, it is evidenced from the literature that there are a few research conducted on water scarcity and conflict all over the world. The study of the Eckstein (2010) focused on water, security and climate change in future and stated that due to the climate change, water scarcity is the immediate effect on the globe. He also mentioned the increased rainfall beside the serious scarcity of water. He argues that it will affect the human migration, growth of population, activities of agriculture, economic development, rivers system, and geographies. Besides, both regional and global fresh water under threat of climate change in near future and all nations also will face legal and policy implications specifically. This problem not only stuck in any specific area rather it will be a serious dynamic global problem. On the other hand, to find the very specific subject on intra-state and inter-state water conflict, Valasquez-Manoff (2009) mentioned that water scarcity potentially destabilizing effect like Darfur conflict because of population growth and water supply problem. He also mentioned that the recent water conflicts like Syrian drought in 2007-08; a Chinese riot took place because of the officials cut off the water they used for irrigation in 2000; in USA the Southeastern states of Georgia, Alabama and Florida have a dispute over water. In the same manner, the study conducted by Yoffe et.al (2001) wanted to see the evidence about the relation of the freshwater and conflict through the quantitative study from time edge 1948-1999. They used the 1800 events from 124 countries and 122 current and historical basins all over the globe. The research team has been found that only twenty-eight percent events were conflictive and sixty seven percent events were cooperative. The research of these two groups of scholar (Valasquez-Manoff, 2009 and Yoffe et.al, 2001) has the same eco on water conflict.

Bernauer et.al (2009) carried out a research on water conflict focusing on legal issues. They stated that what are the amount of conflict exist in the world there are lacks of political unity among the nations that how they manage these problems. They also claimed that it may for the unwillingness of nations regarding the managing these conflicts on water issue. There are very week practices of international trans-boundary law regards of water conflict although almost 500 international treaty presents but not in practice they showed. They concluded with this that the likelihood and intensity of disputes arise when population density is high, income is low, overall relations between countries are unfriendly, there

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are politically active minority groups, large dams or other water development projects are planned.

In the study of Gann (2000) he discussed the south Asian perspective of environmental conflict (inter-state) where he put the analysis of the resource scarcity and environment conflict. He argued that the regionally shared resources leading to inter-state conflict is for water of the river system where the Displaced Persons are resulting from the human growth and available natural resources. National security encompasses by two elements; social and environmental security where water is a major element, without ensuring both only military securities is a vague concept according to him. Beside the other security he also put pressure for personal security with the attention of fresh water, food and housing. Furthermore, renewable resource is the overt example for potential international violent conflict he discussed. Gann discussed how to achieve environmental security through ensuring resource guarantee where water is a major one. There is massive transmigration between Indian and Bangladesh due to the environmental degradation, here Gann put pressure that without identifying the specific group for creating pressure the war will not take place between the countries. According to Gann there are four categories of resource scarcity exist; physical, geopolitical, socio-economic and environmental scarcity where first three are not considered as an environmental conflict rather traditional conflict (resource scarcity conflict). Gann study is slightly differing from before research because he showed the inter-state conflict on the view point of resource scarcity that can be counted as an environmental conflict.

In the research of Sachan et.al (2015) focused on the water fall in the rivers because of the population growth, industrial growth and climate change increase the imbalance between availability and water demand in Bangladesh. They discussed what condition or amount is an indicator of water scarcity and mentioned the annual contribution of Bangladeshi rivers by percentage. They figure out both population growth and water decrease in total up to 2020 and its possible consequences. They mentioned the Indian international water law breaking approach to Bangladeshi rivers by constructing dams and its outcome. They also showed the vulnerability of water quality and aquatic ecosystems to human activities, the failure to treat water as an economic resource, the desire for food security and the importance of water to public health and economic development and these human factors are making conflicts over water resources within country. On the other hand, in the study of Siddaka (2013) discussed the severity of the major disasters events in the coastal area of Bangladesh and its possible consequences. Where she mentioned the Northwest region of the country faced drought where the production of the agriculture lessen, as well as national economy and

public property were disrupted. She also found that the banks of the Brahmaputra-Jamuna, the Ganged-Padma and the whole river systems of the country were affected by the erosion where the effect was, she mentioned, people lost their land, livestock and human population were displaced, disruption the production, and loss of property and evacuation. Another incident she mentioned in her research was Earthquake that has the relation with the scarcity of water. It also killed the human, damage and destruction of property, as well as a change in geomorphology. The study of Sachan et.al (2015) discussed on the demand and supply issue that more close to the water scarcity but in the study of Siddaka (2013) does not directly related to water scarcity. .

From the above literature, one thing is clear that the scarcity of water research is a new field of study in the social science. However, most of the researchers gave their attention on the inter-state conflict and environmental stress & conflict also equally valued. There is no having significant academic work on the water scarcity and conflict (intra-state) in Bangladesh. So the main research gap is here the water scarcity induced conflict relates to intra-state conflict. For this reason, this paper seeks to investigate the relation between water scarcity and conflict (violent conflict) in Bangladesh.

Methodology

Qualitative research methodology has been followed to attain the objective of the study. The purpose of the qualitative methodology for this study is to depict the general scenario of the country because in academic arena there is no such work that can be basis of depth study. The study is basically based on secondary data. Data is collected from various sources of published journals, articles, newspapers, periodic, and reports. The data analysis also followed by the qualitative way which maintains, in the time of analysis of the data, the descriptive and critical technique. Hence forward, this method of the study will give the basis of qualitative, quantitative or mixed types of research.

Operational Definition

Water Scarcity

Water means fresh water not salty, sea, and polluted water (Brooks, 2006). Simply understanding the water scarcity is the situation where the water is insufficient to fulfill the demand and smooth way of life. There is no agreed definition on water scarcity. According to Hydrologists, water scarcity should be counted as the population and water equation. When yearly water supplies fall below 1,700 cubic meters (m³) per person then it is called water stress. People face water scarcity when yearly supplies fall below 1,000 m³ per person. It is called absolute water scarcity when the people experience below 500 m³ per person (Rijsberman, 2006).

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According to the United Nations Commission on Sustainable Development (UNCSD), a country is counted as 'water scarcity' level when yearly withdrawals have felled twenty percent to forty percent of annual supply. When this figure crossed the forty percent it's called 'severely water scarcity' (Alcamo, 2000). In Bangladesh perspective, water availability in Bangladesh is around 90 billion cubic (cu m) meters during the dry season against the demand of almost 147 billion cu m, a shortage of nearly 40 percent, match with the (Alcamo, 2000) criteria. In this study, above mentioned (Alcamo, 2000) and (Rijsberman, 2006) methods are amalgamated for defining the scarcity. In more specific, gap between annual demand and supply has been identified as a water scarcity.

Conflict

The word conflict comes from the Latin word "conflictus", which means collision or clash. According to Cambridge dictionary the term "conflict" has been defined as "fighting between two or more groups of people or countries". Scholars of different epochs defined it with different sense, such as conflict is a struggle between opponents over values and claims to scarce status, power and resources (Coser, 1956). Here scarce status, power, and resource are the main points of struggle. According to Galtung, conflict is a dynamic process in which structure; attitudes and behaviors are constantly changing and influencing one another (Galtung, 1969). Peter Wallenstein wanted to see the Conflict as a situation where two or more parties strive at the same moment of time for the same set of scarce resources (Wallenstein, 2002). Here he put pressure on object of the conflict which is scarce resources in general. In Bangladesh perspective, conflict is a situation where the two or more parties pursue to achieve the same goal (Water). Here the goal is incompatible and alternative is absent. Incompatible goal is driven by the water scarcity. Here individual level to the state level conflict address. However, conflict is defined by the incompatible goal competing by two or more parties to attain that goal (water) where the alternative is impossible. This conflict is not taken place for physical scarcity of water rather economic scarcity of water (Seckler, 1998). Finally, in this study; the main concern is violence conflict.

Discussion and Data Analysis

Water Scarcity and Conflict in Bangladesh: Overall Scenario

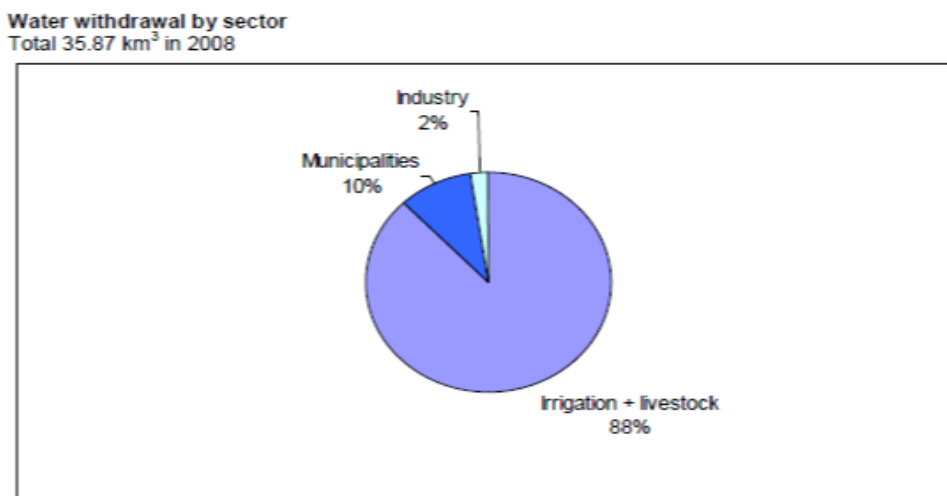
From the end of the last century, war on water issue has become a vital debate in the academic literature. War on water issue depicts the controlling story of two or more parties especially states but degradation or scarcity of water visualize the social disorder, in the initial stage of conflict. Due to the degradation of the water, qualitative or quantitative,

there are various effects fall upon the society. Results of the water scarcity have a great impact on the society which is becoming the sources of conflict. Theoretically, the study has showed the relationship of water scarcity and conflict. Thus, at first, the study has presented those negative impacts that are creating the conflict-like-situation in the society.

Impact on agriculture

Agricultural work depends on the availability of fresh water. Geographically, water availability is easier in this country than most African countries due to the good weather. As a result, the economy of this country is depending on agriculture. The study has found that the agriculture sector has fallen in the crisis due to the shortage of the fresh water in Bangladesh (Ahmed& Roy, 2007). For example, due to the global environmental change, the availability of the fresh water has been affected in the country. It has occurred mostly for the controlling of water flows of the river by the three states namely Nepal, India and Banladesh (Mahibullah, 2010). Besides, salinity intrusion in the cultivable lands, due to the less flows of the rivers towards sea, is causing infertile of the lands (Mahibullah, 2010). On the other hand, Bangladesh requires two percent yield increase per year to feed its increasing population (Mahibullah, 2010) that has been hindered for the shortage of water. However, actually the scarcity of the water has been appeared for two reasons either for the shortage of the surface water or ground water level fallen especially in the dry season that cause hindrance the agricultural production of the country.

Figure 01: Water withdrawals by Sector



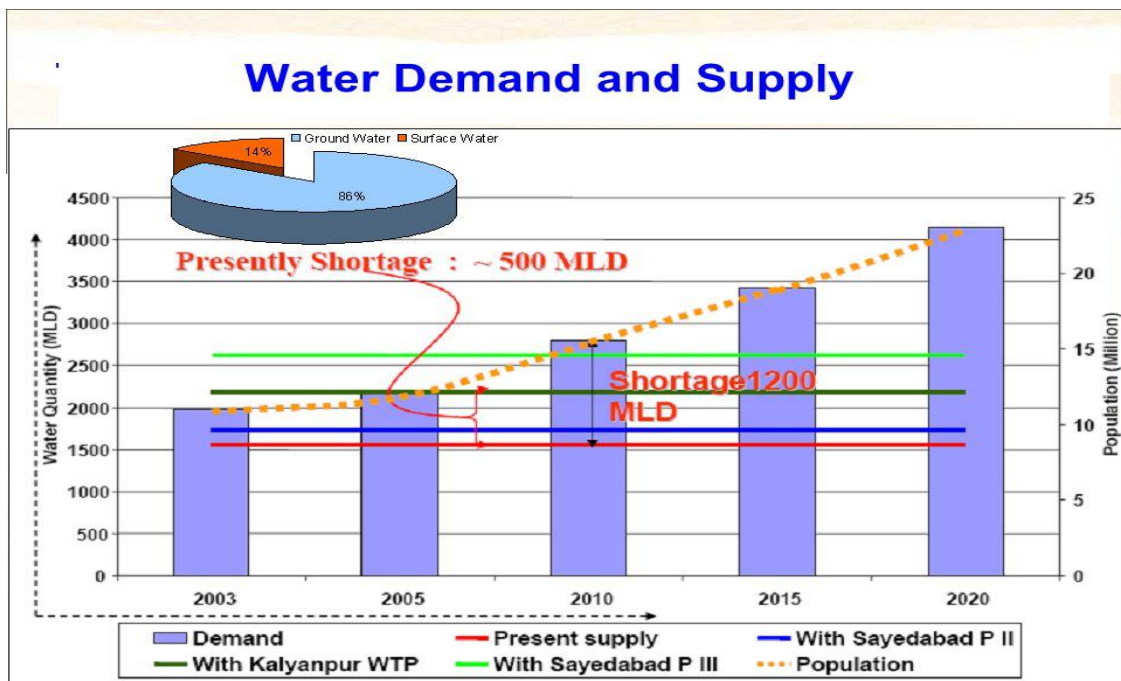
Source:

https://www.google.com/search?q=agricultural+withdrawal+in+Bangladesh&source=lnms&tbm=isch&sa=X&ved=0ahUKEwj23v7g1LfeAhXEs48KHWboBMMQ_AUIDigB&biw=1366&bih=608#imgrc=RmDHg3zYdbyJhM

Impact on water demand

Fresh water is a fundamental requirement of all living organisms, crops, livestock and humanity. In Bangladesh, water demand is increasing day by day with the pace of industrialization and growth of population. The main source of surface water is river which gradually losing its flow. For example, the Goria River is the main tributary of Ganges; carrying water to the southwest region is becoming dry because of getting less water flow for India’s water withdrawal from Ganges (Rahman, Hassan, Islam, & Shamsad, 2000). On the other hand, the water demand of urban area is more acute than rural area. For instance, demand for water in the capital Dhaka is 2.2 billion liters a day, while supply is 1.9 billion liters a day. Chittagong, the second largest city, supplies 210 million liters each day against the demand for 500 million liters (Kibria, 2015). In 2010, there was 1200 MLD demand and supply gap alone in Dhaka city. But it was increased to 1800 MLD in 2015 and it is gradually increasing day by day keeping race with the population growth shown by the figure 01(The Megacity Dhaka Needs no introduction, 2011).

Figure 02: Gap between Demand and Supply in Dhaka City



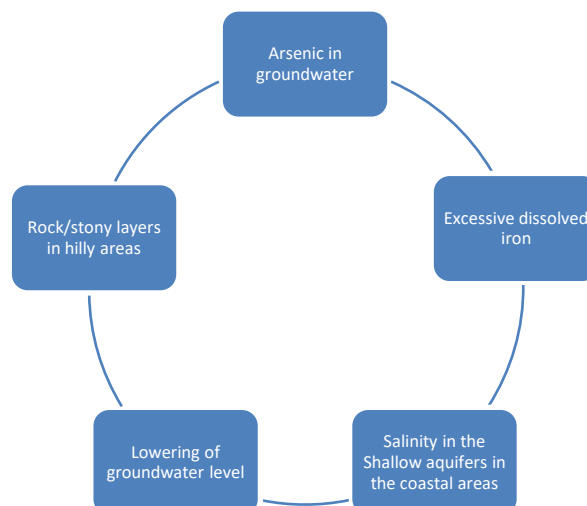
Source: The Megacity Dhaka Needs no introduction, 2011

The water demand is changing in season to season basis. In the dry season water scarcity persists in many areas. In this period surface water is only available in part of the 22,155 km of major rivers, 1,922 km major standing water bodies and about 1,475 km of ponds in the country. Surface water irrigation systems in the country compete for this limited water in the dry season. The perennial water bodies are decreasing with the use of more and more surface water (Ahmed, 2006). There are about 12,88,222 ponds in Bangladesh (Nagarajan, 2009) and seventeen percent

of these ponds are derelict and probably dry up in the summer season. Beside this, surface water receives pollutants from agricultural, industrial (mostly polluting the river water), domestic and municipal sources (Ahmed, 2006). The rivers and surface water sources around densely populated urban areas are four to ten times more polluted than the similar water sources in the other areas of the country. The deterioration of water quality is directly related to population density and industrial activities due to poor management of domestic and industrial wastewater (Khan, 2010) which is liable to increase the demand of the water around the country.

Groundwater contributes a large portion of water supply in Bangladesh. Except in some places it is available at a shallow depth. Groundwater recovers its levels during the wet season except two major districts i.e. Dhaka and Comilla. The study has found that the demand of groundwater is not sufficiently resolved in different areas (Ahmed, 2006). First, in irrigation sector, during the dry season most of the minor rivers are sustained by groundwater outflows (Shamsudduha, 2009) but the decline of its levels starts when irrigation is started. The levels fall from October and the rate of fall is highest in October-November but equally large changes may take place after January. A study has shown that in 60 Upazilas, the groundwater level lies within 4.5m to 6.5m, the marginal range. In 92 Upazilas the water level falls below the limit of suction mode pumps in the later part of dry season, hence it is required for forced type hand-pumps (Ahmed, 2006). Second, in drinking purpose, generally groundwater in Bangladesh is available in adequate quantity but the use of groundwater for drinking purposes has some problems for the following reasons: arsenic in groundwater, excessive dissolved iron, salinity in the Shallow aquifers in the coastal areas, lowering of groundwater level, and rock/stony layers in hilly areas.

Figure 03: Complexity in ground water for drinking

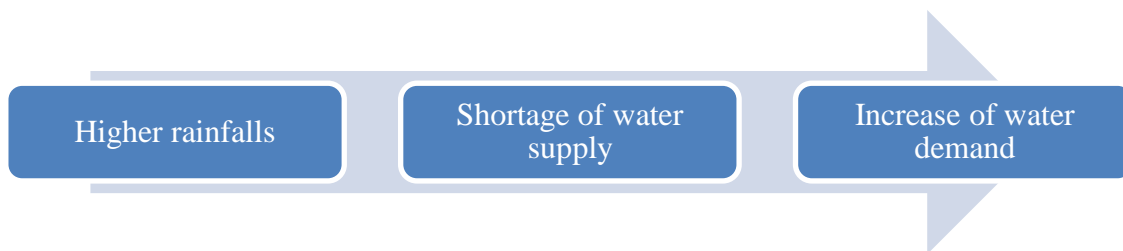


Source: Islam, 2010

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The second largest source of water is rainwater which is available in adequate quantity in Bangladesh is an alternative source of water supply. Relatively higher rainfalls occur in the eastern part of the country and highest rainfalls occur in north-eastern region and eastern part of the coastal area. The low rainfall, less than 1500 mm per year, occurs in the western part of Bangladesh. In the coastal and hilly areas with greater intensity of fresh water source problem have higher rainfall (Islam, 2010). According to a study which is conducted upon a 12-year rainfall pattern based on the main rainfall intensity recorded in 28 stations for the period from 1987 to 1998. It has found that the average yearly rainfall in the country during 1987-96 varied from 1950 mm to 2900 mm i.e. 1.95 to 2.90 m³ of rainwater was available per m² of catchment area (Ahmed, 2006).

Figure 04: Relation between rainfall and water demand

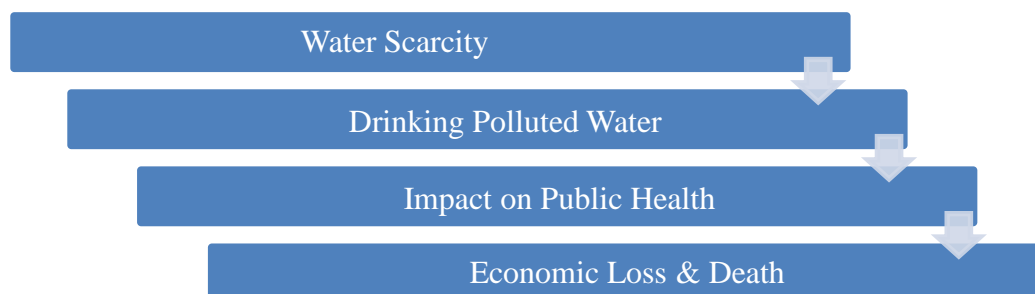


Source: Ahmed, 2006

Impact on public health

Human body is highly reliable on fresh water to be healthy. Scarcity of water forced to human society to drink the polluted water that has direct impact on the human body. According to a research out of 517 respondents, 98.3% developed health problems or found that existing health problems were exacerbated due to drinking of contaminated water. Many perceived that their general health condition was ‘much worse’ (16.9%) or ‘worse’ (64.3%). Only 1.0% and 6.7% of the respondents treated water before drinking, by boiling and chlorination, respectively, although water collected from tube-wells (93.2%) and rivers (6.0%) was perceived by 75.0% of the respondents to be contaminated (Welfare, 1999).

Figure 05: Link between Water Scarcity and Economic Loss



Source: SOS-arsenic.net, 2015 & Welfare, 1999

Similarly, another study found more alarming report that about 342 children die of waterborne diseases every day across the country. Some Tk 5,000 crore is spent every year for healthcare services in Bangladesh in where 85 percent of the amount is used to combat waterborne diseases (SOS-arsenic.net, 2015).

Drinking water, the people of Bangladesh used to rely on surface water and southern part of the country is still depend on the surface water, which is often contaminated with bacteria causing diarrhea, cholera, typhoid, and other life-threatening diseases (SOS-arsenic.net, 2015). Hundreds of Tubewells in rural Bangladesh have been identified with high arsenic concentrations and many more are feared to have been contaminated with the same. So far 50,000 Tubewells were tested and 63 percent of them were found to be contaminated by unacceptable concentrations of arsenic. Many people are suffering from arsenicosis and many more are at risk. According to another study that conducted in the 47 districts, nearly 21 million people have been drinking arsenic contaminated ground water (Sarker, 2010). Sometimes arsenicosis patients have been died or the disease causes serious effect if the patients do not identified in the early stage of disease. According to the government reports there are 4000 cases of arsenic affected patients have been identified³ (Welfare, 1999 and SOS-arsenic.net, 2005) around the country.

Increase Salinity

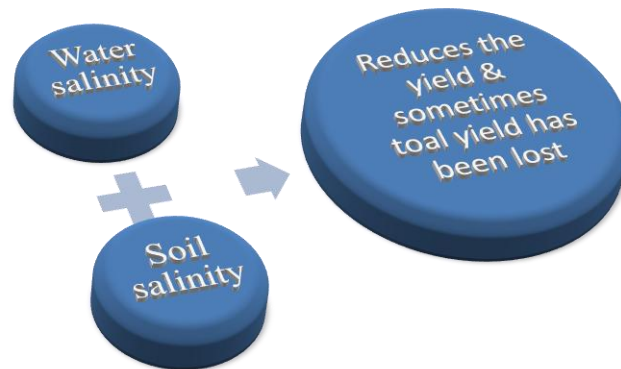
We are only using one per cent of fresh water out of three per cent on the globe (Oki & Kanae, 2006). Badly sometimes existing fresh water affected by human created unnatural hindrance and welcome the natural obstruct of using the fresh water i.e. salinity intrusion due to the sea level rise and change of the river flow i.e. human made dam, diversion water through canal, or development projects e.g. power plan. Increasing salinity creates the economic scarcity of the water which has multiple negative effects on society (Khan, Ireson, Kovats, Mojumder, Khusru, Rahman, & Vineis, 2011; Mirza, 1998 and Hayward, 1943). The study has found that increasing salinity in water and soil has the relation with conflict in the country. Due to the increasing water salinity (in a result, soil salinity took place) in the south-east region (Khulna area) crop damage and severe yield reduction has been appeared. In the dry season of 1974, the intensity of saline water was 380 micro-mhos/cm which increased about 29,500 micro-mhos/cm in 1992 (Khan, 2010). On the other hand, the total area of salinity intrusion also increased significantly

³Extensive research has yet to be conducted in this regard to accentuate the knowledge base. However, natural geological changes are presumed to be the primary reason for arsenic contamination.

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(Khan, 2010). Even though the study has not found any updated data, further it can be assumed that (after the twenty six years) the recent condition has much worse. Thus this devastating effect has been took place due to the diversion of Gangers water by India which is liable for the less flow of the river towards Bay of Bengal that welcoming the salty water intrusion in the crop land especially in the coastal belt of the country (Khan, 2010).

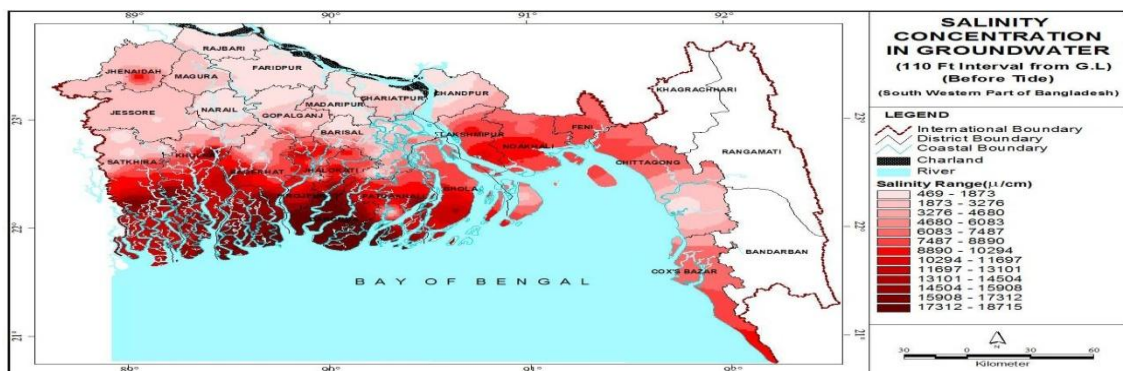
Figure 6: Salinity Reduces the Yield



Source: Haque, 2006; Khan, 2010

The study also found that due to the decreased water flow of Goria (one of the major rivers of Bangladesh) water salinity has been increased beside the river bank. As a result agriculture and fresh water supply are getting affected (Afroz, 2013). In the coastal area about 1.2 million ha of cultivated lands are affected by soil salinity. Sometimes quality irrigation water has not been found to yield the tragated crops. This scenario is also common in Khulna and Chittagona area. Thus a mentionable area of land has been affected due to the tidal saline water as well (Haque, 2006).

Figure 07: Salinity Concentrations in Ground Water



Source: Bangladesh Agricultural Development Corporation

Ground Water Depletion

Ground water is the main controller of the drinking water in Bangladesh. Depletion of the ground water related to the depletion of the river water

level (Sophocleous, 2002). The study has identified the direct relation of the water level of the river and ground water depletion e.g. the ground water level has been fell about ten feet besides the rivers banks of the Padma, the Mohananda and the Gori-Madhumati where Rajshahi and Pabna have the highest points of depletion as a district categories (Ahmed, 2016 and Nishat, 2001). The study of the Ahmed (2016) and (Shahid, 2011) predicts that ground water will be depleted seriously. Consequently, major cities of the country will face the severe crisis of the drinking water and water supply. For example, some areas of the Dhaka city have been already identified forty feet depletion of water level that is alarming for the 1300 bore-hole tapping water (Ahmed, 2016). Table 1 clearly shown the gradual decreasing picture of Dhaka city's water level. Besides this, the study has explored that the quality of the ground water has been worsen. In the study of the Nishat (2001) has found evidence in favor of this statement in where the arsenic and metallic are equally present. For example, almost 200 Tubewells have been identified as presence of arsenic elements out of 1000 Tubewells around the seventeen districts and more alarming report is that out of sixty four districts sixty one districts have been identified as presence of metallic elements that people are drinking regularly (Rahman, 2001).

Table 1: Depth of Groundwater in Different Areas of Dhaka City from 1980 to 2010 (in feet)

Year	Mirpur	Mohammadpur	Dhanmondi	Gulshan	Cantonment	Lalbag	Sabujbag	Sutrapur
1980	8.36	9.3	10.12	9.91	-	1.67	3.13	5.88
1985	13.57	13.5	12.76	9.95	-	16.06	13.63	8.93
1990	15.3	14.52	15.4	10	-	17.71	21.49	11.08
1995	20.76	20.48	24.27	24.25	18.46	19.78	26.43	15.67
2000	35.2	20.87	40.12	27.59	27.88	36.57	46.45	18.79
2005	63	32.21	60.85	37.3	27.8	44.77	54.4	20.12
2010	65.97	31.24	66.32	42.66	27.81	44.77	54.4	21.1

Source: Bangladesh Water Development Board, 2014

Melting the Fisheries and Wildlife

Water is not only water issue rather it has relation of several wealth and opportunity which degradation (qualitative or quantitative) create huge negative impacts on the society. Possible, for this reason, researchers have been depicted that the third world war would be fought on water issue. The easiest resources of the water are fish and wildlife which being disappeared due to the degradation of the water. Bangladesh has the fourth place in the world in term of the production of fish on which livelihood of huge population has dependent (The Daily Star, 2018, July 19; Allison, Perry, Badjeck, Neil Adger, Brown, Conway, & Dulvy,

2009). Beside this, 90 percent of the animal protein of our diet has come from the fish and livestock which help the health sector to be healthy (Khan, 2010). The research has found that the fish and wildlife have been affected for the scarcity of the water. For instance, the presence of the oxygen in the river water has decreased and metallic elements have increased by which fish and wildlife have been missing. The scenario of the Bhudigonga River is more acute than other rivers of the country in this regard (Ahmad, Islam, Rahman, Haque, & Islam, 2010). Discharging chemical and industrial waste into the river is the major reason of pollution. People have moved towards cities for searching job and livelihoods as they lose their jobs due to disappearing of fish and wildlife in where the cities are already over populated and people are remain jobless. Consequently, people remain foodless moreover they have lack of a secure place for living. Indeed, the amount of the slum dwellers has been increasing (Islam, 2011). The study has also found that whole world including Bangladesh will face the severe problem on this issue in near future that will help to create the social crisis (Islam, 2011).

Navigation Problem

Water transportation is the cheapest mode of transportation in Bangladesh. Historically, water ways had the main way of transportation. It was happened basically for the river rain. But, modernization of the road-transport-system making the sector less focused, recent Padma bridge construction is a vital example in this regard. Indeed, Inland Water Transport (IWT) sector will vital in near future, to expand the business and development in all kinds. The IWT has not being modern as it is in the air and land ways. Probably, limitation of the modern technology or economic constrain to bring the technology of third world country is mainly liable. The research has fold out that navigation of the country is facing the crisis mostly for the shortage of the water especially in the dry season. It has been evidenced that during monsoon season only about 6000 km is navigable out of 24000 km of water ways by engine vessels (Ashan, 2005). Third-fourth of the ways have lack of IWT system mostly for the siltation from less flows of rivers during the dry season (Khan, 2010). Further, the navigable amount is standing about 3970 km during dry period. It is happened due to the deterioration of the river system through massive siltation causing serious problem of one third of the total passenger traffic and huge cargo traffic (Ashan, 2005).

Internal Displaced Persons (IDPs)

Internal Displaced Persons (IDPs) is not the issue of discussion on water scarcity as much as it is in Chittagong Hill Tracts (CHT). It is too difficult to relate the IDPs in water scarcity, even some scholars could try to relate with climate change (Etzold, Ahmed, Hassan & Neelormi, 2014 and Kartiki, 2011) in where Bangladesh doesn't consider it is as a cause

of migration. It has been observed in this research that IDPs has been found on water scarcity but not in a significant way. For instance, a significant rainfall has been occurred in the northern and western region that leads to drought like situation (Reuveny, 2007). Consequently, people, those are lost their work, are migrating permanently to search a work but not those who have lost their harvest (Etzold, et.al, 2014). Besides, in the investigation of Reuveny (2007) it has been found that 12.17 million people have been migrated from the time frame of 1975 to 2001 in where environmental change was a major and river water scarcity was a minor reason (Reuveny, 2007). However, water scarcity is not as significant factor like floods for displacement rather in near future it will be a significant cause for IDPs in Bangladesh.

Water Scarcity and Violent Conflict

In this section, scarcity of water and the relation of violent conflict have been proven from the secondary sources. As mentioned in the conceptual framework part, the article has found the water scarcity in terms of supply and demand gap. The study has found that the form of violent conflict, practically, is three kinds: group verses group, society verses state and individual verses group conflict. The section has presented these three kinds of violent conflict. However, structural conflict has not been concerned of this part.

Group Verses Group Conflict

When the resource is scarce then the sense of deprivation arises among the citizens and creates group interests of conflict (Gaan, 2000). On the other hand, if the resource scarcity and population growth happening hand to hand than the conflict likely takes place (Homer-Dixon, 1994). The study has found that this both types of Gaan (2000) & Homer-Dixon (1994) cases of conflict exist in Bangladesh in its different pockts where group verses group conflict has been appeared. The main conflicting places are the river bank in where people rush to own the water area, especially in dry season, for the irrigation purpose and of course muscle power group backed by the political power always take the avdantage. Sometimes, it has appeared that gun fire occurred in different places of the country and occasionally people have been killed to take control on those water areas beside the river bank (Hoelscher, 2013). Furthermore, people also engaged in violent conflict to take control of the pond that can be used as a fishery (Hoelscher, 2013). The study has also discussed in above that the country already faced the gap between water supply and demand which is a trigger for killing cases and fish stock also melting down which is the trigger for violent conflict cases (Hoelscher, 2013).

Society Verses State Conflict

Without providing basic services to the citizen, a modern state system can not run smoothly. When a society deprived of such services it raises its

voice against the state to fulfill the demand. It is called the society verses state conflict (Gaan, 2000). The study also has found that Bangladesh, sometimes, failed to fulfill the demand of its citizen adequately in case of water demand. For this reason, in dry season, people of the society protest occasionally. The scenario has been appeared in different places in the country, mostly in urban areas. For example, a protest was came out in the Dhaka city with the demand of water (for drinking and using in daily life) despite of military ruler ban the all forms of demonstration in the country during the military government (Paul, 2008). The situation was so bad that people were standing in a long queues for water. Mohammad Salam, a rickshaw-puller, stated that “The situation is turning from bad to worse every day, we stand in long queues for hours for water,” (Paul, 2008). This is how the conflict takes place with society verses state in the country, especially in different pockets of cities.

Individual Verses Group Conflict

Beside the above two forms of conflict, the study has found that there is another mode of conflict that can be called individual verses group conflict which is a new form of conflict in the literature of the resource scarcity induced conflict regarding the water scarcity which is described in below.

Society cannot think about irrigation without the water especially in dry season and the situation, sometimes, stand in a position that water can be possessed in a hand of one person e.g. big pond. The study has explored that when the farmer cannot find the sufficient irrigation water from the ground or from the river or canal then they search alternative sources. Adjacent pond (which is the big source of water in the country) is the good source of water for the irrigation. During the irrigation, from the alternative sources, the pond owner, sometimes, does not want to give water. Meantime, farmers do not find any alternative source and they engage in conflict with the pond owner for the irrigation (without the irrigation in that time crops may failed to yield enough or not yield at all). This is the scenario of different places of the country, especially in the rural area where water is obligatory for irrigation purpose. For instance, ‘in 2006, there was less rainfall in the Rajshahi district. Hence, lower level of water has been observed. Consequently, framers were not getting enough water for irrigation. They went to the nearest pond for irrigation water but owner did not let them took water. Ultimately, farmers had got angry and started conflict with the pond owner. It can be called the individual verses group conflict. Then, it was transformed into group verses group conflict and the scenario was so serious that police could be injured to tackle the situation (Hoelscher, 2013).

Conclusion and Recommendations

From the above analysis, it can be concluded that water scarcity and conflict has a relationship in terms of intra-state conflict in Bangladesh

but not in a significant way and this relationship is increasing day by day. Even though, violent conflict exists in the pocks of the country but not in every sector. The findings of the study assume that the structure of the violent conflict already lies in many aspects. This research identified a number of fields in where water scarcity and conflict has been found: agriculture, water supply and demand, navigation, medical, fishery and IDPssectors. Thus, it can also be assumed that the violent conflict is forming in many other sectors.

The study tries to see the relationship of water scarcity and conflict in Bangladesh (intra-state conflict). From this research, it can be hypothesized that the intra-state conflict is liable for inter-state conflict. On the other hand, internationally, this problem should be resolved which is a sole responsibility of the United Nations as envisioned by its charter. Therefore, it is a duty of the state to take adequate initiatives to resolve the problem in a sustainable manner.

Recommendations

1. Appropriate management of crop production is not available in this area. Thus proper management is necessary for production of crops taking into consideration of the salinity, ground water depletion and rainfall pattern.
2. Adequate measures should be taken to fulfill the gap between demand and supply to secure the water, sanitation and hygiene. Furthermore, integrated water resource management sector need to be institutionalized that will help to reduce the negative impact of discussed sectors and will help to achieve the SDGs-6 of the United Nations.
3. Effective monitoring system to ensure quality of fresh water need to be established. It will help to reduce the risk of (the slow-poison-conflict) in the health department. (This phrase is needed to be explained)
4. Specific budget allocation on the water sector is urgent especially in where “hard to reach areas” i.e. hilly and remote areas should be taken into consideration and priority-based budget should be provided.

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