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Bangladesh, Factor 9: Water Sanitation and Security

### **Bangladesh: Dangerous Water Affecting the Masses**

The seventy percent of the world is covered in water. Most of the worlds' water is unavailable for use with only 2.2% being fresh water, and only one percent of it being considered drinkable (NatGeo. Web.). Imagine living with an abundance of water using it for drinking, bathing, and raising your crops, but not knowing this water is slowly killing you and your family. Bangladesh does not suffer from a lack of water with three major rivers constantly flowing through it and set on the coast of the Indian Ocean, with the exception of the dry season, yet water is still unavailable for use or the use of this water is harmful. Bangladesh's water is killing its people at an alarming rate of the population. Water has proven to be the lifeline to all life, but also a killer.

The nation of Bangladesh has a deep history, but is young in development. The first sign of civilization can be dated back four thousand years. The first rule over the Bengal area was established around the 7<sup>th</sup> century and then traders and religious groups inaugurated into Bengal in the 10<sup>th</sup> century. The first Europeans began to set trading post in this area in the early 16<sup>th</sup> century such as the British East India Company. The company gained complete governance over the region and the rest of India in 1757. Until, the British government took control in 1858, which it became a part of British India (Central. Web). During this time, two different religious groups, the Muslims in the east and the Hindu in the West split Bengal. In 1947, the partition of India and Pakistan lead to Bengal to be partitioned on religious lines drawn by the two groups, which formed West Bengal and East Pakistan. These lines of separation and governing stayed this way until 1971 when East Pakistan was pitted against West Bengal. The war known as the Bangladesh Liberation War lasted for almost nine months. During this time, acts of genocide were committed with a death toll estimated around three million people mainly of the intellectual community like doctors, students, and engineers (Asaininfo. Web.) East Pakistan surrendered and formed the new nation of Bangladesh in late 1971. A year after, the Constitution of Bangladesh was signed in December of 1972 establishing the parliamentary democratic government. From 1973 until 1990, Bangladesh faced ministry impediments with major shifts in power and forms of government such as being put under martial law. When the parliamentary democratic government was re-instated, the government continued to be in disarray with extensive corruption, chaos, and political violence. In 2007, a state of emergency and neutral caretaker government was placed by Bangladesh's military to drive out corruption. Many people, including major political figures, were arrested due their involvement in the corruption of the nation. Finally, in 2008, fair elections were held and stable government officials were emplaced including the current Prime Minster, Sheikh Hasina.

Bangladesh is located on the subcontinent of India that joins with the Asian continent forming the Himalayan Mountains north of the country. The country of India, with the exception of Burma at its most southern end, surrounds Bangladesh. It is described as to be the same size as the state of Iowa, but the total land area is approximately 144,000 sq. kilometers or roughly 89,500 sq. miles (Central. Web.). Its climate is tropical with mild winters, hot and humid summers, and with a rainy monsoon season often. The Himalaya's have created the Ganges River that runs east through India and Bangladesh which empties into the Bay of Bengal south of Bangladesh. The Himalayan Mountains also form Brahmaputra River or the Jamuna distributary channel, and the Meghna River systems flow into the Ganges from northeast. Due to these rivers most of the country is situated on a delta. The Bengal Delta or the Ganges-Brahmaputra Delta is the largest delta in the world and has been coined with the nicknamed of the "Green Delta" (Asianinfo. Web.). However, the delta plain has made the country prone to flooding. Yet it has also provided some of the most fertile soil in the world making the delta region one of the most habitable

areas in the country. Homes in the delta region are built on platforms or on high embankments during the dry seasons to be protected from flooding during the monsoon season.

The capitol of Dhaka is located in the center of Bangladesh and has a population of nearly 14.4 million people. Bangladesh's population is nearly 160 million people and is ranked the eighth most highly populated country in the world. Nearly 90% of Bangladesh's population is Islamic with Hindu making up for 9.6% of the rest of the population (Asianinfo. Web.). The majority of the population identifies with Bengali ethnic group making Bengali the official language of Bangladesh and English the secondary language. Bangladesh education system allows free primary education with approximately 85% children attending school while only about 20% of people have a secondary education (UNICEF. Web.). Due to this ratio, Bangladesh has literacy rate of 57%. The average age of a Bangladeshi is 25 years old and the average life expectancy is 67 to 70 years old (UNICEF. Web.). Immunization is very common in Bangladesh with the majority of average vaccination are given at birth are given to newborns. Bangladesh is one of the few countries achieving the Millennium Development Goal. The average cause of death in Bangladesh is tuberculosis, respiratory infections, heart disease, liver failure, etc (WHO. Web.). The average family size of Bangladesh is 5 people with the majority of the population ranging from fifteen to forty-nine years old (Central. Web.). The average diet of Bangladesh family consists of cereals, mainly rice, with two-thirds of the daily diet being rice, vegetables, and very small portions being fish (depending of availability). Though diet habits vary by regions, cereals make up for 62% of the average diet then followed by non-leafy vegetables. Males are also dictated to have better diets and meal portions than women, even when pregnant and nursing, causing higher malnutrition among women (IFPRI. Web.).

Bangladesh's economy is primarily agrarian with agriculture making up almost 18% of the gross domestic product (GDP) and 47% of the work force (UNICEF. Web.). Bangladeshis make their living from farming. The typical farm is family owned and run by the family with only hiring help for planting, weeding, and harvesting. In Bangladesh, land use for agricultural makes up for 69% of Bangladesh's land or 90,290 sq. kilometers (56,103 sq. miles). Only 6.6% of agricultural land is used as pasture or 6,000 sq. kilometers (3,728 sq. miles) (DIME & GAFSP. Web.). Staple crops grown in Bangladesh are rice, jute, tea, and wheat. Other crops also grown are sugarcane, potatoes, tobacco, pulses, oilseed, spices, and fruits like mangos, bananas, and pineapple (Wiki. Web.). Data released by the Food and Agriculture Organization of the United Nations shows that the average household plants six plots of .14ha or .35 acres each plot, which gives a total of .84ha or 2.1 acres per household. A household owns the majority of the farms and plots, at 70% of agricultural used land. The most common crop grown per household is rice with it being grown by 74% of households. In recent years, growing maize in Bangladesh has appeared to be used as a feed for livestock (DIME & GAFSP. Web.). As well as 94% households report of adding a type of input like urea, pesticides, or insecticides to their arable land, and 76% households report using irrigation such as a tubewell or shallow tubewell in at least one plot (DIME & GAFSP. Web.). The average yield of rice 3.5 tons per hectare in Bangladesh compared to the average yield of rice is 4.5 tons per hectare. Farmers only make an income ranging from \$62 to \$844 ("landless" farmers to large-scale farmers) off raising crops (DIME & GAFSP. Web.). Fish are commonly raised with 85% of households raising fish. Ponds are usually very small and fish are raised for household consumption. Households or farmers raise livestock along with crops; farms without livestock make up only 3% of households with arable land, and livestock is also raised for mainly household consumption. The most common livestock raise are chickens, cattle, and duck; other types of livestock also raised in Bangladesh are bullock, goats, sheep, pigeons, and buffalo. One type of livestock not often raised in Bangladesh is swine due to public stigmatization with potential risk for pathogens to infect humans (U.S. National. Web.).

Bangladeshi farmers face the rapid increase of population and urbanization. Bangladesh is one of the most densely populated countries in the world with 2,267 people per square mile. (Central. Web.). The population predominantly lives in rural areas with only 33% of people living in urban areas. Access and use of arable land is decreasing. Growing population pressures have created food deficits mainly in wheat

production, which has been unable to meet the populations' demands. Bangladesh has reverted to importing and foreign assistance to fill this need. With the population increasing, underemployment has become concerning as landless citizens depend on rural labor increasingly every year. People who live in rural Bangladesh, 40% of rural Bangladeshis, earn \$1.25 per day with more than half of those wages spent on food (IFPRI. Web). As well as malnutrition has become a major problem with 90% of rural Bangladeshis have an iron deficiency and or lacking the enough vitamin A. Iron deficiencies cause anemia and make women high risk for childbirth, which has become common in women in this area (IFPRI. Web.). This is also common due to the staple food of Bangladesh being rice, which lacks in vitamin A.

Bangladesh's access to fresh water is great compared to most countries of the world. The World Health Organization reports that 97% of Bangladesh has contact to water. Though there is plenty of water, it is not safe. An astounding, 60% of the Bangladesh's population must endure un-sanitary water or does not have access to proper sanitation (Waterproject. Web.). During the monsoon season, June to October, great amounts of water are given to region but the during the summer months Bangladesh suffers from drought. Water that is available for agriculture use is more forthcoming compared to drinking water, because of the fertile soil of the Bengal Delta holds more moisture. The Ganges and Jumuna rivers derive in other countries like India and China. The two countries have an even larger and faster growing populations than Bangladesh, so by the time water gets to its borders the amount of water is reduced. Most of the water that is meant to go down that Ganges River is diverted by the Farraka Barrage in India, which provides irrigation to the country, this leaves the river salinity to increase further (Waterproject. Web.). The Ganges Rivers salinity has increased due to shrimp farming, salinity has also affected soil and underground water quality. Freshwater from the delta has decreased due to the rise in sea levels as well (Wiki. Web.).

The most grueling problem Bangladesh is facing is a silent killer, arsenic, which is killing one in every five people. With the average family size being 5 people, this means that one person from each family would die, hypothetically. Arsenic is a natural element and is a metalloid. The element itself is not soluble but combined with other elements, surrounding acidity and other chemicals it can become soluble (IPCS. Web.). It occurs naturally and also due to human activity; the arsenic poisoning in Bangladesh is a natural occurrence. People who have been exposed for a long period of time to arsenic have developed skin lesion which is a symptom of arsenicosis. Lesions are not the only symptom arsenicosis cases suffer from they also may suffer from hardening of skin, swollen limbs, dark spots on hands and feet, and loss of feeling in limbs (UNICEF. Web.). Long term exposure to arsenic has been proven to cause cancer and has been linked to liver ailments and heart problems (FAO. Web.). Three of the top ten causes of deaths in Bangladesh are caused by these side effects of arsenic poisoning. The cause of the wide spread epidemic is thought to be caused by hand pumps placed into the ground beginning in the 1970s in Brahmaputra (Jumuna) River basin to lessen the use of traditional contaminated surface water that caused water related diseases (Waterorg. Web.). When place shallow pumps were placed they were meant to provide access ground water, but when they tapped into the aquifer they also tapped into an arsenic deposit thus releasing arsenic to the masses. The World Food Organization has reported that arsenic is affecting one third of the population or 30 to 35 million people of Bangladesh. It has also been called "the largest poisoning of a population in history" (Waterproject. Web.). A concern with contaminated water is that it also being used to for irrigating crops long with drinking water. Studies have found that crops that have been raised in soil and water that is contaminated with arsenic have higher content within the crop. As well as soil with arsenic in it has decreased yields in crops such as rice (FAO. Web.).

However, contaminated wells have begun to be marked and safe water points have been established. Possible contaminated water is being tested with mercuric bromide. The presents of arsenic is detected with a change in color of the water and mercuric bromide solution (IPCS. Web.). Arsenic removal and decontamination is possible by two types of methods: physicochemical and biological methods. With

physicochemical method there are multiple processes such as filtration, adsorption, and chemical precipitation; biological methods use various aquatic plants or microbes to detoxify which this process is known as phytoremediation (Lim, K.T. et al. Web.). The best processes for decontamination for Bangladeshis are the three-pitcher filtration assembly or known locally as 3-kalshi, and a sono filter (Khan. A.H. et. al. Web). These filter assemblies are easy to make, use readily available materials, and are economical for poor rural Bangladeshis. Both filtration systems use similar materials: different grades of sand, iron chips or iron matrix, wood charcoal, and brick (Hussam & Munir. Web). The most essential material in the iron chips or iron matrix. The iron is porous allowing the arsenic to chemically bond with it. The other materials are used to further purify and absorb other contaminants. Water tested after filtration shows great improvement from 1100ppb to under 10ppb (Khan. A.H. et. al. Web.). Technology to treat arsenic contaminated water is also being investigated by the Bangladesh Council of Scientific and Industrial Research (Waterproject. Web.). Education about arsenic and exposure is needed to teach the masses of the dangers and to teach decontamination methods that are available for arsenic. People will continue to die of arsenic exposure until all areas are identified of its contamination and decontamination is possible. Continued testing of water sources is needed.

Bangladesh receives nearly two billion dollars in assistances from countries like the United States, Australia, Germany and the European Union as reported in global humanitarian assistance report by the Development Initiative (Dev. Initiative. Web.). Organizations and non-government like BRAC, WHO (World Health Organization), WaterAid, and many others have provided management and guidelines for safety, review of evidence, testing and identification of contaminated wells, and filtration systems. The World Bank and the International Development Association (IDA) have contribute sixteen billion dollars to the Bangladesh government to finance projects and programs focused on improving the way of life of the Bangladeshis people (World Bank. Web.). One quarter of foreign aid provide is focused on health, education, and rural infrastructure. Government agency and ministrations have been sanctioned to implement action such as the Ministry of Local Government and Rural Development and Cooperation. Funding has provide projects such as the Arsenic Mitigation Water Supply Project, which was focused on decreasing ingestion of arsenic, access to safe water, and treatment to arsenicosis patients until its closure in the 2006 (Arsenic:World Bank. Web.). This program was only moderately satisfactory. Since then arsenic prevention and education has been mainly provided by organizations. Until in 2012 when the Rural Water Supply and Sanitation Project was approved. This project in focused on rural services and infrastructure with a goal of providing safe water for 1.6 million Bangladeshis (BD:World Bank. Web.). Though this is only a small fraction of the thirty million people of Bangladesh that are facing unsafe water conditions. This project is set to close in the year 2017 and at its current rate it is unsure that the project will meet its goal. Extension, further political pressure and advocacy, and financial support is needed to make sure that this goal is completed.

The Bangladesh government is in the early stages of development after facing years of corruption and political confusion, and is still considered a developing nation. As the population increases the government and non-government organizations are incapable of helping maintain an adequate standard of living for the majority of its population. Bangladesh lacks health professionals and services. There is only an estimated a hundred thousand health care professionals and estimate four thousand government run health centers that are available to provide services (Amin, Aasha Mehreen. Web). Bangladesh has a primary health care system as it is a signatory of the Declaration of Alma-Ata, but fails to meet the populations need. There is currently only one doctor for every 2,500 people (MOH&FW. Web.). The need to educate and or train more people in the health care profession is great as the population continues to increase. Beginning with education will allow and provide a better standard of living with a decrease in disease, infant mortality, and malnutrition. Health care services for those affected by long term arsenic exposure and arsenicosis is needed. The Bangladesh government should consider a national health care system and education program to provide available health care and more trained professionals in its continuing development.

Education of the risk of drinking undetermined safe water sources and encouragement of only drinking predetermined safe water is needed. After testing of wells of a negative result people are forced to resort to ditches, ponds, and other sources of water, which often causes diarrheal diseases killing over 100,000 children a year (Water.org. Web). Filters or filtration systems are need for those how have affected wells or source of water. Organizations like BRAC and others have provided immediate needed filters when the arsenic contamination was discovered, but continued maintenances and installment is still needed.

Although, action is being taken against arsenic laced water it is not enough to protect the majority of the affected. As the population continues to grow it will become harder and harder to contain the arsenic exposure, as the demand for water for agriculture or drinking purposes will only escalated. But, once contained, crop yields and food security will increase and deaths will decrease. With increased yields farmers will be able to sell a greater proportion of their crops to earn a higher profit, as well as farmers families will be safe from exposure. This will also upturn the employment rate, reduce the cost of rice, and the amount of people suffering from hunger and malnutrition will decrease with a surge food availability. Clean and accessible water will increase the condition of life, causing life not to end by preventable factors.

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