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Bangladesh, Factor 9: Water & Sanitation

Bangladesh: Water Filtration to Prevent Chronic Arsenic Poisoning

A young boy carries a pot, far too large for his size, to his village's water pump. He has grown frail and weak, and his hunger and thirst follow him along his trek like a shadow. When he arrives to the well, water tinted in color spits out of the pump and slowly fills up his jar. He returns home satisfied that he was able to end his and his family's thirst, even if it is just for a short time. But the water will provide no more than a brief moment of satisfaction, as the water the Bangladeshi family just consumed is contaminated by a multitude of diseases, and will leave this family riddled with illness. The harrowing circumstances surrounding this young boy in his family are, unfortunately, a reality for the majority of families living in Bangladesh. A substantial number of people, in rural and urban areas alike, live well below the poverty line. The number of children per family has steadily decreased in recent years due to the government's push for conscious family planning in hopes families would raise healthier children if they were to limit the number of children they had. While birth rates have decreased, with an average of six people living within each household, there still remains a large amount of pressure upon parents to provide for their families while maintaining the well being of each of their family members. It is not uncommon for extended relatives to live together, thus pushing more people into already small living quarters. Homes in Bangladesh are low in quality, commonly built with mud, bamboo, and sticks, and consisting of one or two rooms at most ("Housing Report" 1). Most rural areas lack acceptable access to electricity, schooling for young children, adequate health care, or even proper roads, which are essential in providing access to nearby towns and markets. These rural areas are predominantly known to practice agriculture, as it serves as both an income and a primary food source for many of the families.

Bangladesh is a nation built up of subsistence farmers. Seventy-five percent of the developing nation's citizens invest their livelihood into agricultural practices; nearly all those living in rural areas participate in some form of farming ("Culture of Bangladesh"). A variety of produce is grown by the Bangladeshi people, including rice, jute, pulses, wheat, and a multitude of vegetables. Since income and meals are reliant upon the outcome of the Bangladeshi people's farming, it can be inferred there is a direct correlation between successful lives and successful farming. With such emphasis placed upon agriculture, it is incredibly important for Bangladeshi farming families to run successful farms. But, being such a densely populated country, Bangladeshi farmers are granted far less land than needed. On average, Bangladesh farmers are granted only about 3 acres of land, which is then divided up into smaller plots ("Culture of Bangladesh"). Such difficulties in gaining adequate land create further barriers in an already difficult situation. Irrigation, another essential aspect to successful farming, creates additional barriers, as well. While irrigation plays a key role in the expansion of Bangladeshi farming practices, difficulties stemming from the developing nation's water supply, cause troublesome dilemmas to arise for the Bangladeshi people.

As a country divided by three major rivers, the Ganges, the Brahmaputra, and the Meghna, it may not be surprising to hear an estimated 97% of Bangladeshi people have access to drinking water. But only 40% have access to appropriate sanitation (Hedrick). This leaves 60% of the population with drinking water contaminated by outside sources often leading to waterborne illnesses. Bangladeshi people often gather their water with urns, then fill the urns with water from a multitude of locations: ponds, rivers, watering holes, and most commonly, tube wells. Many of these sources are contaminated by animal and human fecal matter. Likewise, when great rains and monsoons hit the developing country, water is washed about the land with mud and dirt, again leaving the water contaminated. While all of these contaminations defile the purity of the water, the greatest cause for concern comes from the tube wells, which is a source

directly taking water from the ground. Many Bangladeshi men and women have installed private hand-pumping tube wells to amass their daily water, but it has been found that nearly 20 million people have been affected by arsenic poisoning due to contamination from the ground water (“Sanitation, Hygiene” 2). Arsenic is a heavy metal, which is found naturally in water, in rock, and in the earth. While it may occur naturally, severe consequences can and do occur if arsenic is over consumed. The standard level of acceptable arsenic, within water, is 50 ppb (parts per billion). Statistics from the Bangladesh Atomic Energy Convention provide information stating that water gathered from the everyday tube well systems contain arsenic level reaching between 150 and 200 ppb (Udin and Huda). This alarming statistic reveals the grim situation in Bangladesh.

Not only do the Bangladeshi people drink the arsenic infested water, they also use the water to irrigate their rice paddies and crops. The arsenic infects the growing produce, contaminating one of the most intricate food sources for the people living in the rural areas of Bangladesh. The arsenic poisons the crops, and also can infect the air in the household. As women cook dinner for their families, the arsenic is released in fumes into the air. The arsenic waits to be inhaled by the cooks, further endangering the lives of the innocent women, alongside their families. Alongside their primary water sources, contamination of the crop fields means the people’s primary food source is also poisoned by levels of arsenic exceeding all reasonable standards. Arsenic has made its way into contaminating two of the most important necessities of healthy living: food and water. Without access to cleanly, pure food and water, there is no hope in seeing improvement in the health of Bangladeshi men, women, and children.

Over consumption of arsenic has dire effects on the people of Bangladesh. After a longer period of ingesting the contaminated water a person is more than likely to develop arsenicosis, a form of chronic arsenic poisoning. The most common result of chronic arsenic poisoning, results in skin lesions, known as keratosis. Due to the lack of access to proper healthcare facilities, the lesions are rarely treated properly and often lead to more infections and diseases, creating an unending cycle of illness. Alongside skin lesions, those affected by the arsenic tainted water are repeatedly left to die, untreated from cancers of the lungs, liver, bladder, kidney, and skin. Children of parents who regularly drink the contaminated water are born at alarmingly small sizes with neurological deficits, and their cognitive development is impaired throughout their lives (Udin and Huda). The haunting consequences of chronic arsenic poisoning upon the Bangladeshi people begs for a solution.

Seeing the problem arsenic poisoning has on developing nations, an organization by the name of Geo-Life has designed and tested plans for the Kanchan Arsenic Filter. These filters can be created by other non profit organizations, or even taught to the people of the country in need, providing a solution to the arsenic problem. The filter is designed to have contaminated water poured through the system, passing over brick chips and iron nails- rusted nails have been proven to remove great amounts of arsenic from substances. After passing through this level, the water filters through a biological layer of sand and gravel; thus, removing any other pathogens which could create further illnesses or diseases. Finally, the water travels out of a valve pipe and is considered drinkable (“Arsenic Removal Article”). The construction of these filters is relatively inexpensive, about \$20 per filter, and based off predictions from Geo-Life, the filters should last somewhere between 12-24 years. The success in other developing nations generates hope that a project such as this will have a profound effect on the Bangladeshi people’s livelihood and health.

Geo-Life has focused their project in Cambodia, in the city of Battambang. While parts of Cambodia still struggle to find adequate, safe drinking water, many of the nation's citizens have been helped tremendously because of these filtration systems from this organization. It has been proven from Geo-Life’s testing phases in Cambodia the filtration system is highly effective. In the project’s first phase of research, the systems were able to lower samples of water exceeding 600 ppb and reduce this number to the acceptable level of 50 ppb or less. Determined by the amount of water tested and success in lowering

the levels of arsenic, it has been proven the filtration system yields a 95-97% effective removal rate of the arsenic (“Arsenic Removal Article”). Thus far, the filtration project has been rather successful in Cambodia, a nation that is similar to Bangladesh when it comes to poverty and disease. Such success in Cambodia provides a strong belief that because of its efficiency and its inexpensiveness, the filtration project could be a success in Bangladesh, as well.

The filter is a simple concept that needs minimal interference to work properly. Regardless of its apparent simplicity in management, it would be beneficial to educate the people of Bangladesh how the system works, and what signs to look for if the system were to stop working. The men and women who will be using the filters should also be educated on how to properly dispose of the arsenic waste. If not disposed of correctly, the arsenic waste can contaminate the land and water, once again causing issues for the people of these rural areas. Adsorbents that create liquid waste are the biggest cause for concern; if such liquid were to become a result of adsorbents, a high form of waste management would have to be used, to protect further contamination from occurring. Therefore, adsorbents resulting in solid waste would be most preferable as they could be disposed of in landfills. Eventually these forms of wastes could be tested properly, and separated as hazardous and nonhazardous materials (“Arsenic Removal Article”). This technique, while effective and proven successful, may not be plausible for all rural areas in Bangladesh as it requires a special kind of facility and level of education, in order to dispose thoroughly and properly.

Since many rural parts of Bangladesh will not have access to special disposal facilities to discard the waste gathered from the arsenic filter, other forms of disposal must be taught to the villagers who will be using these filters. The idea of mixing the arsenic waste with cow dung has been proposed by Geo-Life, and numerous other non-profits and environmental agencies, alike. When the two oddities are meshed together, the arsenic waste becomes methylate arsenic, eliminating the concern of further contamination (“Arsenic Removal Article”). The cow dung immobilizes the arsenic waste; thus, rendering the once poisonous, damaging waste incapable of further harming the land and people of Bangladesh. Many of those living in rural Bangladesh areas are farmers with livestock. This poses little to no concern cow dung will be a scarcity in these rural villages. The possibility of furthering the usage of the cow dung could be to use the immobilizer as a fertilizer for farmers’ crop fields. The usage of cow dung would, then, not only discard the poisonous arsenic, but also benefit farmers’ crop production, and the health of their fields. Further testing would have to be done in order to ensure the process is successful, but the concepts provide a promising solution for the people of Bangladesh.

In order to properly educate the villagers of these rural areas on how to appropriately take care of the filters, as well as explain the process of disposal, organizations who will take charge on this project will need to go to the heart of each village. Bangladeshi villages are separated into factions, each faction follows a social hierarchy (Worden and Heitzman). At the heart of each village is a man who comes from more wealth, which is typically measured by the amount of land owned, than the rest of his village. The leader of each factions primary goal is to not only ensure his and his family’s well-being, but also to assist those of lower standing within his village. Therefore, it would likely be most beneficial to go directly to the heart of each faction, or village, in order to effectively express the importance, benefits, and education needed for a project such as the arsenic filtration system. It is important to have someone local with a strong understanding of how the filters work and what needs to be done in order to keep them working properly, in order to see actual success in the rural areas of Bangladesh.

The biggest question surrounding the filters is deciding who will pay for them. Since the filters can actually be created by non profit organizations and are rather inexpensive, it would not be unreasonable to reach out to charity programs who place an emphasis on clean water and sanitation, or even the nation of Bangladesh, as a whole. BRAC is an organization that began in the early 70’s with the goal of helping the developing nation of Bangladesh. They emphasize issues critical to the healthy development of the nation’s people- water sanitation, healthcare, and human rights activism are just mere aspects of all the

work they do. An organization such as BRAC could be the perfect fit for leading the filtration project, in Bangladesh. The organization is already an active member leading the charge for the betterment of the nation, and with proper backing from the government and other charitable organizations, the implementation of the filtration project could have a profound impact on the people of Bangladesh.

Another young boy, years later, watches as his family grows sicker and sicker. He sees the lesions covering his younger brothers. Their sores are infected and growing worse by the day, surely infecting them with new diseases. They are in a constant state of pain, enduring convulsions, severe diarrhea, and vomiting regularly. The boy's father has grown frail, and his headaches prevent him from being able to properly care for his young children. It has grown to be a common occurrence for the boy to hear of his neighbors dying due to their illnesses. As this young boy carries the weight of his family upon his shoulders, he has nowhere else to turn but the source of all their pain, as he desperately tries to care for his family. With such limited resources, the boy and his village are forced to continue drinking the water from the wells, and eating the crops from the fields, regardless of the damage it causes to their bodies. Their fates are uncertain, and they do not look far into the future, they simply try to survive each day. The boy and so many other Bangladeshi's futures are grim if this reality continues to play out through the years.

The young boy's life is at risk due to something as innocent as fetching water for himself and his family. His own well being, as well as so many other Bangladeshi people, is faced with the constant threat of malnutrition, and contaminated water sources. This nation cannot truly begin to thrive if its people are unable to have access to the basic necessities of life. Poverty stricken and disease ridden Bangladesh begs for a solution to the ongoing issue of water contamination. Arsenic poisons the Bangladeshi agricultural harvests, water supplies, and the people of this developing nation. The cry for help is loud, and someone must answer it. The implementation of arsenic water filters into the villages of rural Bangladesh, will be the first step towards paving a way for the promising future the people of Bangladesh so badly want. With proper education to the villagers, effective management of the filtration systems, and support from both domestic and international foreign aid organizations, such as Geo-Life and BRAC, a project such as the Kachan Water Filter could drastically lower the number of illnesses due to water contamination, creating healthier children and adults across the nation, as well as open the door for a nation with so much potential to succeed on the global scale.

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