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Arsenic Mitigation Through Community Water Treatment Plants in Meherpur District, Bangladesh

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B.S
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An abstract of
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Rollins School of Public Health of Emory University
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Abstract

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By Anushree Yogesh Mahajan

Exposure to toxic arsenic through the consumption of contaminated groundwater is affecting millions in rural communities of Bangladesh. For over three decades, the disadvantaged rural populations of Bangladesh have been drinking groundwater through millions of tube wells installed by UNICEF in the late 80's in an effort to reduce the disease burden associated with the consumption of fecally-contaminated surface waters. In 1993, arsenic in the water from these tube wells was discovered and up to 11 million tube wells have been tested and marked as safe or unsafe since then. However, these communities continue to drink unsafe tube well water either because there is inadequate availability of alternative drinking water sources or the more immediate impacts of diarrheal disease outweigh the health problems associated with long-term arsenic exposure. Save the Children, Bangladesh has been implementing Water Treatment Plants (WTPs) as an arsenic mitigation option for rural communities that are severely impacted by arsenic contaminated groundwater in Meherpur District since 2009. This WTP, developed and designed by a local company, Sidko Limited, uses a granular ferric hydroxide (GFH) media to adsorb arsenic out of groundwater collected from deep aquifers. The effectiveness of the GFH media in removing arsenic from aqueous solutions has been widely studied in lab experiments, however, its applications for use in a filter for arsenic mitigation have not been investigated. This thesis summarizes an investigation of the use of the Sidko WTP as an arsenic mitigation option for rural communities in Bangladesh. It also compares the WTP intervention to other arsenic mitigation options that are commonly used in Bangladesh and extensively cited in the literature. Process documentation research was conducted to examine how this intervention is implemented in communities of Meherpur by Save the Children. Qualitative data on community perceptions of the WTP and the water that it provides was also collected through interviews and focus group discussions with community members of four communities that have received the intervention. The cost, sustainability, and implications for future scale-up of the WTP intervention are also discussed.

Keywords: arsenic mitigation, groundwater, water treatment plants, process documentation, qualitative data, community perceptions, Bangladesh

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Table of Contents

1. Introduction

Bangladesh has been affected by water contaminated with naturally-occurring arsenic for over 30 years, resulting in a severe environmental health problem for the nation. It began in the 1970s, when UNICEF initiated the building of millions of tube wells to tap into the abundant groundwater to avoid microbial pathogens in surface sources that were heavily relied on for drinking water. The water was never tested for chemical contaminants until the early 1990's when it was found to be laced with a very high concentration of toxic arsenic. This catastrophe has been deemed "the largest mass poisoning of a population in history" by the World Health Organization and is the cause of a range of health problems, such as cancer, for many in the country (WHO, 2002; Smith et al., 2000; Uddin & Huda, 2011).

Low income, rural communities in Bangladesh are the most affected by arsenic as the majority of their drinking water comes from tube wells that access this contaminated groundwater (UNICEF, 2009). These communities also happen to be located in parts of the country where arsenic is highly prevalent in groundwater (Fendorf et al., 2010, UNICEF, 2008). The lack of available alternative safe drinking water sources within a reasonable distance of these communities means that they have no choice but to drink this contaminated groundwater. The population most affected by this problem is largely uneducated, voiceless, and struck by poverty. It is clear that the lack of appropriate effort to address this problem is a social injustice.

Though arsenic contaminated groundwater is found in countries all over the world, including the United States, arsenic mitigation strategies and technologies are far and few between (Smedley & Kinniburgh, 2002; Welch et al., 2000). As described in **Section 3** of this thesis, thus far, arsenic mitigation strategies for rural communities in Bangladesh have focused almost solely on finding alternative drinking water sources such as

rainwater, dug wells etc. However, the disease burden associated with pathogen contamination in the majority of these alternative water sources, means that they cannot be considered absolute solutions to the arsenic problem. Arsenic removal technologies have shown much promise for use in developing mitigation options for arsenic contaminated groundwater. Nonetheless, literature on successful long-term household mitigation options and studies on community-based mitigation interventions for rural and low income communities, is limited.

Local and international non-governmental organizations (NGOs) in Bangladesh, are working towards mitigating against arsenic exposure in contaminated groundwater, with some successes. In particular, Save the Children, Bangladesh (SC) has been implementing a Water Treatment Plant (WTP) Intervention within rural communities of the Meherpur District since 2009. These WTPs filter arsenic, iron, reactive phosphate, and manganese from pumped up groundwater. SC has been collaborating with a third party company, Sidko Limited (Ltd), who designed the WTP and provides all the materials and manpower needed to construct WTPs within communities. Between 2009-2014, 23 WTPs were implemented by SC in Meherpur and have been providing clean water to over 5000 households.

This thesis will investigate "who" and "what" is involved in SC's WTP intervention in Bangladesh and "how" it is implemented within a community severely affected by arsenic contaminated groundwater. It will also compare the WTP intervention to other arsenic mitigation strategies for arsenic contaminated groundwater and will touch upon how the WTP filters groundwater for arsenic and other mineral contaminants. Literature on qualitative data addressing how individuals and communities have perceived arsenic mitigation strategies is very limited and this thesis seeks to understand community perceptions of the WTP. Finally, it will discuss the sustainability of the WTP intervention

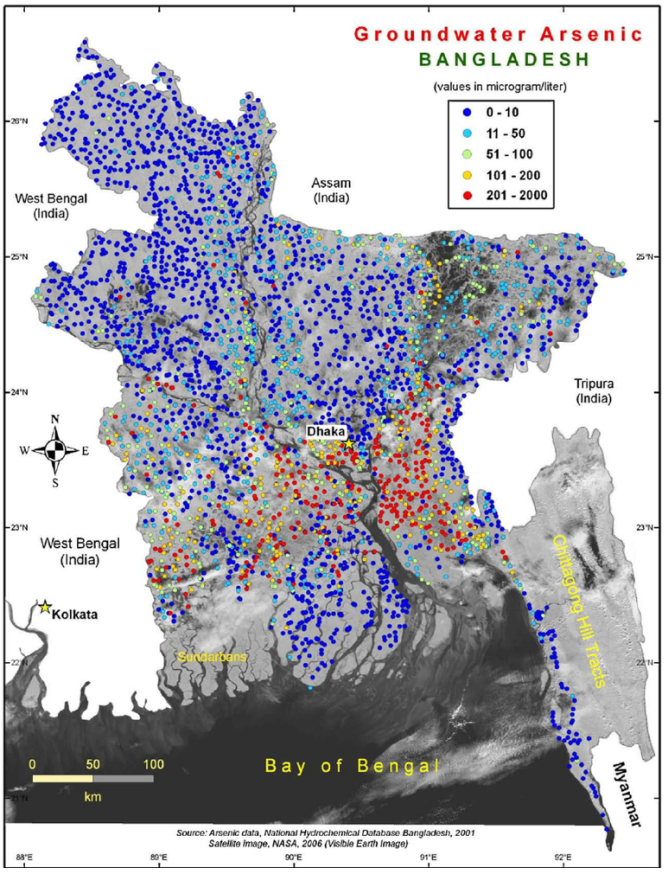
and attempt to determine whether the intervention can be scaled up and implemented in other parts of Bangladesh where there is a lack of alternative arsenic-free water sources.

2. Background

2.1 Bangladesh and Arsenic Contaminated Groundwater

Bangladesh is a low-income South-East Asian country with a population of over 165 million (World Bank, 2013). It has been through a severe history of poverty, disease, natural disasters, and malnutrition (WHO, 2004). One of the greatest public health catastrophes that the country is still suffering the consequences of is naturally occurring arsenic contaminated groundwater that was unwittingly promoted for drinking (Kinniburgh and Smedley, 2001).

Figure 1. Map of groundwater arsenic concentration in Bangladesh (Shamsudduha et al., 2008)



A nationwide tube-well implementation initiative by UNICEF that began in the 1970s was able to provide groundwater to a majority of the country (UNICEF, 2008). This

was done to reduce the significant disease burden caused by the ingestion of pathogen-abundant surface water (UNICEF, 2009). Groundwater was being pumped through 7-11 million tube wells all over the country and used as drinking water for millions of people by the early 1990s (Uddin & Huda, 2011). Despite research linking arsenic poisoning induced skin lesions to shallow tube well water in West Bengal in the 1980s, UNICEF did not halt its initiative (Chakraborty & Saha et al., 1987).

By 1993, when the problem was finally acknowledged, an estimated 80% of the total area of Bangladesh indicated arsenic-contaminated groundwater, and approximately 40 million people were at risk of exposure (Karim, 2000). In more rural areas of Bangladesh, up to 97% of the population depends on tube wells for drinking water, which has resulted in an exposed population with very little ability or incentive to find alternative water sources (Rahman et al., 2003, Ahmad et al., 2005). Over 6 million tube wells have been tested, since the first remnants of the problem, the results of which warranted immediate mitigation (Milton et al., 2012).

2.2 Reasons for Arsenic Contamination of Groundwater

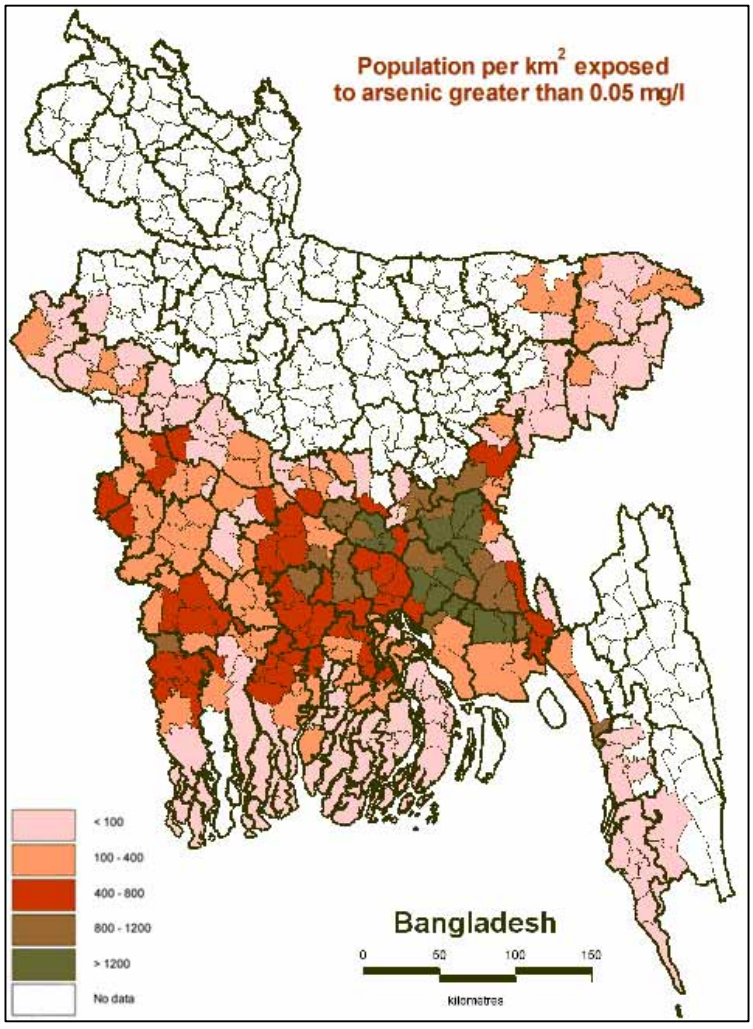
Arsenic is naturally occurring in the environment and is present within minerals and rocks (Rahman, 2012). Argentina, Chile, Mexico, China, Hungary, India, Vietnam, and Bangladesh are all countries where there is a high prevalence of arsenic in groundwater. However, the Bengal Basin, which is an expanse of water shared by Bangladesh and India, has caused arsenic exposure to the largest amount of people through contaminated water used for consumption (Smedley & Kinniburgh, 2002).

The leaching of arsenic into groundwater in the Bengal Basin and other water systems, occurs through natural biogeochemical and hydrologic processes that can be affected by human activity (Fendorf et al., 2010). The nature of the sediments present in a

particular aquifer determines how much arsenic is mobilized and released into the groundwater. The increased presence of oxidized and/or reduced mineral phases, as well as, cofactors of arsenic-rich solids can increase the geochemical occurrence of arsenic in an aquifer (Anawar et al., 2003).

This leaching of arsenic has moderately to severely enriched the delta plains of several river systems that branch into both Bangladesh and India. Over 60% of tube wells that draw water from shallow aquifers of the Ganges-Brahmaputra river system are affected by this process, and over 80% of tube wells in the Meghna river basin and coastal plains are also affected (Ahmed et al., 2004).

Figure 2. Population per km^2 exposed to arsenic greater than 0.05 mg/L (SDNPB, n.d.)



2.3 Climate Change and Groundwater Arsenic

Ming-Kuo et al. (2013) found that the rises in sea level and river base during the warm Holocene period has led to an increase in groundwater arsenic concentration because of the initiation of reducing geochemical conditions and slow groundwater movement. The modelling results of this study also found that arsenic will be released from surface hydrous oxides into groundwater as temperatures rise due to climate change (Ming-Kuo et al., 2013). Taylor et al. (2013) discuss how human use of groundwater will intensify as climate change continues to deplete surface waters through drought and other climate-based mechanisms all over the world.

These studies suggest that climate change will only exacerbate the problem of arsenic contaminated groundwater and will increase human exposure of arsenic through the drinking of groundwater. However, literature on this topic is very minimal and further research on the implications of climate change on groundwater arsenic needs to be conducted to improve our understanding of this process and how it can potentially be slowed down.

2.4 Health Impacts of Arsenic Poisoning

Arsenicosis or arsenic poisoning is caused by the exposure to high-levels of arsenic through ingestion, inhalation, or absorption. The World Health Organization's (WHO) current limit of arsenic in drinking water is 10 μg/L (WHO, 2012). However, Bangladesh has set its limit of arsenic in drinking water to 50 μg/L, five times that of WHO (UNICEF, 2009). National standards have made it acceptable for people in the country to be exposed to a higher concentration of arsenic than that which is acceptable elsewhere in the world.

Arsenic is a carcinogen, and long-term exposure has been shown to cause lung and skin cancers. It is also a teratogen, meaning that it can cross the placental barrier and affect the fetus (Karim, 2000). The drinking of arsenic contaminated water has also been associated with cardiovascular problems such as atherosclerosis and ischemic heart disease (Uddin & Huda, 2011).

In Bangladesh, patients with gangrene, melanosis, hyperkeratosis, leuco-melanosis, keratosis, dorsum, non-petting oedema, and skin cancer have been identified as a result of arsenic-poisoning (Karim, 2000). Chen & Ahsan (2004) found there to be at least a doubling in the potential cancer burden in Bangladesh due to exposure to arsenic, especially in concern to bladder, lung, and liver cancers. Research conducted in other countries that have a history of long-term exposure to arsenic contaminated water (~500 μg/L) suggest that 1 in 10 people will ultimately die of lung, bladder, and skin cancers (Smith et al., 2000).

Social and mental health problems of arsenic exposure through drinking arsenic contaminated water have also been documented. Hassan et al (2005) found that there is a tendency for those who are severely affected by arsenic poisoning to be ostracized in their communities because of the fear that the disease is contagious. Individuals suffering from arsenicosis are prevented from partaking in social activities, or face rejection, even from immediate family members (Hassan et al., 2005). Arsenic-affected children are not sent to school in an effort to hide the problem, and arsenic-affected adults are unable to get married, or are divorced by their spouses because of the manifestation of the disease on the body (Hassan et al., 2005).

Mental health problems, such as depression, are more common amongst those affected by arsenic poisoning (Brinkel & Kraemer, 2009). Neurodevelopmental problems are also seen in arsenic-affected children, such as mental retardation and physical, psychological, sensory, cognitive, and speech impairments (Brinkel & Kraemer, 2009).

These are most likely associated with the fact that the toxin can travel through the placental barrier and directly impact the fetus in the womb.

2.5 Economic Implications of Population Arsenic Exposure

Arsenic exposure varies greatly amongst all 64 districts of Bangladesh and arsenic-related deaths annually account for up to 15% of all adult deaths in the country. It has been estimated that annually, 24,000 adult deaths result from long-term arsenic exposure to concentrations >50 μg/L, and 19,000 annual adult deaths result from long-term arsenic exposure to concentrations of 10-50 μg/L. This translates to a 13 billion dollar (US$) loss in productivity alone over the next 20 years for 1 in every 18 adult deaths (Flanagan et al., 2012).

The great economic burden of arsenic-related morbidity and mortality is vital for the Bangladeshi government to consider. Arsenic-related illness also has a socioeconomic nature that should be researched further. Tani (1999) found a negative relationship between household income and arsenicosis prevalence, i.e. as household income increased, arsenicosis prevalence decreased. This demonstrates the socioeconomic aspect of arsenic poisoning and the multitude of factors that go into who, in the population, is impacted and who isn't.

3. Arsenic Mitigation in Bangladesh

3.1 UNICEF's Mitigation Strategy

In an effort to prevent further arsenic exposure once the problem was established in Bangladesh, UNICEF tested a large number of tube wells they had implemented. Once tested, each tube well was painted either red or green to denote danger or safety, respectively (UNICEF, 2010). Forty-seven percent of all tube-wells tested were found to have arsenic concentrations greater than that of drinking water standards recommended by WHO i.e. >10 µg/L (Flanagan et al., 2012). About 1.4 million tube wells were found to be unsafe of those tested (Uddin & Huda, 2011). Even though these tube wells were not safe to drink from, they were not completely decommissioned because the water could still safely be used for purposes other than drinking and cooking, such as bathing.

Tube well testing had the greatest impact in terms of reducing human exposure to arsenic; of the millions of villagers informed that their tube well had elevated levels of arsenic, about 29% switched their water sources (Ahmed et al., 2006). A study by Madajewicz et al. (2007) had similar findings, in that, when a household knew that their tube well was highly contaminated with arsenic, they were 37% more likely to change their water source within a year. However, there are several factors that determine the ability of villagers to do this, such as, the proportion of unsafe wells in a village and the distance to the nearest safe well (Schoenfeld, 2006). This explains the variations seen from village to village in terms of well-switching (Ahmed et al., 2006). It has been noted, though, that education and targeted messaging about the health hazards associated with the consumption of arsenic contaminated groundwater influence well-switching behaviour (Opar et al., 2007).

3.2 Other Mitigation Efforts

An intervention that has had the second greatest impact in terms of mitigation against arsenic, is deep well installation by the government and nongovernmental organizations (NGOs). These wells provide groundwater from deeper aquifers that are not laced with arsenic. They are often communal wells and require a little bit more walking (~100m) to get to (Ahmed et al., 2006). However, a study conducted in the Mekong Delta of Vietnam, where arsenic contaminated groundwater is also a problem, found that unrecognized mechanisms associated with deep groundwater extraction are causing arsenic contamination to deep aquifers over decades (Erban et al., 2013). This questions the sustainability, reliability, and the overall environmental impact of using deep well installation as a solution to this problem.

Other mitigation efforts are far and few apart and a large amount of the population are still being exposed to arsenic through drinking contaminated water. According to the most recent survey data, an estimated 35-70 million people have been chronically exposed to arsenic (Flanagan et al., 2012). Alternative interventions from well-testing to household filtration systems are being sought out by the government and NGOs, however, the impact and sustainability of these interventions needs to be researched before scaling up (Ahmed et al., 2006).

3.3 Arsenic Mitigation Strategies

By 2012, over 6 million tube wells had been tested and it had been evident for a while that arsenic mitigation was necessary, to appropriately deal with the problem (Milton et al., 2012). The two main categories of mitigation against arsenic contaminated water are to either find alternative, arsenic-free water sources, or to filter out arsenic from existing water sources. Finding alternative, arsenic-free water sources can involve tapping into deep groundwater sources through deep tube wells, switching tube wells to those that

meet drinking water standards recommended by WHO, using dug well water, using surface water, such as ponds and lakes, or rainwater harvesting (Shankar & Shankar, 2014).

Research conducted in the Bengal Basin and Mekong Delta suggests that arsenic-rich water is usually prevalent in shallow groundwater (Smedley, 2008). A tube well dug deep enough to access an aquifer that has one or more water-bearing aquifers above it is called a deep tube well (Ahmed et al., 2005). The deep Pleistocene aquifers in Bangladesh, which usually meet this criteria, have been found to be relatively free of arsenic contamination (Islam & Uddin, 2002). Studies by the British Geological Survey (BGS) and DPHE have found that only about 1% of deep tube wells (~150 m) reaching these aquifers contained an arsenic contamination >50 μg/L and about 5% contained an arsenic contamination >10 μg/L (BGS & DPHE, 2001). A study by Escamilla et al. (2013) showed how the introduction of deep tube wells to reduce arsenic in drinking water in rural Bangladesh had the additional benefit of lowering the incidence of diarrhoea among young children. However, as mentioned above, in **Section 3.2**, removal of deep groundwater threatens these arsenic-free deep aquifers of arsenic contamination (Erban et al., 2013).

There are millions of shallow groundwater tube wells in Bangladesh, and well-switching to a tube well meeting the arsenic drinking water standards has been the most successful method of arsenic mitigation, as mentioned previously (Ahmed et al., 2006). In a study conducted by Van Geen et al. (2002), 48% of all tube wells surveyed contained an arsenic concentration >50 μg/L and it was found that over 90% of inhabitants in the area of interest, lived within 100 meters of a safe tube well. The biggest problem concerning well-switching is that arsenic concentrations within shallow groundwater are highly variable and tend to increase during the monsoon season (Shankar & Shankar, 2014).

A dug well is a shallow hole dug into the ground to reach a water table and is most commonly open and unprotected (WHO, n.d.). Dug well water withdrawal is the oldest

method of accessing groundwater in Bangladesh and has often been shown to contain very low concentrations of dissolved arsenic and iron if contaminated (Ahmed et al., 2005). This low concentration is due to the oxidative environment of the dug well and groundwater recharge through precipitation (Shankar & Shankar, 2014). Dug wells, however, are easily contaminated by microorganisms because of their open and unprotected nature and consumption can often result in diarrheal disease (WHO, n.d.).

Surface waters such as ponds, lakes, and rivers are generally not contaminated by arsenic and are often present in areas with high arsenic prevalence of groundwater. However, the inflow of drainage from tube wells has been found to be a major source of arsenic contamination of pond water (Yokota et al., 2001). Similar to dug wells, the greatest drawback to using these surface waters is the contamination by microorganisms (Shankar & Shankar, 2014). If this method is to be used to mitigate against arsenic, disinfection or filtration of the water prior to consumption is necessary. This is commonly done in Bangladesh, with the use of Pond Sand Filters (PSF). Yokota et al. (2001) found that the the PSF they had installed was providing good quality treated water in Samta, Bangladesh. However, a study by Kamruzzaman & Ahmed (2006) found that only 6% of PSF water samples were free of faecal contamination. These contradicting results may very well be due to the quality of the PSF design used in each study, which can differ vastly.

Rainwater harvesting is an adequate method of collecting arsenic free water in Bangladesh because of the high rate of rainfall (up to 3000 mm per year) experienced in the country (Ahmed et al., 2005). A catchment system, either through rooftop harvesting or through a large outdoor container is the most effective way to collect rainwater (Shankar & Shankar, 2014). It is vital, however, that safe and appropriate storage of the collected water is maintained, so as to prevent microbial contamination.

3.4 Risk Substitution of Arsenic Mitigation Strategies

A study conducted by Howard et al. (2006) demonstrated how there is a substitution of risk made when arsenic mitigation strategies solely focus on finding alternative sources of water, like the ones discussed above in **Section 3.1**. The study assesses the quality and sanitary condition of these alternative water sources to determine the burden of disease associated with each in disability-adjusted life years (DALYs) (Howard et al., 2006).

Dug-wells and pond sand filters showed high microbial contamination in both the dry and monsoon seasons, whereas, rainwater was of good quality during the monsoon season but it deteriorated during the dry season (Howard et al., 2006). Deep tube wells showed microbial contamination in the monsoon season but not during the dry season and were the only water source relatively free of pathogens that met WHO's reference level of risk of 10^{-6} DALYs (Howard et al., 2006). This study demonstrates how these alternative mitigation strategies cannot be considered absolute solutions to the arsenic problem. However, they may suffice till a long-term sustainable solution is developed for these communities.

3.5 Arsenic Removal Technologies

Arsenic is present as molecules of two main toxic forms in the environment: arsenite (As(III)) and arsenate (As(V)). There are several technologies that are used in the removal of these forms of arsenic from contaminated water, through the processes of oxidation, coagulation and flocculation, adsorption, and biological arsenic removal (Shankar & Shankar, 2014).

Arsenite is more difficult to remove from water than arsenate, thus many removal techniques involve a pretreatment through oxidation to convert As(III) to As(V) (Shankar & Shankar, 2014). Studies have shown that air and pure oxygen can partially (54-57%)

convert As(III) to As(V), whereas complete conversion can be obtained through ozone (Bajpai & Chaudhuri, 1999). Oxidation is quickest when using permanganate, chlorine, and ozone (Ahmed et al., 2001). UV radiation in the presence of oxygen has also been used in photochemical and photocatalytic oxidation of As(III) to As(V) (Shankar & Shankar, 2014).

Coagulation followed by the formation of flocs is another technology used to remove arsenic from contaminated groundwater. Coagulants cause the arsenic molecules to aggregate and form dense clumps (flocs) that sink to the bottom of the water. Aluminium (Al) and iron (Fe) based coagulants are used in the removal of arsenic from contaminated water (Shankar & Shankar, 2014). Pallier et al. (2010) demonstrated a 90% removal of As(III) and 77% removal of As(V) from contaminated water through the use of two coagulants: $Al_2Si_2O_5(OH)_4$ and $FeCl_3$.

Adsorption involves the adherence of arsenic onto activated/coated surfaces. Adsorbents attract arsenic molecules onto their surface, aggregating them, and extracting them from the water. Oftentimes, adsorbents can be reused which is a great advantage. As(V) is more successfully removed through this process than As(III) (Shankar & Shankar, 2014). Granular ferric hydroxide has been shown as an extremely successful adsorbent, removing over 95% of both As(III) and As(V) from contaminated water (Thirunavukkarasu et al., 2003).

Removal of arsenic through biological reduction involves using bacteria to reduce As(V) to As(III) through their respiratory processes (Shankar & Shankar, 2014). Bacteria that are known to conduct this process, include *Geospirillum arsenophilus, Geospirillum barnesi, Desulfutomaculum auripigmentum, Bacillus arsenicoselenatis,* and *Crysiogenes arsenatis* and are called arsenate reducing/respiring bacteria (Macy et al., 2000). Biological oxidation also needs to take place in the removal of arsenic from water where As(III) is oxidized (Shankar & Shankar, 2014). Specific bacteria, such as *Gallionella*

ferruginea and *Leptothrix ochracea* have been used to conduct this oxidation process, with promising results (Katsoyiannis & Zouboulis, 2004).

3.6 Household Options for Arsenic Mitigation

The above listed arsenic removal technologies in **Section 3.5** have been used to develop household or point-of-use options for arsenic mitigation. Three household options that are most commonly cited in the literature for arsenic mitigation in Bangladesh are the SONO filter, the activated alumina filter, and PUR sachets. These three methods are by no means exhaustive as to the options available, but they are ones that have had studies conducted using them and have been used in low-income rural settings. The methods are further described below.

3.6.1 SONO (Three-Kolshi) Filter

The SONO filter is a widely used mitigation strategy against arsenic contaminated groundwater throughout the world. Its filtered water successfully meets both WHO's and Bangladesh's drinking water standards (Hussam & Munir, 2007). About 5 people can use a single SONO filter system for roughly 5 months, at a rate of 50 L/day of water, and at a cost of US $5-6 per a unit (Munir et al., 2001).

There are several variations of the setup of the SONO filter system, but one, in particular, is most popular in Bangladesh. This system involves 3 fire unglazed clay pitchers (locally known as a Kolshi), one placed on top of another using a steel bamboo frame for support. The top and the middle Kolshi have small (~0.5 cm in diameter) holes at the bottom and are covered by a polyester material. The middle Kolshi is filled with sand, charcoal and briquette pieces, and the top Kolshi is filled with cast iron turnings

(CIM), sand, and briquettes (Munir et al., 2001). The system uses adsorption and coagulation/flocculation technologies in its removal of arsenic.

Munir et al. (2001) showed the performance of the SONO filter by using it to filter 6000 L of groundwater containing an arsenic concentration between 80-1900 μg/L. The resultant filtered water contained about 10 μg/L of arsenic, no As(III) was present, and a significantly reduced level of other metals and minerals (Munir et al., 2001). Hussam & Munir (2007) demonstrated the performance of 6 SONO filters that all reduced filtered water arsenic levels to below 10 μg/L, and significantly reduced iron levels. A study conducted in Srinagar, Bangladesh revealed some of the downfalls associated with the filter, such as the difficulty to replace/maintain the system, possibility of injury when cleaning the filter, and the easy breakability of the system (Hoque et al., 2004).

3.6.2 Activated Alumina Filter (ALCAN Filter)

The ALCAN filter works through the process of adsorption of arsenic by activated alumina (Das & Mostafa, 2015). Activated alumina is produced by thermal dehydration (at 250- 1150˚C) of an aluminium hydroxide such as gibbsite or bayerite (Das & Mostafa, 2015). It is the most commonly used adsorbent for the removal of arsenic from aqueous solutions (Kim et al., 2004).

The filter works by passing raw water through an activated alumina media, which results in arsenic-free treated water (Das & Mostafa, 2015). The activated alumina media is porous and has a high surface area, which can differ vastly in how it is made and can determine how quickly and effectively raw water is filtered for arsenic (Kim et al., 2004). Activated alumina has been studied in the lab and its efficacy as an effective arsenic removal material has been shown (Singh & Pant, 2004; Lin & Wu, 2001; Xu & Okhi, 2002).

The use of this media has been adapted to be used in both a household and community based setting. For the Magc-Alcan household design, two buckets with taps are used to create the filter system, and filled with activated alumina in series using a stand (CAWST, 2009). Raw water is poured through this system and comes out into a clean pot that is now safe to drink. The Magc-Alcan system is 80-85% effective at removing arsenic and can filter up to 100 liters/hour. It costs between US $35-50 and has a lifespan of 6 months to a year (CAWST, 2009).

3.6.3 PUR Sachets

P&G PUR sachets are more widely used throughout the world than SONO filters because they are a general and all-encompassing form of water treatment that disinfects, decreases turbidity, and reduces levels of metals and minerals (CDC, 2014). PUR uses chemicals that coagulate, flocculate, and disinfect unwanted substances within batches of water at the household level (Reisner & Pradeep, 2014). Coagulation and flocculation is the technology used here to remove arsenic from the water. Norton et al. (2009) demonstrated the efficacy of flocculant disinfection in arsenic removal by showing how it decreased arsenic in tube well water by 88% and decreased the concentration of total urinary arsenic by 42% amongst study participants.

Each sachet of P&G PUR is provided to global emergency relief organizations and NGOs for 3.5 US cents (CDC, 2014). The contents of a single sachet are stirred into a 10 L bucket of water for 5 minutes to dissolve. Then the water is left to rest for another 5 minutes and during this time period, arsenic and other contaminants coagulate and form flocs. The water is then transferred to another container while being filtered through a tightly woven cloth to remove the flocs and large particles. Finally, the water is left to rest for another 20 minutes to finish the disinfection process (Arvai & Post, 2012).

These sachets are easy to use, extremely portable, and ideal for emergency response situations (Lantagne & Clasen, 2012). The main purpose of this product is to remove microbial contaminants in raw water. Randomized control trials using PUR sachets that were conducted in several different countries report reductions in diarrheal disease ranging from 19-59% (Reller et al., 2003; Chiller et al., 2006; Luby et al., 2006). However, it has also been noted that individuals may not want to deal with the time and labor required to make use of the PUR sachets appropriately (Arvai & Post, 2012). Studies that explore the performance of PUR sachets as an arsenic mitigation strategy are lacking, but their performance in disinfecting water have been well documented (Doocy & Burnham, 2006; Johnston, 2008).

3.7 Difficulty of Household Arsenic Mitigation Options

A study conducted by Hoque et al. (2004) suggested that household-based arsenic mitigation strategies, such as the ones mentioned above, in **Section 3.8**, were discontinued by individuals after several weeks for various reasons, such as difficulty to operate and manage and/or it being too time-consuming. In fact, individuals explained that walking to a single water source that was safe and reliable, once a day was preferred to maintaining a household based system (Hoque et al., 2004). Another study demonstrated that the most common household arsenic mitigation option used in Bangladesh, the SONO filter, is only effective for short-term arsenic mitigation (Milton et al., 2007). The SONO filter only lasts a year if not properly managed and may even be harmful if the resultant water quality is not properly monitored (Milton et al., 2007).

Hoque et al. (2004) recommended consideration of a cluster-based piped water system for rural communities in arsenic affected areas of the country rather than choosing household options. The strong demand for piped water by rural communities in arsenic affected areas was established in an analysis by Ahmad et al. (2005). There was a clear

preference for piped water over other arsenic mitigation strategies and options (Ahmad et al. 2005). Convenience of a piped system has been shown as the most prominent reason why individuals in rural communities prefer this method of arsenic mitigation over others (Ahmad et al., 2003). Ahmad et al. (2003) also demonstrated, through a multinomial logit model, the willingness of households to pay for piped water. The value of arsenic-free water to a household was found to be 10-13 Bangladeshi Taka (BDT) per month (Ahmad et al., 2003).

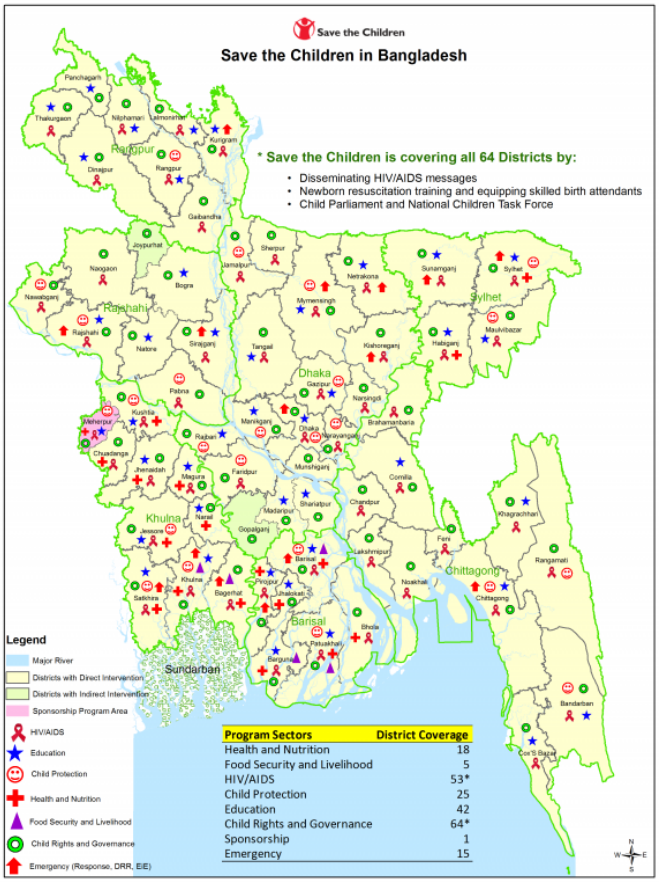
In concern to piped water, the willingness to pay and the ability to pay are two very different matters that need to be further studied. The feasibility of providing piped water to rural communities affected by arsenic in a low-income country, such as Bangladesh, also comes into question. Community-based arsenic mitigation options may be a solution for low-income rural communities. These options, however, are extremely limited in the literature.

4. Save the Children

4.1 Save the Children in Bangladesh

Save the Children (SC), has been working in Bangladesh since 1972. Their work comprises of several areas of focus including child poverty and protection, education, health and nutrition, HIV/AIDS, livelihoods and food security, policy, rights & governance, and humanitarian emergency response. Save the Children's programs and interventions directly reach more than 20 million children and adults in Bangladesh, with a focus towards poor and disadvantaged populations. As of now, they have implemented over 90 projects in all 64 districts of Bangladesh, and encompass over 800 skilled staff that work with over 65 partner organizations (Save the Children, 2016).

Figure 3. Where Save the Children works in Bangladesh (Save the Children, 2016).



The Shishuder Jonno (SJ) Program is Save the Children's Education and Child Development Program in Bangladesh. Part of this program's Health & Nutrition activities involve implementing interventions addressing the problem of arsenic contaminated groundwater in affected rural communities of the country. One of the activities is conducting awareness raising interventions such as the Community Based Health Education (CBHE) within rural communities of Meherpur District. This CBHE began in 2014 and is meant to use children as agents of change within a community by educating them about important health behaviours. The CBHE teaches children about safe drinking water sources and the health hazards associated with drinking arsenic contaminated water. The CBHE dedicates one of its four topics over an 8-month period to bringing awareness of the arsenic issue to these communities and encourages behaviour change to prevent the consumption of arsenic contaminated water. The SJ program is also developing informational posters and distributing them to households in arsenic affected communities of Meherpur. In schools of these communities, the SJ program provides support in installing deep tube wells, testing water sources for arsenic contamination, and marking them as safe or unsafe accordingly. However, this is not done on the community-level.

4.2 Community Water Treatment Plants

Save the Children (SC), has been implementing a Water Treatment Plant (WTP) Intervention within communities of the Meherpur District (highlighted in pink on the map in **Figure 3.**) in Bangladesh since 2009. This region of the country has been shown to have highly contaminated groundwater and many of the communities living in this area have almost no access to alternative safe water sources (Chakraborti et al., 2009). Such communities are only able to use arsenic contaminated tube well water for their drinking and cooking water needs.

Between 2009-2014, SC implemented 23 WTPs (refer to **Table 1.** below) across Meherpur, with the intent to implement more. SC estimates that about 250 households in each community are making use of the WTP intervention; thus, in 2015, approximately 5750 households were drinking water drawn from a WTP.

Table 1. Timeline of WTP implementation by SC.

Year	Month	Number of WTPs Implemented In Meherpur
2009	August	1
2011	July - December	4
2012	September - October	5
2013	June	4
2014	November - December	9
	Total	**23**

Refer to ***Appendix A*** for information on all 23 WTPs.

SC has been collaborating with a third party company, Sidko Limited (Ltd), who provide all the materials and manpower in order to construct a WTP within a community. Sidko is the only authorized company who work on the community level to install arsenic removing water treatment plants in Bangladesh. It takes 1-2 weeks from the initiation of the plant installation process to when the community is able to collect water from the plant.

Figure 4. One of SC's WTPs in Meherpur (Photo credit: Anushree Y. Mahajan).

The WTP removes arsenic, iron, reactive phosphate, and manganese from the groundwater it filters. These substances are only harmful when ingested, hence, the water drawn from the WTP is strictly to be used for drinking and cooking. Water from a tube well or elsewhere is used for washing clothes, bathing, and other water-based activities.

4.3 The Sidko WTP: Design and Arsenic Removal Technology

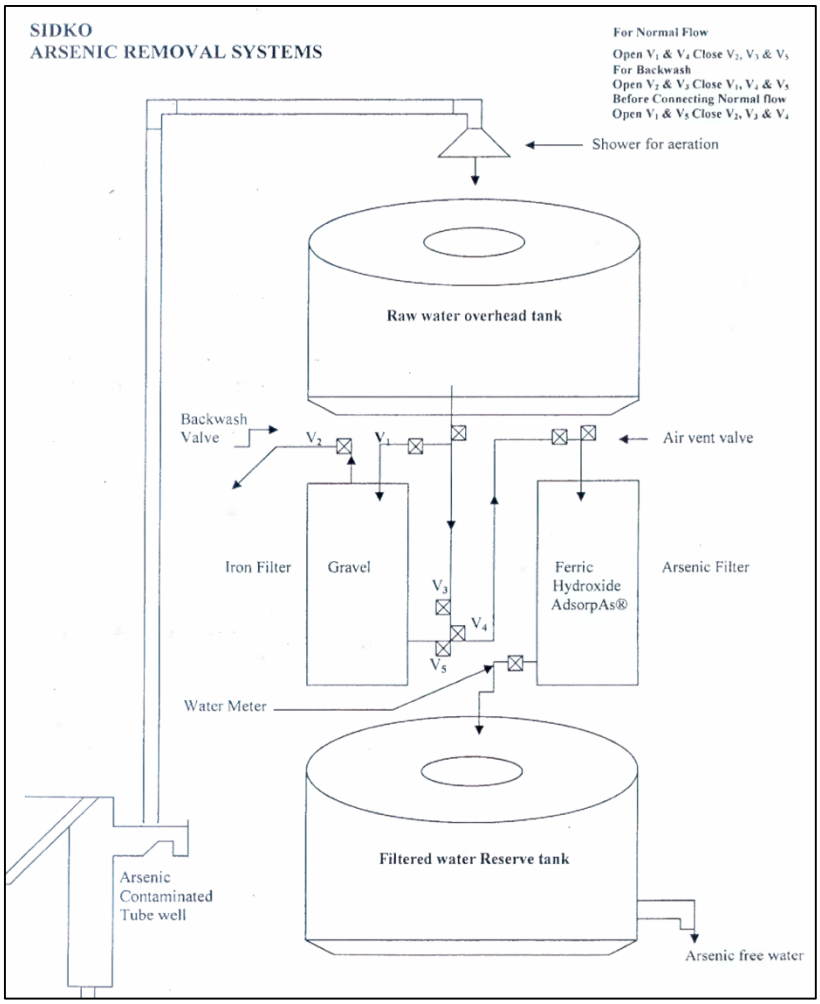
The Sidko WTP is 15 x 10 feet and is surrounded by a protective fence with a door that can be locked (refer to **Figure 4.**). The pipe that draws the water from the ground is

80-120 feet deep (similar to that of a deep tube well) with a diameter of 4 inches. The pump can draw up to 900 liters of water in 8 minutes with a motor that uses electricity. About 950 liters of water can be stored in the WTP tank when full. SC has been working with Sidko for the past 8 years to install these WTPs in communities of Meherpur. Communities have responded positively towards the intervention, have taken ownership of their WTP, and are making use of it.

The initial capital cost to install a WTP within a community is 500,000 BDT, about US $6,450. According to Sidko, if maintained appropriately, the plant can last for 25-30 years, with the arsenic filter being replaced every 4-5 years. SC only implements a WTP in communities who agree to take on the responsibility of maintaining the WTP post installation, which includes paying the monthly electricity bill, for repair costs, and to replace the arsenic filter. Refer below, to **Section 6**, for more information regarding SC's WTP intervention and its implementation in a community.

The arsenic and iron filters are the two main components of the WTP. The iron filter is designed like a sand filter to remove iron from groundwater, whereas the arsenic filter requires a unique media that works through adsorption to remove arsenic from raw water. The pipes of the iron filter need to be cleaned twice a day to prevent blockages. The arsenic filter needs to be replaced every 4-5 years, according to Sidko. One concern with the WTP is the over saturation of the filter media with arsenic that then leaches back into the water if the filter in not replaced in a timely fashion. More research has to be conducted to determine the extent of this concern and the conditions that would make it likely to occur.

Figure 5. Sidko WTP design and the flow of water through the system.



The Sidko WTP uses a granular ferric hydroxide (GFH) substance and adsorbs arsenic similar to the activated alumina in an ALCAN filter. However, the absorptive capacities of GFH estimated from column studies were higher than that of activated alumina reported in the previous studies (Thirunavukkarasu et al., 2003). GFH has been shown to successfully remove arsenic from water in several lab studies (Driehaus & Hildebrandt, 1998; Pal, 2001; Badruzzaman et al., 2004; Sperlich et al., 2005; Guan & Chusuei, 2008). Thirunavukkarasu et al. (2003) demonstrated how water with an arsenic concentration of 100 µg/L could be filtered using a GFH media in a column test of 38-43

hours down to a concentration of <5 μg/L. This study recommended that GFH be used in small water utilities, such as the WTP, to achieve a water arsenic concentration less than 5 μg/L.

It is unclear whether the WTP removes any microbial contaminants because the sand iron filter is thought to have some micro-biological removal capabilities (Elliot et al., 2008; Bellamy et al., 1985). However, because the deep groundwater that it draws water from is generally thought to be free of pathogen contamination (Escamilla et al., 2013). However, there is still concern for microbial contaminants in shallow groundwater in Bangladesh, according to several studies, which is why the WTP should not draw its water from shallow groundwater, unless it incorporates a filter to remove microbial contaminants into its design (Ferguson et al., 2011; Leber et al., 2011; Van Geen et al., 2011). Community members have to walk to the WTP in their community and carry the water they collect back to their homes in water jugs, which is a disadvantage of the system. Since the WTP is not a point-of-use system, there is possibility of contamination of the water in these jugs if not stored properly. This concept has been demonstrated by several studies examining the contamination of stored household water (Jensen et al., 2002; Clasen & Bastable, 2003; Wright et al., 2004).

4.4 Why Did SC Choose the WTP Intervention?

SC considered three main options when looking for solutions for communities with high arsenic prevalence in Meherpur: (1) point-of-use SONO filters, (2) Procter and Gamble (P&G) PUR sachets, and (3) the Sidko WTP. SC discussed options with government officials, the Bangladesh Council for Scientific and Industrial Research (BCSIR), International Centre for Diarrhoeal Disease in Bangladesh (ICDDRB), and the Department of Public Health Engineering (DPHE) in Meherpur before shortlisting these three options. These options were based on what was easily available and found to be

effective in arsenic mitigation. SC communicated with the heads of SONO filter, P&G, and Sidko to obtain relevant information about each option.

SC also conducted a basic cost analysis of the three options and found the Sidko WTPs to cost the least for providing arsenic filtered water on a household level (household = 5-7 people) for a year. This cost analysis was done for a catchment of 200 households for a period of 5 years. The SONO filter cost US $17 to provide filtered water to a household for a year, the PUR sachets cost US $10 if provided at 1 cent per sachet, and the Sidko WTP cost US $8 (refer to **Table 2.** below). SC was in favour of using the PUR sachets in their arsenic mitigation intervention but the supply chain was not in place to ensure long term benefits to communities and the calculated cost was higher than the Sidko WTP.

SC had implemented SONO filters on a small-scale in schools of Meherpur, Sadar, and Mujibnagar. The initial plan was to cover 10 schools before scaling it up but SC found many problems associated with the maintenance of the filters, which led to misuse. In 2009, SC also implemented a Sidko WTP in a community in Alampur, Meherpur where good ownership and acceptability of the intervention was observed. SC decided to extend the WTP intervention and implemented it within a few other communities within Meherpur.

Over the years, SC has worked with the DPHE in extending the WTP intervention and in understanding the needs of the communities where groundwater is highly concentrated with arsenic. SC has been able to oversee the WTPs they have implemented and support households within these communities, but they're concerned about the sustainability of the intervention once they leave the district. They have yet to do an external evaluation of the WTP intervention but are interested in pursuing this as they phase out of Meherpur within the next few years.

Table 2. Save the Children's basic cost analysis of three arsenic mitigation options.

	SONO Filter		PUR Sachets[1]		Sidko WTP	
	BDT	**USD***	**BDT**	**USD**	**BDT**	**USD**
Cost per litre of arsenic-free water	0.17	0.002	0.08	0.001	-	-
Cost per household[2] for over 5 years	-	-	-	-	3,328	40
Total cost of intervention for 3 years	-	-	2,407	29	-	-
Cost per household for 1 year	1,411	**17**	830	**10**	666	**8**
Cost per household for 1 day	-	-	-	-	2	0.022

* Assuming 1 USD = 83 BDT

[1] One PUR sachet = 1 US cent

[2] One household = 5-7 people

4.5 Process Documentation Research

Save the Children continues to expand their work in Bangladesh and are interested in strengthening the monitoring and evaluation (M&E) aspects of their current interventions. They intend to focus on the quality of their programs so as to better understand the effectiveness and impact of their interventions (Save the Children, 2016). They were interested in conducting process documentation research of their WTP intervention, which the author of this thesis was recruited to do during the months of May-July 2015.

The idea behind this research was to obtain a complete picture of how SC implements the WTP intervention, including the hardware involved (refer to **Section 4.3**), the process behind its implementation from start to finish, the financial aspect, community perceptions of the intervention, potential barriers to access and challenges within the community in concern to the WTP, the potential for its future sustainability, and ways the intervention can be improved. This was done with the intent to better understand the WTP intervention and its possibilities for scaling-up. **Section 5** and

Section 6 below describe how this process documentation research was conducted and its findings, respectively.

5. Materials and Methods

5.1 Study Design

To understand community perceptions and the implementation process of the WTP intervention in Meherpur, members of SC, Sidko, and the communities (where the WTP had been implemented) were interviewed. The tools developed, were largely qualitative in nature and included interview guides, focus group discussion questionnaires, and structured observation forms. A qualitative approach to this study was chosen to provide context to the WTP intervention, offering a more complete picture of what happened in the project and why.

The qualitative method was appropriate for this study because detailed information about a person's thoughts and behaviors was needed to answer the questions of this research (Boyce & Neale, 2006). Open-ended questions also needed to be asked about the WTP intervention to obtain as much information as possible. Hence, in-depth interviews were used because they provide much more detailed information than what is available through other data collection methods, such as surveys (Boyce & Neale, 2006).

Focus group discussions (FGDs) with several beneficiaries of the WTP intervention were used to obtain community opinions and perceptions of the intervention. FGDs with beneficiaries were conducted instead of the use of surveys because 1) data was collected from a largely uneducated population and 2) perceptions are best understood using this method (Kitzinger, 1995). The beneficiaries interviewed, were mostly women in the community and were more comfortable talking in a group setting than individually, hence the FGD.

A quantitative tool, structured observation forms (SOF), was used to evaluate the condition of the respective WTP visited. Collecting this data would show whether the plant

is in decent condition, whether it looks like it is being maintained, whether it is in use, and whether people who are using it do it with ease and are using it appropriately.

5.2 Tool Development

The development of the tools was completed by consulting with SC program managers for the purposes of gaining greater insight into the WTP intervention. Based on the goals and interests of SC, the following qualitative tools, in **Table 3.**, were developed:

Table 3. Tools developed and their importance to the research.

Tool	Who is being interviewed?	Why are they being interviewed?	What topics were discussed during interview?
SC staff interview guide	The SC Senior Officer chosen has been highly involved in SC's WTP intervention since the formative research stage.	To understand the "how" of the WTP intervention process, which includes all the stages of the implementation process and SC's involvement throughout.	-Pre-installation of WTP -Installation of WTP -Post-installation of WTP -SC's current involvement in intervention -Sustainability of intervention
Post field visit interview guide for SC staff		To answer new questions that were not asked prior to the first field visit.	-Community engagement and capacity building -WTP locations -Future plans for WTP intervention
Sidko Manager interview guide	The Sidko Manager who has been thoroughly involved on the Sidko side of SC's WTP intervention since the first WTP was installed in 2009.	To understand Sidko's perspective of the WTP intervention and the role they play during and after the installation process.	-Pre-installation of WTP -Installation of WTP -Post-installation of WTP -Cost and design of WTP -Sustainability of intervention
Plant Management Committee (PMC) member interview guide	The Plant Management Committee (PMC) is a group of community members whose purpose is to ensure the maintenance of the WTP and to deal with any issues related to the WTP.	To understand the communities' perspective of the WTP intervention, how the WTP is maintained post-installation, thoughts on sustainability of the WTP in their community, problems that have occurred concerning the plant and how the community has dealt with these problems.	-Pre-installation of WTP -Installation of WTP -Maintenance of WTP -Sustainability of WTP -Community perceptions -Recommendations to improve intervention
Community Core Group (CCG) interview guide	The Community Core Group (CCG) is a leadership group that works to address community problems in relation to the well-being of children in the community, such as child marriage and school dropouts. If a WTP is implemented in a particular community, then the respective CCG is also responsible for issues concerning the WTP.		-Maintenance of WTP -Sustainability of WTP -Community perceptions -Recommendations to improve intervention
PMC and CCG combined interview guide	PMC members can be part of the CCG and vise versa. In some communities, interviews were conducted with a community member who was		-Pre-installation of WTP -Installation of WTP -Maintenance of WTP

	both part of the PMC and CCG, hence the interview guide was combined to form one interview guide.		-Sustainability of WTP -Community perceptions -Recommendations to improve intervention
FGD with women	The women of these communities are the main users of the WTP because they walk back and forth to collect water for their respective households. They provide the most direct perspective of the users of the WTP.	To understand whether the community feels benefitted by the WTP and whether it is meeting their drinking water needs. To determine whether there are any differences between their previous drinking water source and the WTP water.	-Installation of WTP -Problems with the plant -Barriers to access -Sustainability of WTP -Community perceptions -Recommendations to improve intervention
WTP structured observations form	N/A	N/A	-Cleanliness of WTP -Functional or not -Accessibility of WTP

Note: After SC installs a WTP within a community, they request the community to form a PMC and elect community members for positions with associated responsibilities. Both the PMC and CCG are formed within a community upon SC's request.

Every tool, except for the structured observations form, was translated into Bengali. English versions (with Bengali translations) of each of the study tools are in ***Appendices B-K***. The number of questions in each of the interview guides and FGDs, except the post field visit interview guide for SC staff, ranged from 31-44 and were open-ended. The post field visit interview guide for the SC staff was also open-ended and was 11 questions long. All interviews and FGDs were designed to take approximately 30-60 minutes to administer.

The PMC and CCG interview guides were very similar in nature and essentially contained the same questions, except for a select few that were only pertinent to either the PMC or CCG member's responsibilities concerning the WTP. Several PMC/CCG interview sessions contained more than two respondents answering the interview questions of a single interview guide. For all these reasons, much of the data collected for the PMC and CCG members was combined for the results of this study (**Section 6**).

5.3 Consent and IRB

Verbal consent was received from every individual before the interview or FGD began. Each individual consented to being interviewed and to having the interview/FGD recorded on a tablet. This research was part of Save the Children's IRB review and verbal consent was sufficient according to that review. The results of this research are anonymized and recordings of interviews/FGDs were destroyed after data was translated and transcribed into English.

Emory IRB was also consulted for this research and the determination of "No IRB Review Required" was received (refer to document in ***Appendix L***). This research did not meet the definition of "research" on human subjects as set forth by Emory policies and procedures because it was a public health practice project for Save the Children.

To use the data collected in this research for this thesis, Emory IRB was further consulted and a determination of "No IRB Review Required" was again received (refer to document in ***Appendix M***). It was determined that this study is a program evaluation of a project and did not meet the definitions of "research" with human subjects or "clinical investigation" as set forth by Emory policies and procedures.

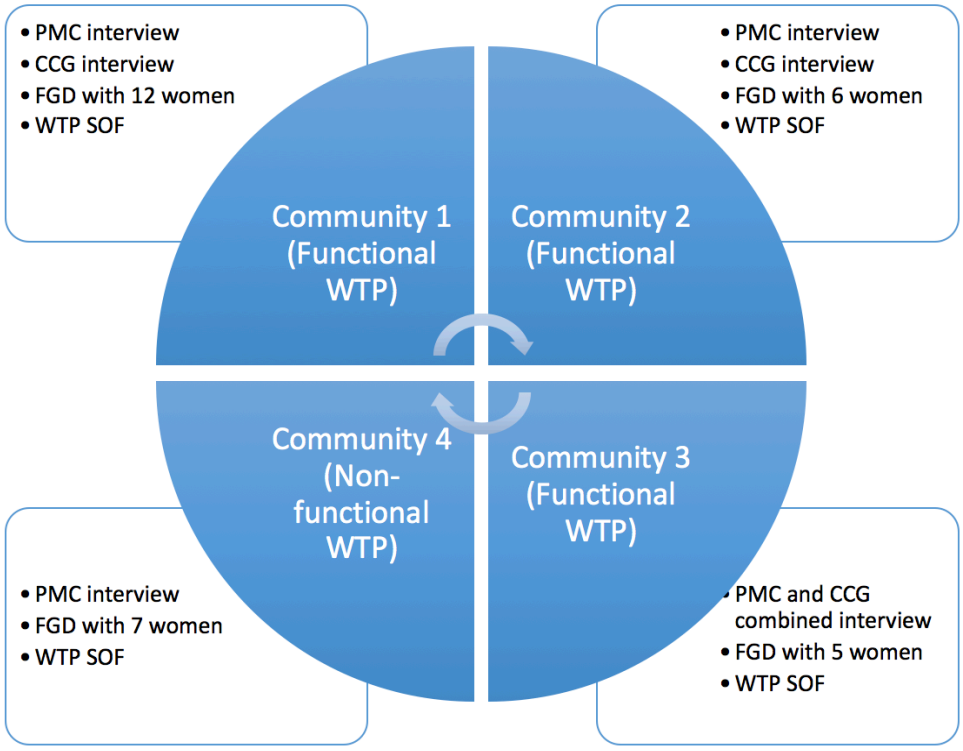
5.4 Data Collection

All tools, except the WTP SOF, were administered in Bengali by a research assistant, that SC hired externally, who was skilled and experienced at conducting interviews and FGDs in this setting. The WTP SOFs were filled out in every community visited. Every interview and FGD session was recorded on an electronic tablet, to be transcribed at a later time.

Tools were administered over a 5-week period and all data was collected between June - July 2015. The following shows the order in which all the data was collected:

1. SC staff interview data
2. Community 1 (Pilot Community) data
3. Post field visit SC staff interview data
4. Community 2 data
5. Community 3 data
6. Community 4 data
7. Sidko Manager interview data

Figure 6. Data collected in each community.



5.5 Communities Visited

Four communities out of 23 with WTPs in Meherpur, were visited to collect the data. The chosen communities were pre-picked by SC and not randomly selected. Out of the four communities visited, three had a functional WTP and one had a non-functional WTP. A functional WTP is one that is currently in use and providing arsenic-free water. A non-functional WTP is one that is either damaged/clogged, needs a filter replacement, or is not providing water the way it should be.

The first community visited where the tools were administered, was the pilot community. This community's data was used to improve the tools made, either by adding new questions to, or by removing questions from, the existing tools. A new set of post field questions for the SC staff member was also made post-visit to the pilot community/Community 1.

5.6 Data Handling and Analysis

Daily debriefing of the interviews and FGDs took place to understand the key findings from the topics of interest. The recorded interviews and FGDs were transcribed and translated from Bengali into English by the research assistant who administered the tools. This translated data was then classified by question and the answers to each question were summarized. These summarized points were then placed under subheadings of topics of interest (e.g. cost, maintenance, installation, community members' perceptions).

The information put together under each topic was used to answer questions about the WTP intervention and to inform SC's interests and goals for this research. A program that assists with qualitative data analysis was not required to analyze the data collected in this study. An RSPH professor experienced in qualitative data was consulted on this matter and it was determined that manual analysis was sufficient for the data collected.

6. Results

Qualitative data was collected from 1 SC Senior Officer, 9 members of the communities who were either part of the PMC or the CCG, 1 Sidko Manager, and 30 women who participated in the FGD sessions. Quantitative data was collected in the form of 4 WTP structured observation forms. These data informed the following results.

6.1 Implementation of the WTP Intervention by SC

There are three phases to implementing the WTP intervention into a community: the pre-installation phase, the installation phase, and the post-installation phase.

6.1.1 Pre-installation of the WTP

A community is considered for the WTP intervention by SC, if there are at least 150-200 households within the community that are being exposed to arsenic through the consumption of arsenic contaminated water. This is to ensure that they are meeting the maximum number of beneficiaries for the large investment of the plant. Communities 1, 2, and 4 said that about 70-120 households are making use of their respective WTP. Community 3 said around 300 households are making use of their WTP.

A lot of groundwork must be conducted by SC to identify the need for installing a plant. SC needs to contact the Department of Public Health Engineering (DPHE) in Meherpur to receive information about the extent of arsenic contaminated groundwater within the community area, then a visit is made to the community to observe how many tube wells in the community are marked red (highly contaminated) or green (safe to drink).

The groundwork takes 1-2 months and involves doing surveys within the communities, checking tube wells, and investigating the number of patients suffering from arsenic-poisoning related health problems in the community. SC meets with at least 100-150 members of the community to assess and understand the community's needs for an intervention such as the WTP. SC establishes whether the community will take ownership of the WTP and whether they will be capable of paying for the monthly electricity bill, any future repairs, and replacement of the filter. SC field officers play an important role in the pre-installation phase, by mobilizing the community and building capacity for the WTP.

Once SC determines that there is capacity for the WTP, the PMC committee is formed within the community and they become responsible for all matters related to the plant. SC explains to the community that this committee must be formed in order to ensure the sustainability of the plant. The community decides amongst themselves who will be in this committee and what they will each be responsible for. All the work done by the PMC is voluntary, thus, the members themselves must be motivated to maintain the plant. Some of the responsibilities of the PMC include paying the electricity bill, collecting money from households every month for the plant, and cleaning the iron filter pipes.

In order to initiate the plant installation process, a site needs to be selected for the plant. Someone in the community has to donate some land and this land must gain access to an electricity line, as this is a vital component to the functionality of the plant. Other considerations for plant location include, being:

- In a central location within the community for easy access.
- Free of any walls/boundaries that may occur if located in a community member's residential area.
- An acceptable distance away from cowsheds and toilets to prevent water source contamination.

Once the site is finalized, the donor is officially recorded as having donated the land with the signing of a legal document, and they are usually made a member of the PMC. The PMC and CCG community members interviewed, made it evident that the land donor usually plays a very prominent role in ensuring the maintenance of the plant post installation. In the final community visited (the non-functional plant), there were problems concerning coming to an agreement between the potential landowner and SC in terms of land donation for the plant. The Sidko official said that this aspect of the installation process could pose as a potential challenge for the installation of future plants.

The idea of the CCG committee was only implemented in communities in 2012; hence, some communities didn't have a CCG committee during the installation of their plant. Now, however, all communities with a WTP maintain a PMC and CCG committee who are both involved with the WTPs operations.

6.1.2 Installation of the WTP

Once the location for the plant is made official, Sidko can begin constructing the plant. The Sidko Manager said that 4 WTPs can be installed simultaneously within 15 days with 4-5 Sidko employees. PMC/CCG members and women of all four communities interviewed recalled their plants being installed within 7-10 days. SC follows up daily with the community as well as with Sidko during the installation process through the SC engineer, field officers, and other SC officials.

> *"If everything is ok (the location, land donor etc.) we hire a local mechanic to bore the tube well. We buy the necessary materials for the tube well. I check the quality of the materials. We purchase the stainless steel tank for the water from Taiwan. The mason builds the foundation of the plant area. The SIDKO workers install the plant and I observe the process during the installation."* - Sidko Manager

The CCG and PMC members, as well as other individuals of the community are very much involved during the installation process. They support the operation by:

- Bringing water to the site to aid in the digging of the pit where the pipe will go to draw the groundwater for the plant.
- Looking after all the materials and equipment that Sidko bring.
- Guarding the cement foundation of the plant overnight to prevent animals from walking on it.
- Providing food to the plant construction workers.

> *"First the shallow labour came, and they bore the pipe. Then the masons came. They constructed the plant area with bricks, sand, and cement. Then the main plant (tank, filter, etc.) came and Sidko workers constructed the plant. When everything was done, the last day they came and gave the electricity connection. We prayed (ritual) for the plant and had some sweets for celebration and launched the plant. All the community people were there to celebrate. The village elder first drunk the water and we started to collect water from the plant."* - Woman in Community 1

One to two weeks are needed from the initiation of the installation process by Sidko to when the community is able to collect water from the WTP. Once the plant has been installed, Sidko explains to the community how to appropriately use the plant and specifically tells them to prevent water wastage. Sidko also trains members of the PMC on how to clean the pipes of the iron filter, something that must be done 2-3 times a day in order to prevent pipe blockage.

6.1.3 Post-installation and Maintenance of WTP

Even though there are several members (up to 11) of the PMC/CCG committees within one community, it was discovered that only a select 1 or 2 individuals maintain the plant. These few individuals have taken on the responsibility of looking after the plant and making sure of its constant functionality.

SC field officers play a very important role in terms of constantly updating SC about the condition of the plant and how the community is working to deal with any problems. These field officers are assigned a community in which they work in. They help maintain a good relationship between SC and the community and are able to check up on SC's current activities and interventions within the communities.

When it comes to minor repairing of the WTP (e.g. fixing a broken tap), the communities are able to successfully conduct repairs with materials that are available at the local market. PMC/CCG members of all four communities interviewed said they have a designated repairperson who can fix basic problems the plant faces. Community 3 said that their "repairman" would be willing to help fix the WTPs of other communities.

Sidko gives a one-year warranty for all of its plants, but continues to support the community past this one year, free of charge. The plant itself has a signboard with the SC logo as well as Sidko contact information, and the date of installation of the plant. Any member of the community can contact Sidko to voice their concerns related to the plant. Oftentimes, a community PMC is able to solve plant problems over the phone with a Sidko official.

Many plants used to be built by a pond within the community. This was so that the run-off of the iron filter would be dumped into the pond during pipe cleaning. Sidko realized that dumping the iron filter waste back into the community environment is objectionable so they redesigned their plant to include a pit constructed with metal rings to collect the iron filter backwash.

The concentration of arsenic in the water, and how much water the plant is filtering daily determines when the arsenic filter needs to be changed. For a community of about 200 households, and groundwater containing 100 μg/L of arsenic, a WTP can filter up to 1.5 million liters of water. It would take about 5 years before this filter would need to be

changed. Sidko estimates that about 6000 liters of water are taken from a single plant everyday.

The arsenic filter takes one day to replace. Sidko comes to clean out the filter of the used granular ferric hydroxide media and they add 30 kg of new media to the filter. Sidko takes the used up media with them to give to the Bangladesh Council of Scientific and Industrial Research (BCSIR). Bangladeshi government regulations prohibit the dumping of arsenic waste back into the environment and BCSIR keeps records of how much waste has been collected and how much granular ferric hydroxide has been distributed.

Sidko tests the water in each plant at least once in a year for arsenic, iron, reactive phosphate, and pH, to make sure that the plant is functioning appropriately. They do this with a test kit obtained from UNICEF. Other than this, there is no other testing of the WTP water.

6.2 SC's Current Involvement in the WTP Intervention

SC has several interventions and activities aside from the WTP within communities of Meherpur, hence, the designated field officer of the community, pays a visit at least 3-4 times a week to make sure things are going well. During a visit to the community, the field officer follows-up with the PMC chairperson about the plant to make sure all is in order. The plant itself is relatively small in size and easily accessible. Anyone can observe whether it is in order with very brief inspection. SC is aware of the current state of each of the WTPs in the intervention. They maintain a record of the functionality of each plant and update it every 3 months (refer to **Appendix 3**).

6.3 Structured Observations of WTPs Visited

Table 4. Condition of each plant visited.

	WTP functional?	WTP accessible?	WTP clean?	WTP used by: (during 30 minute observation period)	Problem of water wastage?
Community 1	Yes	Yes	Yes	6 women, 3 girls	No
Community 2	Yes	Yes	Yes	8 women, 1 girl	No
Community 3	Yes	Yes	Yes	13 women, 1 child	Yes - leaky faucet
Community 4	No - filter replacement needed	Yes	Yes	No one	No

6.4 Financial Considerations of the WTP Intervention

SC explains to the community that once the plant has been installed, the community must resume all financial responsibilities of the plant. One of the groundwork criteria for installing a plant within a community is that the community must be willing and able to resume this financial responsibility. All households are informed of this and they must agree to these terms before the plant can be installed.

Table 5. Cost breakdown of WTP intervention in a community.

	Bangladeshi Taka (BDT)	US Dollars ($)*
WTP Installation by Sidko	500,000	6,450
Arsenic Filter Replacement	30,000	390
Electricity Cost	100-300/month	2-4/month
Motor Replacement	900	12
Households Each Pay	20-40/month	<1/month
PMC Collects on Average	1000-1500/month	13-20/month

* Assuming 1 USD = 78 BDT

The money that households pay per month for the WTP, goes toward the payment of electricity, repairs, and is saved up by the PMC for the future filter replacement. The PMC cashier collects this money by visiting each household every month during a predetermined few days of the month. Sometimes the household cannot pay the BDT 20 that month and will pay double the next month. Sometimes households can only pay BDT 10. The households give what they can when they can, but it is the PMC cashiers responsibility to encourage continuous payment.

The PMC/CCG members in Communitys 1 and 4 said that for the first few months after the plant is installed, about 80-120 households make monthly payments. This number usually dwindles down to about 50-80 households making monthly payments. Not everyone who uses the water from the plant makes payments towards it.

The PMC uses the money collected from households to pay the monthly electricity bill and they save the excess money. If the community is able to save at least BDT 700 (US $9) every month, within 4 years, they will have enough money to replace their arsenic filter. SC recommends every community have a bank account where they can keep this saved money. Two or three PMC members' names in one community must be on the account so any withdrawals from the account will require all members' signatures. Every community visited had upheld this request by SC.

The PMC of community 4 (with the non-functional plant) was able to mobilize funds quickly and households even made contributions of up to BDT 500 (US $7). They needed to replace their arsenic filter and had not saved enough to do so. As a result, they had been drinking water that was potentially contaminated with arsenic for four months prior to the interview. They said that households in the community had not been contributing regularly to WTP funds because of political conflicts within the community. Hence, they had not been able to save up enough money for the filter replacement.

6.5 Community Perceptions of the WTP

The PMC/CCG members and women of every community that was interviewed expressed being greatly benefitted by the WTP. They were satisfied with the water quality of the WTP and it was meeting their drinking/cooking water needs. They felt safe now from diseases such as arsenicosis and have even experienced a decrease in gastrointestinal problems that they experienced prior to drinking the plant's water.

> *"Of course the community is benefiting from the plant. We are getting pure and safe water from the plant. The water doesn't contain arsenic. So our children can drink the water without any hesitation."* - CCG member in Community 3

> *"We don't need to drink poison (arsenic) water anymore. People believe that the plant water is safe and is 1000 times better than the tube well water. They drink the plant's water more than they drank the tube well water. The plant's water is tasty and we drink it with contentment and satisfaction."* - CCG member in Community 1

> *"This water is very pure. We don't feel unsafe. The water is better than the mineral water we buy (in bottle). The rice becomes nice when cooked with the plant water."* - Woman in Community 1

One complaint that was mentioned by Community 1 and 2 was that the water in the tank becomes very hot during the summer and very cold during the winter. Community 2 said that they would pay for a way to make the hot water cold during the hot days if that was a possibility.

6.6 Potential Barriers to Using the WTP

PMC/CCG members and women of all four communities interviewed emphasized the importance of preventing water wastage and not using the water for anything other than drinking and cooking.

> *"No, there is no limit. But the community people don't waste water or let their children wastewater. There is no restriction for collecting drinking water and cooking water. But you can't wash yourself or clothes by this water."* - CCG member in Community 3, in response to whether there are any limits on how much water can be collected

Communities 2 mentioned queuing at the plant during certain times, but never for too long to become an issue. Problems associated with electricity for the WTP posed the greatest barrier to usage of the plant because without electricity, the pump cannot pump the water into the plant. When there are power cuts, the WTP cannot be used for up to two days.

Every community we visited had established their own, most suitable way of when and how to keep the plant accessible. Communities 2 and 4 decided that they would always keep the plant open and never lock the gate. Community 1 kept their plant open at all times until they had a vandalism incident where a few taps were stolen. After that, they decided to only unlock the gate for a few hours each day. The women of the community decided these hours. If any woman cannot collect water during this designated time, they can get the key to the plant anytime they want to collect water and then lock it up again.

Community 3 was the most innovative because they had their "repairman" reconstruct 3 of the 6 taps to be outside of the plant cage. That way the plant could always be locked and community members could collect water at any time they pleased. Another reason for doing this was to prevent the inside of the plant from getting muddy with all of the women walking into and out of the plant.

6.7 Challenges with the WTP Intervention

Communities have faced problems with the WTP in relation to the electricity line. All four communities are using a sub line for their WTP because the government has not approved a direct line as of yet. The person who donates the land generally gives this sub

line. The issues arise when it comes time to pay the bill for this sub line. It is difficult calculating the electricity bill for the sub line based off of the meter reading on a direct line.

Another issue concerning electricity is that when there are power cuts the majority of the communities with the WTP intervention cannot draw water from the plant because the pump motor does not work. Only two communities out of twenty-three have a manual hand pump attached to their WTP, which can be used to draw the groundwater up into the WTP when there is no electricity.

One mechanical issue that has occurred in Community 3 is repairing/replacement of the automatic motor that is used to pump the groundwater into the tank. In Community 4, the auto-switching mechanism of the motor was damaged, at one point, and the plant would not automatically be pumped with water when empty. Though this didn't prevent usage of the plant, it was inconvenient for the community.

Community 2 mentioned how their iron filter was blocked because they had not cleaned it properly. They required Sidko's assistance on this, who then demonstrated the correct way to clean the filter. Community 4 (non-functional WTP) explained that when the person who usually cleaned the iron filter went to Dhaka, the pipe blocked up. No other community member who was present at that time knew how to appropriately clean the filter so there were a few days when the plant was not functional.

6.8 Sustainability of the WTP Intervention

As stated previously, Sidko says the plant can last for 25-30 years. Many of the PMC/CCG members interviewed regarded the WTP within their community as they do one of their own children. The WTP is one of the community's greatest assets and it is very precious to them because of the clean water it provides.

> *"Inshallah (if God wills), we will try our level best to keep this (plant) functional till death. If any major repair is needed, it may take time but we will definitely repair this. We won't let it be 'out of order'."* - CCG member in Community 1

All the communities, including the community with the non-functional plant, believed they will be able to sustain the plant once SC leaves. The communities are saving money for the plant every month and are certain they will be able to tackle any problems that the plant may incur.

> *"SC has a plan. They don't work in a particular area for long. That doesn't mean that the plant they have given will not be functional when they leave. This is our community's property. We will not let it go out of order…Now that the plant is installed we should take care of it. If the plant is broken, we will have to collect water from the tube well once again. Again we will have arsenic in our drinking water, again we will have iron. There will be no safe water. If we can take good care of the plant, we will get arsenic and iron free water throughout our life."* - PMC member in Community 2

The community PMC/CCG members of Community 4, the non-functional plant, know what they should do differently in order to prevent their current situation from happening again. They did not save enough money to replace the plant filter when time came; however, they were able to mobilize BDT 18,000 (US $232) in 3 months. They have applied for the rest of the money that is required for a filter replacement, from SC. They explained that they will save enough money in the future to maintain the plant, and will be more disciplined about money collection.

> *"We should try this otherwise there will be no water. This is ours, so we need to take care of this….we should ensure the longevity of this plant. Everyone of this community should cooperate for the betterment of the plant."* - Woman in Community 3

The communities are well aware of the consequences of not sustaining the plant after SC leaves and are taking the initiative to make sure that their WTP sustains.

> *"We, the beneficiaries of the plant, should meet together sometimes. Should tell the community households to give money properly. If every family gives money on a regular basis we will have sufficient money in our bank. We will be able to take care of our plant if SC leaves. If we need to pay more to keep the plant functional we will pay that. We will work together to keep it functional. We have to keep the water tank (plant) functional. Otherwise we will again need to drink arsenic water."* - PMC member in Community 4

Table 6. Communities that have had their filter media replaced and how much they have paid towards it.

WTP Location	Community Contribution (BDT)	Save the Children Contribution (BDT)	Total Cost (BDT)	Completed/In Process
Rajnagar Mollah para WTP, Rajnagar, Pirojpur, Meherpur sadar	18,388	17,000	35,388	Completed
Rajnagar Shekhpara WTP, Rajnagar, Pirojpur, Meherpur sadar	6,000	29,388	35,388	Completed
Taranagar school para WTP, Taranagar, Bagoan, Mujibnagar	5,000	30,388	35,388	In Process
Voladanga moddhopara WTP, Voladanga, Solotaka, Gangni	5,000	30,388	35,388	In Process

SC has plans to connect communities with the appropriate government officials so that they will know who they can contact to seek information and assistance. Government officials may even help these communities test the water regularly. SC has also been working with a local partner organization that they are building capacity within to run some of their programs in Meherpur. They are confident that this partner organization will help maintain the WTP intervention once SC leaves.

7. Discussion

7.1 Overview of Results

The results presented above inform "who" and "what" is involved in SC's WTP intervention and the process of "how" an NGO could go about implementing WTPs on a community level in Bangladesh. For an NGO looking to adopt this intervention as an arsenic mitigation strategy for communities in Bangladesh, the process of implementation is extensive and requires many resources, such as large initial capital investment, and manpower for 1) the formative research stage and 2) capacity building within the respective communities.

The results of this study also present various community perceptions of the WTP intervention implemented by SC and address 1) whether it is meeting the communities drinking/cooking water needs, 2) the challenges and potential barriers to access of the WTP, and 3) whether the communities think they will be able to sustain the intervention after SC leaves Meherpur District, Bangladesh.

Four out of the twenty-three communities with WTPs were visited; which is approximately 17%. Even though this seems like a very small sample size, a saturation of ideas was evident in the data collected from the interviews and FGDs, which validates the research to some extent. The PMC and CCG members of all four communities generally gave similar responses to the questions asked, as did the women in the communities.

7.2 Early Stages of the WTP Intervention

Though the results of this study barely touched upon how SC conducted their formative research and program development for the WTP intervention, its importance in setting up the foundation, is evident. SC has ensured sufficient community capacity

strengthening before they installed the WTP and this was able to promote ownership and potential sustainability, which is key to the success of the WTP intervention. This may make it difficult for smaller entities to implement the WTP intervention because of a lack of resources, but it is certainly something that bigger NGOs, like Save the Children, can take on if they are looking for arsenic mitigation strategies for rural communities.

7.3 Gender Roles and Community Perceptions of the WTP

Community women were interviewed for assessing community perceptions of the WTP because they are the ones who collect the water for the household and use it to cook with. During the structured observations period in every community visited, men were not observed collecting water. As is the case in many cultures all over the world, in Bengali culture women are responsible for water collection, as it's part of conducting household chores and maintaining the household (Sultana, 2007). Water is vital to fulfilling this role that women play but there are politics surrounding water especially in these rural settings in terms of access and control of arsenic-free water. Though the results of this study suggest that there was complete access to the WTP to all community members in all the communities visited, perhaps, in the future when a community is left completely on their own where SC is not checking in with them regularly, these kinds of politics may arise.

The PMC and CCG were overwhelmingly comprised of men, except for in Community 3. This is also seen in many other cultures of the world where men predominantly hold leadership positions, and does not come as a surprise. However, Community 3 was peculiar, in that, women were part of the PMC and CCG, which made them a more progressive community. Later, it was identified that the PMC and CCG women members in Community 3 were married to men who were also part of the PMC/CCG in that community. This explains how these women acquired their positions.

Encouraging women to take up leadership positions in concern to the WTP intervention could be a way of empowering women in these communities.

Community members' responses made it clear that they felt benefitted by the WTP and thought that it was meeting their consumption needs. An interesting response from a woman in Community 1 was that she had experienced fewer gastrointestinal problems since drinking the WTP water. The groundwater that is drawn up by tube wells is rich in many minerals contaminants besides arsenic (e.g. iron, manganese, reactive phosphate etc.) that makes the water very hard and may irritate the gastrointestinal tract (Sengupta, 2013). However, it is more likely that the shallow tube well water that this woman was drinking from, prior to the WTP water, may have been contaminated by pathogens, as shallow aquifers often can be (Escamilla et al., 2013). Since the WTP collects water from deep aquifers, microbial contamination is less likely (Howard et al., 2006). However, once this water is collected, contamination while it is stored in the home is also of concern (Ferguson et al., 2011; Leber et al., 2011; Van Geen et al., 2011).

7.4 Electricity Issues with the WTP

The WTP cannot draw up groundwater without electricity. The unreliability of the electricity line needed for the WTP presents a great problem for this intervention because power cuts are very common, especially in this setting. Communities also mentioned having problems with the WTP motor breaking down and needing replacement. Two out of the twenty-three of SC's WTPs have an in-built hand pump attached that can be used to manually draw up water into the tank. However, this is not a sustainable solution to the electricity and motor problems because these aquifers are too deep for hand pump tube wells and the groundwater table is only moving lower and lower as the water is depleted.

A solution to this may be to enhance the design of the WTP to incorporate solar power panels. This was something that was brought up during our interview with the Sidko

Manager, however he said that solar power panels are too expensive. NGO's, such as SC, working with Sidko and implementing WTPs in rural communities may consider investing in the improvement of the design of the WTP to increase the sustainability prospects of their intervention. They can also request Sidko to incorporate solar power panels in their WTP design, if found to be feasible, before they agree to a new contract with Sidko to install more WTPs for them.

7.5 Other Challenges with the WTP

According to the community members, queuing is not a concern when it comes to using the WTP. During the observation period, no queueing was seen and women were able to collect water leisurely. None of the women spoken to brought up the matter of walking distance to the WTP. Though this question was not specifically asked during the FGD sessions, it is an interesting point that should have been discussed. SC does try to ensure the WTP is placed in a central location to a majority of households in the community, so perhaps all the women spoken to lived only a short distance from the WTP. Another theory may be that the tube well where each woman used to collect water from was about the same distance away as the WTP is; or perhaps, the water from the WTP makes it worth the walk if it was a considerably long distance away.

The blocking up of the iron filter has prevented use of the WTP in communities on occasion, which has mainly been caused by the absence of the PMC member who usually cleans the filters. Only one or two of the PMC/CCG members in a community clean the filter daily and when they are not available or are unable to do it, the filter gets blocked and the WTP cannot be used. This points to the need for more community members to be trained in how to clean the filter.

Vandalism was only mentioned in Community 1 where the taps of the WTP were stolen. Locking the gate of the WTP when it wasn't in use was seen as the best solution by

the community. The strong sense of community ownership of the WTP might explain the lack of vandalism incidence seen in the other communities.

The only restriction, per se, to using the WTP is that water cannot be wasted and is to only be used for drinking and cooking. These ideas seem to be instilled in the community members as it was echoed by everyone interviewed.

7.6 Willingness to Pay

Two communities complained about the temperature of the water in the tank during summer and winter months of the year. One of those communities even said they would pay to be able to regulate the water temperature. This was interesting because it alludes to the willingness to pay for convenience and services. Essentially, community members collectively decided that they are willing to pay for the upkeep of the WTP once it is implemented in their community. This demonstrates the communities' willingness to pay for arsenic-free water.

A study by Ahmad et al. (2003) showed participants', in rural communities, willingness to pay for arsenic-free water. The amount that was willing to be paid was about 10-13 BDT a month per household, which is about half of how much is requested from each household where SC's WTP intervention is implemented (refer to **Table 5.**). However, there is low compliance with these payments in these communities, especially in those that have not been able to save up enough money over the years to pay for the replacement of their filter when time came (refer to **Table 6.**).

This shows how the willingness to pay and the ability to pay are two very different things. Communitys 1 and 4 said there were many households that contributed to the monthly payments of the WTP in the first few months after it was installed, but this number halved after those first few months. Whether they should be any repercussions for not contributing towards the WTP remains to be debated, however, it is very important to

find ways of encouraging compliance of payments amongst community members. Perhaps more capacity needs to be built within these communities to improve on this aspect.

7.7 Sustainability

Every community member interviewed, emphasized the importance of their WTP and how they are sure they can sustain it in the future, even once SC leaves Meherpur. All three communities visited, with functional WTPs, had not yet reached the stage of filter replacement for their WTP. However, all communities visited have overcome some challenges in concern to their WTP without any help, whether it be small repairs or vandalism. This demonstrates their desire to keep the WTP up and running. Daily and regular maintenance is also evident with all three of the functional WTPs visited, which were clean and in use.

Community 4 has reached the stage of needing a filter replacement, and has been unable to replace it in time because of a lack of funds. At the time this data was collected, Community 4 had not had their filter replaced for 4 months. Nobody was seen collecting water from the WTP when we visited the community, but the taps were still working and theoretically could still have been used. As mentioned previously, there is a concern for having the saturated filter media in the plant, release its arsenic back into the water, concentrating it with arsenic. Either way, without the WTP, community members are forced to retort back to their old, most likely arsenic contaminated, water sources.

During the time of these interviews, two of SCs twenty-three WTPs were non-functional because of the need for a filter replacement. All other twenty-one WTPs were working sufficiently. The majority of communities seen in **Table 6.** have only been able to contribute a small fraction towards their WTP filter replacement. When communities need a new filter and haven't saved up enough money to get one, they have to apply for the money from SC. This process takes a long time and has led to WTPs being non-functional

for several months after their need for a filter replacement has been identified. Though SC is helping out communities, such as Community 4, with their filter replacement, this was not the intent of their intervention. Again, if communities aren't using the WTP it means they are drinking from some other water source that is most likely contaminated with arsenic; if they are still using the WTP, there is concern of leaching arsenic from the filter media into the tank water.

7.8 Water Testing

Sidko only tests the water of the WTPs once a year for arsenic, iron, reactive phosphate, manganese, and pH. Once a year is not sufficient because the arsenic concentration within deep aquifers is highly variable (Van Geen et al., 2003; Cheng et al., 2005). This variability means that the GFH media in the filter can become saturated with arsenic even before the predicted time, which then prevents it from filtering out the arsenic from groundwater. Arsenic is also a colourless, odourless, and tasteless chemical which means there is no way of identifying its presence without an actual test.

Whether Sidko has a specific schedule or routine annual checkup for each WTP, is not known. However, a WTP is only put out of commission and is said to be in need of a filter replacement once Sidko has tested the water and confirmed the presence of arsenic in its water. Since this process is only done once a year, if the water is not tested regularly, communities could be exposed to arsenic water for months before it is identified. Hence, without scheduled and appropriate testing for arsenic within the water of the WTPs, communities may still be exposed to arsenic unknowingly.

It is not known how Sidko tests the water, only that they use a kit from UNICEF. Another arsenic testing kit, developed by the Asian Arsenic Network of Japan, works like a type of litmus paper and changes colour when exposed to arsenic contaminated water

(Chowdhury & Jakariya, 1999). If investment in a test kit such as this one was made, Sidko or even an SC field officer would be able to easily test the water of the WTPs more often.

7.9 Comparison of WTP to Other Common Intervention Options

Below, in **Table 7.**, information of four arsenic mitigation options that were discussed in **Sections 3.6** (SONO filter, activated alumina filter, PUR sachets) and **4.3** (Sidko WTP) have been summarized. The Sidko WTP costs the least for a household/year compared to all other options. It is also the only option that is truly a community-based intervention that requires complete community acceptance and participation. Even though the activated alumina filter can be a community-based arsenic mitigation option, the majority of its applications have been on the household level (CAWST, 2009). When using the Sidko WTP, community members have to walk to one place to collect water that is already in a state where it can be safely consumed. With every other option in this table, including the SONO filter, community members have to collect water and then filter the water. However, this could mean that they can collect tube well water or surface water from right by their home. Since SONO filters and PUR sachets remove microbial contaminants, the condition of the collected raw water is almost negligible. None of the literature read, discussed the activated alumina filter's ability to remove microbial contaminants, hence, this information is unknown.

So far, we can conclude that the activated alumina filter comes in fourth place if we are to rate these arsenic mitigation options. PUR sachets and the SONO filter are neck in neck in terms of performance and cost, however, the inconvenience of using PUR sachets, puts it in third place (Arvai & Post, 2012). Though studies have not been conducted on the arsenic removal performance of the WTP, studies have been conducted on the GFH media that the WTP uses, which has been shown as effective as SONO filters in terms of arsenic removal ability (Thirunavukkarasu et al., 2003). Aside from the fact that the SONO filter

costs double that of the Sidko WTP for a household/year, it can be argued that the SONO filter is a less ideal option for arsenic mitigation on a community level than the Sidko WTP. If the SONO filter were to be implemented as a community-based intervention, individual households would have to maintain their own SONO filters. This means that there is more room for many of the cons illuminated by Hoque et al. (2004) associated with household SONO filters. With the Sidko WTP, a single plant is installed that can be used by up to 250 households in an area, with select individuals within the community maintaining it. However, to collect water from the Sidko WTP, community members do have to walk to the WTP and the collected water is then stored in a container at home which allows for potential faecal contamination.

Table 7. Comparison of four arsenic mitigation options: SONO filter, activated alumina filter, PUR sachets, and Sidko WTP.

	Arsenic Removal Performance	**Concern for Microbiological Contaminants**	**Microbial Contaminant Removal Performance**	**Cost for a household for a year (USD)**	**Pros**	**Cons**
SONO Filter	>90% (Hussam & Munir, 2013)	High because will use surface water or shallow groundwater (Shankar & Shankar, 2014; Escamilla et al., 2013;)	94 % (Hussam & Munir, 2013)	15-18 (Munir et al., 2001; **Table 2.**)	-Well-accepted household arsenic removal option in Bangladesh -Effective at removing both arsenic and microbial contaminants	-Possibility of injury when cleaning the filter -Difficulty to replace/maintain the system -Easy breakability of the system (Hoque et al., 2004)
Activated Alumina Filter	80-85% (CAWST, 2009)	High because will use surface water or shallow groundwater (Shankar & Shankar, 2014; Escamilla et al., 2013;)	Not in literature	70-100 (CAWST, 2009)	-Can be used in both a household and community setting	-Expensive compared to other options
PUR Sachets	88% (Norton et al., 2009)	High because will use surface water or shallow groundwater (Shankar & Shankar, 2014; Escamilla et al., 2013;)	>90% (CDC, 2014)	10-30 (**Table 2.**; Norton et al., 2009)	-Effective at removing both arsenic and microbial contaminants	-Takes a lot of time and patience before clean water can be filtered and used (Arvai & Post, 2012)
Sidko WTP	GFH removes 95% (Thirunavukkarasu et al., 2003). No studies conducted on WTP itself	Low because using deep groundwater (Howard et al., 2006)	Unknown	8 (**Table 2.**)	-Once installed, can last for 5 years -High acceptance by community -One can provide water for up to 250 households -Open a tap to collect water, quick and reliable	-Community may not be willing to donate prime land -Participation and awareness of community members needed -Need to collect water and store in home which opens up possibility for contamination

8. Conclusion

The results of SC's WTP intervention portray it to be a successful one with room for improvement. With a large initial capital investment, water free of arsenic and other mineral contaminants can be provided to over a thousand individuals living in an area, in less than two weeks. Though much capacity building within a community must take place before the WTP is installed, the returns of the intervention are worth it, especially because it can last up to 5 years if appropriately maintained by the community, including regular testing of the water. If a greater sense of compliance of payments towards the upkeep of the WTP is achieved, the replacement of the filter after these 5 years can also be fulfilled by the community. It is clear that the communities value their WTP and desire its sustainability. There is a great sense of ownership of the WTP and the communities want to be able to take care of it so they have clean water to drink in the future.

Some of the downsides of the WTP include the need for women to have to walk some distance to collect the water, and then store it in their homes, which allows for potential microbial contamination of the water prior to consumption. Another con of the WTP is that it draws water from deep aquifers and studies have shown these aquifers to be in danger of further arsenic contamination because of this disturbance (Erban et al., 2013).

SC has only implemented the WTPs in communities with especially high arsenic prevalence in groundwater where almost no safe water alternatives are available and where there are several people suffering from arsenicosis. For parts of Bangladesh where there are other sources of drinking water available and arsenic is not so prevalent in groundwater, perhaps other arsenic mitigation strategies, such as those mentioned above in **Section 3**, may be more appropriate. However, how SC has implemented their version of the WTP intervention may be used as a guide for how it can be implemented in other

parts of Bangladesh where SC/other NGOs work and where rural communities have no other option but to drink arsenic contaminated water.

The broader implications of this intervention beyond SC require more research to be determined. From a policy standpoint, further investigation needs to take place before a recommendation can be made to scale-up the intervention nationwide. The WTPs long term sustainability still needs to be determined, its performance in arsenic removal from water shoud be investigated, and a more thorough cost and cost effectiveness study needs to be conducted. However, as discussed in **Section 7.9** above, the Sidko WTP is the best out of the four options mentioned in this thesis as a community level intervention for arsenic mitigation. SC is not the only NGO in Bangladesh implementing these Sidko WTPs, which means there is greater opportunity for further research to improve the prospects of this intervention.

8.1 Further Research

Further research for the WTP intervention could include having a quantitative study exploring the efficacy of all WTPs in an NGOs intervention and testing how much arsenic is present in water samples of these WTPs. It would also be interesting if the water from WTPs was tested for microbial contaminants just to test the hypothesis that groundwater in these deep aquifers is pathogen-free. Another study could be done investigating exactly how many people are making use of the WTP in each community and exploring the catchment area surrounding the WTP showing where people in the community are coming from. A final study could be conducted examining whether microbial contamination does occur in WTP water that has been collected and stored in the home.

For the WTP itself, studies examining the arsenic removal abilities of the technology should be further explored, showing the efficacy of granular ferric hydroxide

(GFH) within the confines of the WTP system. A study should also be done to investigate whether there is a leaching of arsenic from the filter back into the tank water from the arsenic saturated GFH media; and if so, how long could it take before this process starts to occur? Research on how the design of the WTP can be improved to incorporate solar power panels is also a consideration.

9. Limitations and Reflection on Methods

A major limitation of this study is the bias that interviews and FGDs are often prone to. Many people who are rooting for the WTP intervention and have a stake in its success, were interviewed, which may have made their answers more in favour of the intervention. This could be the case for both the SC Senior Official and the Sidko Manager. However, since their interviews were more informational in nature and less about opinions, the impact of this bias on the study findings is also limited.

Community members are very grateful for all the work that SC is doing in their community, including the implementation of the WTP, hence they may not want to say anything negative about the intervention. That being said, all community members were ensured that their identities would not be associated with their responses and the recordings would be kept confidential. SC staff members were not present during interviews with community members which allowed for honest and open conversation. However, community member may have associated the interviewer as being from SC because it was not made clear, and this could have affected their responses.

Another limitation may be the sample size of the study. Only four out of twenty-three WTPs and communities were visited. In hindsight, perhaps, a second non-functional WTP should have been visited to get more information on the causes of a non-functioning WTP. However, the general rule on sample size for interviews is that when the same stories, themes, issues, and topics are emerging from the interviewees, a sufficient sample size has been reached (Boyce & Neale, 2006).

Only a small percentage of the total communities were used in data collection but a saturation of ideas was obtained. This saturation is demonstrated in the results section with the same responses from all the communities in concern to maintenance of the WTP, community members' opinions, the challenges with their WTP, thoughts on sustainability

etc. Many questions were repeated in different interviews within the same community and the same responses were received. This was done to corroborate any stories about incidences and anything else to do with the WTP in the community.

Random sampling methods were not used, which is common in qualitative research (Boyce & Neale, 2006). This may be a limitation because the selection process of the communities is not known; SC chose four communities and data was collected from them. These communities may have been chosen for several reasons, including proximity of the community, accessibility of the community, condition of the WTP etc. If this study could be done over again, a random sampling method for choosing communities would have been used.

SC field officers who work in the chosen communities requested the PMC/CCG members and women of the community who were interviewed to participate. The process by which these community members were selected, is not known. It may have been based on who was around, who was available, who wanted to participate, which PMC/CCG member is known to be most involved with the maintenance of the WTP etc. Using field officers to ask community members to participate in this research was appropriate because they are well-known and respected within the communities that they work in. If this study was redone, we would make sure to ask the field officers how they choose the community members who were interviewed.

When field officers asked community members to participate in the study, they also informed them of when we would be coming to visit. This may explain why at least two of the WTPs visited, looked freshly swept. This was only recorded in the structured observations and is not very important in the grand scheme of the study, but may have caused some questionable findings to the structured observations data, including some women who were seen collecting water and perhaps, were only there because we were there.

The person administering the tools during the interviews and FGDs was not the same person who had developed the tools. This prevented follow up questions to interesting comments or to clarify certain answers from interviewees, from being asked. The language barrier between the tool developer, who spoke English, and the interviews, that were conducted in Bengali, meant this kind of follow-up could not take place. However, the tool developer and tool administer thoroughly discussed the goals of this research and the type of information that was wanted and this helped the tool administer to ask follow-up questions when they felt necessary.

10. Recommendations to Improve SCs WTP Intervention

1. Field officers can play an important role in helping to avoid the scenario that occurred with the non-functional plant. If they follow-up with the PMC cashier at least once a month about how much money was collected, how many households paid, how much the electricity bill cost, and how much of the money has been put into savings that month, there is greater accountability. Field officers can keep a record of all this information to help the PMC keep on track in terms of plant finances.

2. A greater number of PMC/CCG members need to be trained on how to appropriately clean the iron filter. Currently, only one, very rarely two, members are cleaning these filters daily and when they are not available, the pipes become blocked and the plant cannot be used. SC needs to insure that Sidko trains several members for this purpose. SC must encourage these members to rotate the filter cleaning duty weekly so that they all become capable of cleaning the filter.

3. It is also important that the water from each plant be tested regularly. Currently, Sidko tests the water in each plant maybe once a year, but it is important that this water be tested at least once in 3 months to make sure the plant is removing contaminants correctly. One way this can be done is to include this term in the next contract that is made with Sidko. Sidko will be required to test the water of the plants once every three months, in their next contract with SC. This will ensure that the plant filter be changed in due time and not long after the media has reached its full capacity of arsenic.

4. Every plant has a water meter that has a reading of exactly how many liters of water has been filtered by the plant. Before a plant is installed, the water is first tested for arsenic and there is an established concentration of arsenic within the water. This number can be used to calculate exactly how many liters of water the arsenic filter can filter at this arsenic concentration before the media is used up in the filter. The designated field officer of the community can routinely check this water meter to make sure that the number of liters doesn't surpass the number calculated. When it does, the water must be tested. This, too, will insure that the filter is changed in due time.

5. Once SC leaves, the communities will essentially only be able to rely on Sidko for support with their WTP. Communities should be connected with the DPHE to assist them with the water quality of their WTP. SC should somehow encourage and capacitate the PMC to communicate with the DPHE to assist in any water issues they come across. It would be good for the communities to cross check the water quality test results of their WTP with an entity other than Sidko to ensure that they are only replacing the filter media when necessary and no sooner.

6. One request that every community had was to somehow get a direct electric line for their WTP. Using a sub line is a constant challenge for the community. If SC could work to approve direct electric lines for their WTPs it would save a lot of trouble for the communities. The direct line should also be placed in the name of a PMC member, preferably the one who donated the land.

References

1. Ahmad, J., Goldar, B. N., Misra, S., & Jakariya, M. (2003). Willingness to pay for arsenic-free, safe drinking water in Bangladesh. *World Bank Water and Sanitation Program-South Asia*.
2. Ahmad, J., Goldar, B., & Misra, S. (2005). Value of arsenic-free drinking water to rural households in Bangladesh. *Journal of Environmental Management*, *74*(2), 173-185.
3. Ahmed, M. F. (2001). An overview of arsenic removal technologies in Bangladesh and India. *Proceedings of BUET-UNU International Workshop on Technologies for Arsenic Removal from Drinking Water, Dhaka* (pp. 5-7).
4. Ahmed, M. F., Ahuja, S., Alauddin, M., Hug, S. J., Lloyd, J. R., Pfaff, A., ... & Van Geen, A. (2006). Ensuring safe drinking water in Bangladesh. *Science, 314*(5806), 1687.
5. Ahmed, M. F., Shamsuddin, S. A., Mahmud, S. G., Rashid, H., Deere, D., & Howard, G. (2005). Risk assessment of arsenic mitigation options (RAAMO). In *Risk Assessment of Arsenic Mitigation Options (RAAMO)*. APSU.
6. Ahmed, K. M., Bhattacharya, P., Hasan, M. A., Akhter, S. H., Alam, S. M., Bhuyian, M. H., ... & Sracek, O. (2004). Arsenic enrichment in groundwater of the alluvial aquifers in Bangladesh: an overview. *Applied Geochemistry*,*19*(2), 181-200.
7. Anawar, H. M., Akai, J., Komaki, K., Terao, H., Yoshioka, T., Ishizuka, T., ... & Kato, K. (2003). Geochemical occurrence of arsenic in groundwater of Bangladesh: sources and mobilization processes. *Journal of Geochemical Exploration*, *77*(2), 109-131.
8. Arvai, J., & Post, K. (2012). Risk Management in a Developing Country Context: Improving Decisions About Point-of-Use Water Treatment Among the Rural Poor in Africa. *Risk Analysis*, *32*(1), 67-80.
9. Badruzzaman, M., Westerhoff, P., & Knappe, D. R. (2004). Intraparticle diffusion and adsorption of arsenate onto granular ferric hydroxide (GFH).*Water research*, *38*(18), 4002-4012.
10. Bajpai, S., & Chaudhuri, M. (1999). Removal of arsenic from ground water by manganese dioxide-coated sand. *Journal of Environmental Engineering*,*125*(8), 782-784.
11. Bellamy, W. D., Silverman, G. P., Hendricks, D. W., & Logsdon, G. S. (1985). Removing Giardia Cysts With Slow Sand Filtration (PDF). *Journal-American Water Works Association*, *77*(2), 52-60.
12. BGS & DPHE (2001). Arsenic contamination of groundwater in Bangladesh. *Summary British Geological Survey WC/00/19*, *1*, 1-15.
13. Boyce, C., & Neale, P. (2006). *Conducting in-depth interviews: A guide for designing and conducting in-depth interviews for evaluation input* (pp. 3-7). Watertown, MA: Pathfinder International.
14. Brinkel, J., Khan, M. H., & Kraemer, A. (2009). A systematic review of arsenic exposure and its social and mental health effects with special reference to Bangladesh. *International journal of environmental research and public health*, *6*(5), 1609-1619.
15. CAWST (2009). Household Water Treatment and Safe Storage Fact Sheet Academic. [PDF]. *Centre for Affordable Water and Sanitation Technology*. Retrieved from: http://www.sswm.info/sites/default/files/reference_attachments/CAWST%202

009%20Household%20Water%20Treatment%20and%20Safe%20Storage%20Fact%20Sheet%20Academic.pdf
16. CDC (2014). The Safe Water System - Flocculant/Disinfectant Powder. *Centers for Disease Control and Prevention*. Retrieved from: http://www.cdc.gov/safewater/flocculant-filtration.html
17. Chakraborty, A. K., & Saha, K. C. (1987). Arsenical dermatosis from tubewell water in West Bengal. *Indian Journal of Medical Research*, *137*(6).
18. Chakraborti, D., Das, B., Rahman, M. M., Kumar, U., Chowdhury, B. B., Goswami, A. B., ... & Hossain, A. (2009). Research Article Status of groundwater arsenic contamination in the state of West Bengal, India: A 20-year study report. *Mol. Nutr. Food Res*, *53*, 542-551.
19. Chen, Y., & Ahsan, H. (2004). Cancer burden from arsenic in drinking water in Bangladesh. *American Journal of Public Health*, *94*(5), 741-744.
20. Cheng, Z., Van Geen, A., Seddique, A. A., & Ahmed, K. M. (2005). Limited temporal variability of arsenic concentrations in 20 wells monitored for 3 years in Araihazar, Bangladesh. *Environmental Science & Technology*,*39*(13), 4759-4766.
21. Chiller, T. M., Mendoza, C. E., Lopez, M. B., Alvarez, M., Hoekstra, R. M., Keswick, B. H., & Luby, S. P. (2006). Reducing diarrhoea in Guatemalan children: randomized controlled trial of flocculant-disinfectant for drinking-water. *Bulletin of the World Health Organization*, *84*(1), 28-35.
22. Chowdhury, A. M. R., & Jakariya, M. (1999). Testing of water for arsenic in Bangladesh. *Science*, *284*(5420), 1621-1621.
23. Clasen, T. F., & Bastable, A. (2003). Faecal contamination of drinking water during collection and household storage: the need to extend protection to the point of use. *Journal of water and health*, *1*(3), 109-115.
24. Das, K., Roy, D., & Mostafa, M. G. (2015). Sustainable Management for Arsenic (As) Free Safe Drinking Water in Bangladesh: A Review. *Journal of Petroleum & Environmental Engineering*, *2015*.
25. Doocy, S., & Burnham, G. (2006). Point-of-use water treatment and diarrhoea reduction in the emergency context: an effectiveness trial in Liberia. *Tropical medicine & international health*, *11*(10), 1542-1552.
26. Driehaus, W., Jekel, M., & Hildebrandt, U. (1998). Granular ferric hydroxide—a new adsorbent for the removal of arsenic from natural water. *Journal of Water Supply: Research and Technology-Aqua*, *47*(1), 30-35.
27. Elliott, M. A., Stauber, C. E., Koksal, F., DiGiano, F. A., & Sobsey, M. D. (2008). Reductions of E. coli, echovirus type 12 and bacteriophages in an intermittently operated household-scale slow sand filter. *Water research*,*42*(10), 2662-2670.
28. Erban, L. E., Gorelick, S. M., Zebker, H. A., & Fendorf, S. (2013). Release of arsenic to deep groundwater in the Mekong Delta, Vietnam, linked to pumping-induced land subsidence. *Proceedings of the National Academy of Sciences*, *110*(34), 13751-13756.
29. Escamilla, V., Wagner, B., Yunus, M., Streatfield, P. K., Van Geen, A., & Emch, M. (2011). Effect of deep tube well use on childhood diarrhoea in Bangladesh. *Bulletin of the World Health Organization*, *89*(7), 521-527.
30. Flanagan, S. V., Johnston, R. B., & Zheng, Y. (2012). Arsenic in tube well water in Bangladesh: health and economic impacts and implications for arsenic mitigation. *Bulletin of the World Health Organization*, *90*(11), 839-846.
31. Fendorf, S., Michael, H. A., & van Geen, A. (2010). Spatial and temporal variations of groundwater arsenic in South and Southeast Asia. *Science*,*328*(5982), 1123-1127.

32. Ferguson, A. S., Mailloux, B. J., Ahmed, K. M., van Geen, A., McKay, L. D., & Culligan, P. J. (2011). Hand-pumps as reservoirs for microbial contamination of well water. *Journal of water and health*, *9*(4), 708-717.
33. Guan, X. H., Wang, J., & Chusuei, C. C. (2008). Removal of arsenic from water using granular ferric hydroxide: macroscopic and microscopic studies. *Journal of hazardous materials*, *156*(1), 178-185.
34. Hassan, M. M., Atkins, P. J., & Dunn, C. E. (2005). Social implications of arsenic poisoning in Bangladesh. *Social Science & Medicine*, *61*(10), 2201-2211.
35. Hoque, B. A., Hoque, M. M., Ahmed, T., Islam, S., Azad, A. K., Ali, N., ... & Hossain, M. S. (2004). Demand-based water options for arsenic mitigation: an experience from rural Bangladesh. *Public health*, *118*(1), 70-77.
36. Howard, G., Ahmed, M. F., Shamsuddin, A. J., Mahmud, S. G., & Deere, D. (2006). Risk assessment of arsenic mitigation options in Bangladesh. *Journal of Health, Population and Nutrition*, 346-355.
37. Hussam, A., & Munir, A. K. (2007). A simple and effective arsenic filter based on composite iron matrix: Development and deployment studies for groundwater of Bangladesh. *Journal of Environmental Science and Health Part A*, *42*(12), 1869-1878.
38. Hussam, A., & Munir, A. K. M. (2013). Sono Water Filter: A Sustainable Solution for Arsenic Crisis and Clean Drinking Water.
39. Islam, M. N., & Uddin, M. N. (2002). Hydrogeology and arsenic contamination in Bangladesh. *Arsenic mitigation in Bangladesh. Government of the People's Republic of Bangladesh: Local Government Division, Ministry of Rural Development & Cooperatives*.
40. Jensen, P. K., Ensink, J. H., Jayasinghe, G., Van Der Hoek, W., Cairncross, S., & Dalsgaard, A. (2002). Domestic transmission routes of pathogens: the problem of in-house contamination of drinking water during storage in developing countries. *Tropical Medicine & International Health*, *7*(7), 604-609.
41. Jones-Hughes, T., Peters, J., Whear, R., Cooper, C., Evans, H., Depledge, M., & Pearson, M. (2013). Are interventions to reduce the impact of arsenic contamination of groundwater on human health in developing countries effective? A systematic review. *Environmental Evidence*, *2*(1), 1.
42. Johnston, R. (2008) Preliminary Data: Response to Cyclone Sidr, UNICEF, Dhaka, Bangladesh.
43. Kamruzzaman, A. K. M., & Ahmed, F. (2006). Study of performance of existing pond sand filters in different parts of Bangladesh. In *Sustainable development of water resources, water supply and environmental sanitation, 32nd WEDC conference, Colombo, Sri Lanka* (pp. 377-380).
44. Kapaj, S., Peterson, H., Liber, K., & Bhattacharya, P. (2006). Human health effects from chronic arsenic poisoning–a review. *Journal of Environmental Science and Health Part A*, *41*(10), 2399-2428.
45. Karim, M. M. (2000). Arsenic in groundwater and health problems in Bangladesh. *Water Research*, *34*(1), 304-310.
46. Katsoyiannis, I. A., & Zouboulis, A. I. (2004). Application of biological processes for the removal of arsenic from groundwaters. *Water Research*,*38*(1), 17-26.
47. Kim, Y., Kim, C., Choi, I., Rengaraj, S., & Yi, J. (2004). Arsenic removal using mesoporous alumina prepared via a templating method. *Environmental science & technology*, *38*(3), 924-931.
48. Kinniburgh, D. G., & Smedley, P. (2001). Arsenic contamination of groundwater in Bangladesh.

49. Kitzinger, J. (1995). Qualitative research. Introducing focus groups. *BMJ: British medical journal*, *311*(7000), 299.
50. Lantagne, D., & Clasen, T. (2012). Point-of-use water treatment in emergency response. *Waterlines*, *31*(1-2), 30-52.
51. Leber, J., Rahman, M. M., Ahmed, K. M., Mailloux, B., & van Geen, A. (2011). Contrasting influence of geology on E. coli and arsenic in aquifers of Bangladesh. *Ground Water*, *49*(1), 111-123.
52. Lin, T. F., & Wu, J. K. (2001). Adsorption of arsenite and arsenate within activated alumina grains: equilibrium and kinetics. *Water research*, *35*(8), 2049-2057.
53. Luby, S. P., Agboatwalla, M., Painter, J., Altaf, A., Billhimer, W., Keswick, B., & Hoekstra, R. M. (2006). Combining drinking water treatment and hand washing for diarrhoea prevention, a cluster randomised controlled trial. *Tropical medicine & international health*, *11*(4), 479-489.
54. Macy, J. M., Santini, J. M., Pauling, B. V., O'Neill, A. H., & Sly, L. I. (2000). Two new arsenate/sulfate-reducing bacteria: mechanisms of arsenate reduction. *Archives of microbiology*, *173*(1), 49-57.
55. Madajewicz, M., Pfaff, A., Van Geen, A., Graziano, J., Hussein, I., Momotaj, H., ... & Ahsan, H. (2007). Can information alone change behavior? Response to arsenic contamination of groundwater in Bangladesh. *Journal of development Economics*, *84*(2), 731-754.
56. Milton, A. H., Hore, S. K., Hossain, M. Z., & Rahman, M. (2012). Bangladesh arsenic mitigation programs: lessons from the past. *Emerging health threats journal*, *5*.
57. Milton, A. H., Smith, W., Dear, K., Ng, J., Sim, M., Ranmuthugala, G., ... & Shraim, A. (2007). A randomised intervention trial to assess two arsenic mitigation options in Bangladesh. *Journal of Environmental Science and Health Part A*, *42*(12), 1897-1908.
58. Mondol, M. R. (2009). Effectiveness of multistage filtration in removing iron, manganese and arsenic from groundwater of Bangladesh.
59. Munir, A. K. M., Rasul, S. B., Habibuddowla, M., Alauddin, M., Hussam, A., & Khan, A. H. (2001). Evaluation of performance of Sono 3-Kolshi filter for arsenic removal from groundwater using zero valent iron through laboratory and field studies. *Technologies for arsenic removal from drinking water*, *1*, 177-189.
60. Norton, D. M., Rahman, M., Shane, A. L., Hossain, Z., Kulick, R. M., Bhuiyan, M. I., ... & Henderson, A. (2009). Flocculant-disinfectant point-of-use water treatment for reducing arsenic exposure in rural Bangladesh. *International journal of environmental health research*, *19*(1), 17-29.
61. Opar, A., Pfaff, A., Seddique, A. A., Ahmed, K. M., Graziano, J. H., & Van Geen, A. (2007). Responses of 6500 households to arsenic mitigation in Araihazar, Bangladesh. *Health & place*, *13*(1), 164-172.
62. Pal, B. N. (2001). Granular ferric hydroxide for elimination of arsenic from drinking water. *Technologies for Arsenic Removal from Drinking Water*, 59-68.
63. Pallier, V., Feuillade-Cathalifaud, G., Serpaud, B., & Bollinger, J. C. (2010). Effect of organic matter on arsenic removal during coagulation/flocculation treatment. *Journal of Colloid and Interface Science*, *342*(1), 26-32.
64. Rahman, M. H., Rahman, M. M., Watanabe, C., & Yamamoto, K. (2003). Arsenic contamination of groundwater in Bangladesh and its remedial measures. In *Arsenic Contamination in Groundwater-Technical and Policy Dimensions. Proceedings of the UNU-NIES International Workshop, United Nations University, Tokyo, Japan* (pp. 9-21).

65. Rahman, M. (2012). Drinking water treatment for underground low redox water. *Politecnico di Milano*. Retrieved from: https://www.politesi.polimi.it/bitstream/10589/56911/1/.pdf
66. Reisner, D. E., & Pradeep, T. (Eds.). (2014). *Aquananotechnology: Global Prospects*. CRC Press.
67. Reller, M. E., Mendoza, C. E., Lopez, M. B., Alvarez, M., Hoekstra, R. M., Olson, C. A., ... & Luby, S. P. (2003). A randomized controlled trial of household-based flocculant-disinfectant drinking water treatment for diarrhea prevention in rural Guatemala. *The American Journal of Tropical Medicine and Hygiene*, *69*(4), 411-419.
68. Save the Children. (2016). Bangladesh - Our History. Retrieved from https://bangladesh.savethechildren.net/about-us/our-history
69. Schoenfeld, A. (2006). Thesis: Area, Village, and Household Response to Arsenic Testing and Labeling of Tubewells in Araihazar, Bangladesh. *Columbia University, New York, NY*. Retrieved from: www.ldeo.columbia.edu/~avangeen/arsenic/
70. SDNPB (n.d.). Arsenic Contamination in Bangladesh. *Sustainable Development Networking Programme - Bangladesh. United Nations Development Program*. Retrieved from http://www.sdnbd.org/arsenic1.htm
71. Sengupta, P. (2013). Potential health impacts of hard water. *International journal of preventive medicine*, *4*(8).
72. Shamsudduha, M., Uddin, A., Saunders, J. A., & Lee, M. K. (2008). Quaternary stratigraphy, sediment characteristics and geochemistry of arsenic-contaminated alluvial aquifers in the Ganges–Brahmaputra floodplain in central Bangladesh. *Journal of Contaminant Hydrology*, *99*(1), 112-136.
73. Shankar, S., & Shanker, U. (2014). Arsenic contamination of groundwater: A review of sources, prevalence, health risks, and strategies for mitigation. *The Scientific World Journal*, *2014*.
74. Singh, T. S., & Pant, K. K. (2004). Equilibrium, kinetics and thermodynamic studies for adsorption of As (III) on activated alumina. *Separation and Purification Technology*, *36*(2), 139-147.
75. Smedley, P. L. (2008). Sources and distribution of arsenic in groundwater and aquifers.
76. Smedley, P. L., & Kinniburgh, D. G. (2002). A review of the source, behaviour and distribution of arsenic in natural waters. *Applied geochemistry*,*17*(5), 517-568.
77. Smith, A. H., Lingas, E. O., & Rahman, M. (2000). Contamination of drinking-water by arsenic in Bangladesh: a public health emergency. *Bulletin of the World Health Organization*, *78*(9), 1093-1103.
78. Sperlich, A., Werner, A., Genz, A., Amy, G., Worch, E., & Jekel, M. (2005). Breakthrough behavior of granular ferric hydroxide (GFH) fixed-bed adsorption filters: modeling and experimental approaches. *Water Research*,*39*(6), 1190-1198.
79. Sultana, F. (2007). Water, water everywhere, but not a drop to drink: Pani politics (water politics) in rural Bangladesh. *International Feminist Journal of Politics*, *9*(4), 494-502.
80. Tani, M. (1999). Ethnographic studies for mitigating arsenic poisoning in Samita. *Arsenic contamination of groundwater in Bangladesh; Interim report of the research at Samta Village. Dhaka: Asia Arsenic Network, Research Group for Applied Geology, Department of Occupational & Environmental Health, national Institute of Preventive and Social Medicine*, 12-17.

81. Taylor, R. G., Scanlon, B., Döll, P., Rodell, M., Van Beek, R., Wada, Y., ... & Konikow, L. (2013). Ground water and climate change. *Nature Climate Change*, *3*(4), 322-329.
82. Thirunavukkarasu, O. S., Viraraghavan, T., & Subramanian, K. S. (2003). Arsenic removal from drinking water using granular ferric hydroxide. *Water Sa*, *29*(2), 161-170.
83. Uddin, R., & Huda, N. H. (2011). Arsenic poisoning in Bangladesh. *Oman medical journal*, *26*(3), 207.
84. UNICEF (2008). Bangladesh. [PDF]. *United Nations International Children's Emergency Fund.* Retrieved from: http://www.unicef.org/bangladesh/cbg_(18.10.08).pdf
85. UNICEF (2009). Bangladesh & Bangladesh Bureau of Statistics. *Multiple Indicator Cluster Survey*. *United Nations Children's Fund*. Retrieved from: http://www.unicef.org/bangladesh/knowledgecentre_6292.htm
86. UNICEF (2009). Bangladesh National Drinking Water Quality Survey of 2009. *United Nations Children's Fund*. Retrieved from: http://www.unicef.org/bangladesh/BNDWQS_2009_web.pdf
87. UNICEF (2010). Arsenic Mitigation in Bangladesh [PDF]. *United Nations International Children's Emergency Fund.* Retrieved from: http://www.unicef.org/bangladesh/Arsenic_Mitigation_in_Bangladesh.pdf
88. Van Geen, A., Ahsan, H., Horneman, A. H., Dhar, R. K., Zheng, Y., Hussain, I., ... & Wallace, S. (2002). Promotion of well-switching to mitigate the current arsenic crisis in Bangladesh. *Bulletin of the World Health Organization*, *80*(9), 732-737.
89. Van Geen, A., Zheng, Y., Versteeg, R., Stute, M., Horneman, A., Dhar, R., ... & Graziano, J. H. (2003). Spatial variability of arsenic in 6000 tube wells in a 25 km2 area of Bangladesh. *Water Resources Research*, *39*(5).
90. Van Geen, A., Ahmed, K. M., Akita, Y., Alam, M. J., Culligan, P. J., Emch, M., ... & Layton, A. C. (2011). Fecal contamination of shallow tube wells in Bangladesh inversely related to arsenic. *Environmental science & technology*, *45*(4), 1199-1205.
91. Welch, A. H., Westjohn, D. B., Helsel, D. R., & Wanty, R. B. (2000). Arsenic in ground water of the United States: occurrence and geochemistry. *Ground water*, *38*(4), 589-604.
92. WHO (n.d.). Fact Sheet 2.2 - Dug wells. *World Health Organization*. Retrieved from: http://www.who.int/water_sanitation_health/hygiene/emergencies/fs2_2.pdf
93. WHO (2002). Arsenic - mass poisoning on an unprecedented scale. *World Health Organization*. Retrieved from http://www.who.int/features/archives/feature206/en/
94. WHO (2004). Status Report on Macroeconomics and Health - Bangladesh [PDF Document]. *World Health Organization*. Retrieved from http://www.who.int/macrohealth/action/en/rep04_bangladesh.pdf
95. WHO (2012). Arsenic- Fact Sheet. *World Health Organization*. Retrieved from http://www.who.int/mediacentre/factsheets/fs372/en/
96. WHO (2014). Bangladesh - Noncommunicable Diseases (NCD) Country Profiles. *World Health Organization*. Retrieved from http://www.who.int/nmh/countries/bgd_en.pdf
97. World Bank (2010). Bangladesh - World Development Indicators. *World Health Organization*. Retrieved from http://data.worldbank.org/country/bangladesh.

98. World Bank (2013). Bangladesh - Country at a Glance. *World Health Organization*. Retrieved from http://www.worldbank.org/en/country/bangladesh
99. Wright, J., Gundry, S., & Conroy, R. (2004). Household drinking water in developing countries: a systematic review of microbiological contamination between source and point-of-use. *Tropical Medicine & International Health*,*9*(1), 106-117.
100. Xu, Y. H., Nakajima, T., & Ohki, A. (2002). Adsorption and removal of arsenic (V) from drinking water by aluminum-loaded Shirasu-zeolite. *Journal of Hazardous Materials*, *92*(3), 275-287.
101. Yokota, H., Tanabe, K., Sezaki, M., Akiyoshi, Y., Miyata, T., Kawahara, K., ... & Ahmad, S. A. (2001). Arsenic contamination of ground and pond water and water purification system using pond water in Bangladesh. *Engineering Geology*, *60*(1), 323-331.

APPENDIX

Appendix A

SL	WTP Name	Upazila (Geographical Region)	Union	Village	Para/Mohollah (Locality)	Name of CCG
1	Alampur Uttarpara WTP	Meherpur Sadar	Amjhupi	Alampur	Uttarpara	Alampur Uttarpara CCG
2	Beltolapara Maddhopara WTP	Meherpur Sadar	Amjhupi	Beltolapara	Maddhopara	Beltolapara Maddhopara CCG
3	Jhawbaria Raipara WTP	Meherpur Sadar	Amjhupi	Jhawbaria	Raipara	Jhawbaria Raipara CCG
4	Rajnagar Mollahpara WTP	Meherpur Sadar	Pirojpur	Rajnagar	Mollahpara	Rajnagar Mollahpara CCG
5	Rajnagar Sheakh WTP	Meherpur Sadar	Pirojpur	Rajnagar	Sheakh WTP	Rajnagar Sheakh CCG
6	Rajnagar Dokhinpara WTP	Meherpur Sadar	Pirojpur	Rajnagar	Dokhinpara	Rajnagar Dokhinpara CCG
7	Singhati School para WTP	Meherpur Sadar	Pirojpur	Singhati	School para	Singhati School para CCG
8	Khatalpota Uttarpara WTP	Meherpur Sadar	Pirojpur	Khatalpota	Uttarpara	Khatalpota Uttarpara CCG
9	Kulbaria Basindapara WTP	Meherpur Sadar	Kutubpur	Kulbaria	Basindapara	Kulbaria Basindapara
10	Hitimpara Hitimpara WTP	Meherpur Sadar	Kutubpur	Hitimpara	Hitimpara	Hitimpara
11	Suvorajpur Dhakhinpara WTP	Meherpur Sadar	Kutubpur	Suvorajpur	Dhakhinpara	Surorajpur Dhakhinpara
12	Kamdeppur School Para WTP	Meherpur Sadar	Buripota	Kamdeppur	School Para	Kamdeppur Shimul
13	Voladanga Maddhapara WTP	Gangni	Solotaka	Voladanga	Maddhapara	Baly
14	Tatulbaria Shilalpara WTP	Gangni	Tatulbaria	Tatulbaria	Shilalpara	Rajanigandha
15	Tetulbaria Chairmanpara WTP	Gangni	Tatulbaria	Tatulbaria	Chairmanpara	Lead by Chairman

16	Palashipara Purbopara WTP	Gangni	Tatulbaria	Palashipara	Purbopara	Purbopara CCG
17	Palashipara Shohoratola WTP	Gangni	Tatulbaria	Palashipara	Shohoratola	Joba
18	Sohogalpur Bashindapara WTP	Gangni	Kathuli	Sohogalpur	Bashindapara	Golap
19	Garabaria Bashindapara WTP	Gangni	Kathuli	Garabaria	Bashindapara	Bely
20	Taranagar PIC Clubpara WTP	Mujibnagar	Bagoan	Taranagar	Clubpara	Clubpara CCG (Shimanta)
21	Taranagar Dakshinpara WTP	Mujibnagar	Bagoan	Taranagar	Dakshinpara	Taranagor Daskhinpar
22	Joypyr Dakshinpara WTP	Mujibnagar	Bagoan	Joypur	Dakshinpara	Joypur Dokhin para
23	Annadabas Madalpara WTP	Mujibnagar	Bagoan	Annadabas	Madalpara	Anondobash Mondol Para

Appendix B

Interview Guide

WTP - Save the Children Staff Involved in Implementation

Duration: 45-60 minutes

Overall Objective: to understand the role of Save the Children and Save the Children Staff in the implementation of the WTP.

Opening Questions

1. What is your role in Save the Children? Your position?

2. How long have you been working within this community/area for?
   আপনি কতদিন থেকে থেকে এই মহল্লা/গ্রাম (CBHE/WTP সংশ্লিষ্ট) এর দায়িত্বে আছেন?
3. Can you tell us about the WTP intervention in Meherpur? How many have been implemented? When was the first one implemented? Where?
   মেহেরপুরে পানি পরিশোধন কেন্দ্রের ব্যাপারে আপনি আমাদের কিছু বলতে পারবেন? এ পর্যন্ত কতগুলো প্ল্যান্ট স্থাপন করা হয়েছে? প্রথম প্ল্যান্টটি কবে স্থাপন করা হয়েছিলো? কোথায় স্থাপন করা হয়েছিলো?
4. How many people are currently obtaining arsenic-free drinking water from this intervention?
   মোটামুটিভাবে কতজন মানুষ এই মূহুর্তে প্ল্যান্ট থেকে আর্সেনিকমুক্ত পানি সংগ্রহ করছে?
5. How long does it take on average to implement a WTP in a community from the initiation of the process to when the community is able to collect water from the plant?
   একটি প্ল্যান্ট স্থাপনের শুরু থেকে শেষ করা পর্যন্ত (যখন পানি সংগ্রহ করা যায়) মোটামুটি কত সময় ব্যয় হয়?

Key Questions

Pre-installation of WTPs

6. How do you identify the need for installing a WTP in a community?
   কোন মহল্লা/গ্রামে প্ল্যান্ট স্থাপন করা হবে সেটা কিভাবে নির্ণয় করা হয়?
7. What is the background criteria for installing a WTP?
   প্ল্যান্ট স্থাপনের জন্য কি কি পারিপার্শ্বিক অবস্থা (কি কি বিষয়) বিবেচনা করা হয়?
8. What preparatory work do you do before installation of WTP?
   প্ল্যান্ট স্থাপনের আগে আপনারা কি কি প্রস্তুতিমূলক কাজ করে থাকেন?
9. Who within the community do you communicate with to initiate the process?
   কাজ শুরু করার জন্য প্রাথমিকভাবে মহল্ল/গ্রামের কার সাথে আপনারা যোগাযোগ করেন?

a. Probe: CCG? Community members? Village elders?

অনুসন্ধানঃ CCG? মহল্লা/গ্রামের কেউ? গ্রামের বয়োজ্যেষ্ঠ ব্যক্তিবর্গ?

10. Do you know how the site for the WTP is selected? Can you describe the process? Is SC involved in this process? If so, how? Does SC keep any records/paperwork of who within the community donated the land for the WTP? Does this person usually become an important stakeholder of the WTP? If so, how?

প্ল্যান্ট এর জন্য স্থান কিভাবে নির্ধারিত হয়েছিলো আপনি কি বলতে পারবেন? দয়া করে ব্যাখ্যা করবেন কি? সেভ দ্য চিলড্রেন কি এর সাথে সম্পৃক্ত? যদি থাকে তবে কিভাবে? প্ল্যান্টের জন্য মহল্লা/গ্রামের মধ্য থেকে কে/কারা জমি দান করেছিলো সেই সম্পর্কিত কাগজ/দলিল কি সেভ দ্য চিলড্রেন সংরক্ষণ করে? স্বাভাবিকভাবেই তিনি এই প্ল্যান্টের গুরুত্বপূর্ণ ব্যাক্তিদের মধ্যে একজন কিনা (তাকে আলাদাভাবে গুরুত্ব দেয়া হয় কিনা)? যদি হয়, তবে কিভাবে?

11. How does SC communicate with SIDKO to initiate this process?

প্ল্যান্ট স্থাপনের কাজ শুরু করার জন্য সেভ দ্য চিলড্রেন কিভাবে SIDKO'র সাথে যোগাযোগ করে?

a. Probe: What paperwork must be filled out? What other matters does SC need to discuss with SIDKO before the installation can begin?

অনুসন্ধানঃ দলিল/কাগজ/ফর্ম পূরন করা? এছাড়াও প্ল্যান্ট স্থাপনের পূর্বে সেভ দ্য চিলড্রেন এর সাথে SIDKO'র আর কি কি ধরণের আনুষাঙ্গিক আলোচনা হয়?

Installation of WTPs

12. What is SCs role during implementation of the WTP?

প্ল্যান্ট তৈরির সময়ে সেভ দ্য চিলড্রেন এর ভূমিকা কি ছিলো?

13. Were you involved in the implementation of the WTP intervention in this community? If so, how?

প্ল্যান্ট বাস্তবায়নের সময় আপনি কি সম্পৃক্ত ছিলেন? যদি থাকেন, কিভাবে?

a. Probe: Were you physically involved?/Did you observe the installation?/Did you work with the community in some capacity during this process?

অনুসন্ধানঃ শারিরিক/আর্থিক/দেখাশুনা, ইত্যাদি। এই প্রক্রিয়া চলাকালীন আপনি কি ঐ মহল্লা/গ্রামের সাথে কোন না কোন ভাবে জড়িত ছিলেন?

14. How does SC work with SIDKO during the implementation process?

সেভ দ্য চিলড্রেন SIDKO'র সাথে প্ল্যান্ট নির্মাণকালীন সময়ে কিভাবে কাজ করে?
(অনুসন্ধানঃ পরিদর্শণ/মনিটরিং/দেখাশোনা, ইত্যাদি)

15. How does SC work with the community during the implementation process?

সেভ দ্য চিলড্রেন মহল্লা/গ্রামের সাথে প্ল্যান্ট নির্মাণকালীন সময়ে কিভাবে কাজ করে?
(অনুসন্ধানঃ পরিদর্শণ/মনিটরিং/দেখাশোনা, ইত্যাদি)

Post-installation of WTPs

16. What is SCs role after the WTP has been installed within a community?

প্ল্যান্ট নির্মাণ পরবর্তী ঐ মহল্লা/গ্রামে সেভ দ্য চিলড্রেন এর ভূমিকা কি?

17. Is there an SC staff member who is responsible for overseeing the activities of the WTP after it has been installed?

প্ল্যান্ট নির্মাণের পরে সেভ দ্য চিলড্রেন এর পক্ষ থেকে কেউ কি ঐ প্লান্ট এর সার্বিক দায়িত্বে থাকেন?

18. Does SC have a role in assigning responsibility of the WTP within the community?

মহল্লা/গ্রামের কাকে কি দায়িত্ব দেয়া হবে সে ব্যাপারে সেভ দ্য চিলড্রেন কোন ভূমিকা আছে কিনা?

a. Probe: Is SC part of the decision making process of who will make up the PMC/CCG within a community? If so, how is the PMC and CCG formed?

অনুসন্ধানঃ CCG/PMC গঠনে সেভ দ্য চিলড্রেন সিদ্ধান্ত/পরামর্শ দেয় কিনা? কিভাবে CCG/PMC গঠন করা হয়?

b. Do they assign any other individuals within the community responsibility over the WTP? If so, who/how?
এর বাহিরেও কমিউনিটি থেকে অন্য কাউকে আলাদাভাবে কোন দায়িত্ব দেয়া হয় কিনা? যদি দেয়া হয়, কাকে/কিভাবে?

19. According to SC, what is the role of the PMC within a community and in regards to the WTP? What is the role of the CCG within a community and in regards to the WTP?

সেভ দ্য চিলড্রেন এর মতে, প্ল্যান্ট এর ব্যাপারে PMC'র ভূমিকা কি? প্ল্যান্ট এর ব্যাপারে CCG'র ভূমিকা কি?

20. Have there been any political issues surrounding members of the CCG/PMC and use of/access to the WTP? Does SC get involved when these kinds of issues arise?

প্ল্যান্ট বিষয়ক কোন ব্যাপার নিয়ে কখনো CCG/PMC এর মধ্যে কোনো রাজনৈতিক সমস্যার সৃষ্টি হয়েছিলো কিনা?

Save the Children's current involvement in the WTPs

21. How often do you/other SC staff visit the WTP in each community?

প্রকল্প এলাকায় আপনি কিংবা সেভ দ্য চিলড্রেন এর কেউ (মাঠ কর্মী, ম্যানেজার, বা যে কেউ) কতদিন পর পর পরিদর্শন করেন?

22. What do you/SC staff do when you visit there?

পরিদর্শনে গিয়ে আপনি/তারা (সেভ দ্য চিলড্রেন কর্মী) কি কি করেন?

23. What are the main problems, if any, that you have experienced while dealing with the WTPs?

পানি শোধন কেন্দ্র নিয়ে সচরাচর কি ধরণের সমস্যা দেখা যায়?

a. Probe: vandalism/broken/functionality/fights/quarrelling at the plant

অনুসন্ধানঃ ইচ্ছাকৃত ভাবে ক্ষতি করা/ ভেঙ্গে যাওয়া/কাজ না করা/পানি সংগ্রহ করা নিয়ে মারামারি-ঝগড়া করা

24. When repairs are needed for the WTPs what happens? Does the community take initiative to contact the appropriate people? SIDKO? SC? Or do they just contact SC and SC follows up with SIDKO?

যখন কোন মেরামতের প্রয়োজন হয় তখন কি ঘটে? মহল্লার লোকজন কার সাথে যোগাযোগ করে? সেভ দ্য চিলড্রেন? SIDKO? অথবা তারা শুধুই সেভ দ্য চিলড্রেন কে জানায় এবং সেভ দ্য চিলড্রেন SIDKO'র সাথে যোগাযোগ করে?

25. Who pays for the repairs usually? If the community does, who within the/this community pays for the repairs?

মেরামতের জন্য সাধারণত কে/কারা অর্থ দিয়ে থাকেন? যদি মহল্লার কেউ দিয়ে থাকেন, তিনি কে? *(অনুসন্ধানঃ ঐ মহল্লার মধ্যে কে বা কারা আর্থিক সহায়তা দেন?)*

26. How do the communities deal with minor problems with the plant? Do they inform SC about these problems? Do they keep SC informed about the runnings of the WTP or does SC only find out this information when they visit the community?

প্ল্যান্ট এর খুদ্র মেরামত এর প্রয়োজন হলে তা কিভাবে করা হয়? মহল্লার মানুষজন কি সেভ দ্য চিলড্রেনকে সেই সমস্যা সম্পর্কে জানান? প্ল্যান্ট ঠিকমত চলছে কিনা সেটা কি মহল্লার মানুষ সেভ দ্য চিলড্রেনকে জানান নাকি সেভ দ্য চিলড্রেন থেকে প্ল্যান্টের কার্যকারিতা নিয়মিত খোঁজ নেয়া হয়?

27. Describe SCs role with the WTP within these two particular communities.

দয়া করে এই নির্দিষ্ট মহল্লা দুটিতে সেভ দ্য চিলড্রেন কি কি কাজ করে তা বিস্তারিত বলুন।

Closing Questions

28. What have been the main challenges that SC has faced in concern to the WTPs within these communities?

এই মহল্লায় কাজ করতে গিয়ে সেভ দ্য চিলড্রেন মূলত কি কি ধরণের সমস্যার সম্মুখীন হয়েছে?

29. Do you think these communities will be able to sustain the WTP once SC leaves? Why or why not?

আপনি কি মনে করেন সেভ দ্য চিলড্রেন যদি সহযোগিতা বন্ধ করে দেয় তবে এই মহল্লা/গ্রাম তাদের পানি সংশোধন কেন্দ্র চালু রাখবে, প্রয়োজনে মেরামত করবে? কেন অথবা কেন নয়?

30. Is there anything else you would like to tell us about SC's operations in concern to the WTP in these communities?

এই মহল্লায় নিরাপদ পানি শোধনাগার সম্পর্কে সেভ দ্য চিলড্রেন এর ভূমিকার ব্যাপারে আপনি আর কিছু বলতে চান কি?

Appendix C

Post Field Visit Interview with StC Staff

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1. Is this intervention only in Meherpur?
   এই কার্যক্রম শুধু কি মেহেরপুরেই পরিচালিত হয়?
2. When SC/SIDKO installs a plant do they have a certain number of households in mind who are going to be the beneficiaries of this plant? If so, how many households to one WTP? What happens if many more households in the community make use of the plant? Does SC/SIDKO account for this in some manner?
   সেভ দ্য চিলড্রেন/সিডকো যখন একটি প্ল্যান্ট স্থাপন করার পরিকল্পনা করে তখন কি 'নির্দিষ্ট সংখ্যক' পরিবার বিবেচনা করা হয় কিনা যারা এই প্ল্যান্ট থেকে উপকৃত হবেন? যদি হয়, একটি প্ল্যান্ট থেকে কতগুলো পরিবার সুবিধাভোগ করে থাকে? যদি ঐ মহল্লার আরো বেশি সংখ্যক মানুষজন সুবিধা নিয়ে থাকে তবে কি ঘটবে? সেভ দ্য চিলড্রেন/সিডকো এই বিষয়গুলো বিবেচনা করে কিনা?
3. Have there ever been any conflicts between households who are not paying for the WTP and yet are collecting water? Is this an issue that has ever come up since the implementation of the WTPs?
   সুবিধাভোগী মানুষের মধ্যে পানি সংগ্রহের জন্য টাকা পরিশোধ করছে এবং যারা করছে না তাদের মধ্যে কখনো কোনো বিরোধের সৃষ্টি হয়েছে কিনা? এ রকম ঘটনা প্ল্যান্ট স্থাপনের পর থেকে কখনো ঘটেছে কিনা?
4. Do you ask the community if they are willing to pay for the upkeep of the plant before it is installed? Is this a factor of consideration in terms of assessing whether you will install a plant in a community?
   'প্ল্যান্ট সচল রাখতে মহল্লা বাসীর নিয়মিত অর্থ প্রদান করতে হবে' প্ল্যান্ট স্থাপনের পূর্বে তাদেরকে এই বিষয়ে জানানো হয়েছিলো কিনা? প্ল্যান্ট স্থাপনের পূর্বে এই বিষয়টি বিবেচনা করা হয় কিনা?
5. Do you have any advice for a future community that may be receiving a plant like the one you have?
   ভবিষ্যতে কোন মহল্লায় প্ল্যান্ট করতে চাইলে মহল্লাবাসীর জন্য আপনার কোনো পরামর্শ আছে কি?

a. Probe: Something that maybe your community could have done differently to smoothen the process of installing and maintaining the WTP?
   অনুসন্ধানঃ এমন কোন পরামর্শ যা হয়ত আগে থেকেই আপনার মহল্লায় করলে প্ল্যান্ট স্থাপন এবং রক্ষণাবেক্ষণ সহজতর হত।

6. We visited the community in Rajnagar School Para. We noticed that there was a plant very close to the one we were supposed to investigate (about 300m). Does this happen often? If so, how do you decide whether to put two plants so

close to one another in a single community? Can you explain more about this scenario? (maybe we can even ask Sheila di about this).

রাজনগরে ৩০০ মিটার এর মধ্যে দুইটি প্ল্যান্ট স্থাপণ করা হয়েছে। এটা কি মাঝে মাঝেই ঘটে (একই মহল্লায় একাধিক প্ল্যান্ট)? যদি হয়, কোথায় কোথায় তা স্থাপন করা হবে তা আপনারা কিভাবে নির্ধারণ করেন? এই ব্যাপারে বিস্তারিত বলতে পারবেন কি?

7. When SC started implementing WTPs in communities did they plan to provide financial support for the plant once it was installed? Or were they very clear to the community and told them that the community will resume financial responsibilities once the plant is installed?

সেভ দ্য চিলড্রেন প্ল্যান্ট স্থাপনের পরে ঐ মহল্লায় প্ল্যান্টের জন্য পরবর্তী সময়ে আর্থিক সহযোগিতা করে কিনা? অথবা মহল্লার মানুষকে স্পষ্ট করে এর যাবতীয় ব্যয়ভার বহনের জন্য নির্দেশনা দিয়ে থাকেন?

8. When you encourage a community to form the CCG and PMC committees, what do you tell them? What do you want the committees to consist of? Why? What do you hope these committees will achieve? Have you had success with these committees?

যখন CCG/PMC কমিটি গঠন করা হয় তখন তাদের দায়িত্ব/কেন কমিটি গঠন করা দরকার সে সম্পর্কে কি বলেন? এই কমিটিতে কাদেরকে প্রাধান্য দেয়া হয়? কেন? এই কমিটি থেকে অর্জণ কতটুকু হবে বলে আপনারা প্রত্যাশা করেন? কমিটিগুলো নিয়ে আপনারা কি সফল?

9. In the communities that we investigated, it seemed as though there were mainly one or two people of either or both committees who maintains the plant even though the committees may have 10-15 people in them. Why are so many people made part of the committee then?

যেসব মহল্লায় পরিদর্শণে যাওয়া হয়েছে, তাদের সাথে কথা বলে মনে হয়েছে যে প্রতিটি কমিটিতেই সকল সদস্যের মধ্য থেকে ২-১ জন সদস্য সক্রিয় থাকেন। তাহলে বাকি সদস্যদের কমিটিতে অন্তর্ভুক্তির কারণ কি?

10. What are your plans in terms of installing new WTPs? How many more do you plan to install in Meherpur? In other areas?

নতুন প্ল্যান্ট স্থাপনের ব্যাপারে আপনার পরিকল্পনা কি? মেহেরপুরে আর কতগুলো প্ল্যান্ট স্থাপনের পরিকল্পনা আছে? অন্য কোন এলাকায় (মেহেরপুর ব্যতীত)?

11. Can you tell us about the partner organization? What will be their role in the WTP intervention once SC leaves?

আপনি কি আমাদেরকে সহযোগী এনজিও গুলোর ব্যাপারে বলতে পারবেন? সেভ দ্য চিলড্রেন চলে গেলে প্ল্যান্ট এর ব্যাপারে সহযোগী এনজিও গুলোর ভূমিকা কি হবে?

Appendix D

Interview Guide

WTP - SIDKO Involvement in Implementation

Duration: 45-60 minutes

Overall Objective: to understand SIDKO's role in the implementation of the WTP in the communities.
সামগ্রিক উদ্দেশ্যঃ উক্ত মহল্লা/গ্রামে 'পানি পরিশোধন কেন্দ্র' প্রকল্প বাস্তবায়নে SIDKO'র ভূমিকা সম্পর্কে ধারণা নেয়া।

Other Objective: to understand the functionality of the plant as well as any post installation support/involvement that SIDKO has given/had.
অন্যান্য উদ্দেশ্যসমূহঃ কিভাবে পানি পরিশোধন কেন্দ্র কাজ করে এবং একই সাথে নির্মান পরবর্তী সময়ে প্রকল্পের সাথে SIDKO'র সহযোগিতা/সম্পৃক্ততা সম্পর্কে ধারণা নেয়া।

Opening Questions

1. What is your role/position in SIDKO?
   SIDKO তে আপনার ভূমিকা/পদবী কি?
2. Are you/have you been involved in the installation of WTPs in these communities in Meherpur? How?
   আপনি কি মেহেরপুরে 'পানি পরিশোধন কেন্দ্র' স্থাপন এর সাথে যুক্ত আছেন/ছিলেন? কিভাবে?
   a. Probe: physically/observer/supervisor/administrator?
      অনুসন্ধানঃ শারীরিকভাবে/পর্যবেক্ষক/সুপারভাইজার/প্রশাসক
3. How were you selected by SC to install the WTPs? Did they contact you or you them? What was the process like?
   প্ল্যান্ট স্থাপনের জন্য আপনাকে কিভাবে নির্বাচিত করা হয়েছিলো? তারা কি আপনার সাথে যোগাযোগ করেছিলো নাকি আপনি তাদের সাথে যোগাযোগ করেছিলেন? প্রক্রিয়াটি কেমন ছিল?

Key Questions

Pre-installation of the WTP

4. What needs to take place before a plant is installed? Who needs to be contacted? Does SC contact you? Is there anyone else that needs to be included in the discussion before the installation of the plant can be initiated? Paperwork involved? Tendering?
   প্ল্যান্ট স্থাপনের আগে কি কি আনুষ্ঠানিকতা সম্পন্ন করতে হয় (অনুসন্ধানঃ টেন্ডার, জায়গা নির্ধারণ করা, অনুমতি নেয়া, ইত্যাদি)? কার সাথে যোগাযোগ করার প্রয়োজন হয়? সেভ দ্য

চিলড্রেন কি আপনাদের সাথে যোগাযোগ করে? প্রকল্পের কাজ শুরু করার আগে আর কেউ কি আছেন যার/যাদের সাথে প্রকল্প বাস্তবায়ন এর প্রাথমিক বিষয়গুলো নিয়ে আলোচনা করতে হয়? কোনো কাগজপত্র/দালিলিক বিষয় কি এখানে জড়িত? টেন্ডারিং?

5. Do you discuss/consult/negotiate with the community where the plant should be built? Do you have a say in the site selection?

প্ল্যান্ট কোন স্থানে তৈরি করা উচিত/উচিত নয় সে বিষয়ে আপনি কি স্থানীয় লোকজনের সাথে আলোচনা/পরামর্শ/মধ্যস্থতা করেন? স্থান নির্বাচনের করতে আপনি কোন ভূমিকা পালন করেন কিনা?

6. Describe the ideal site where a WTP should be installed within a community.

কোনো একটি মহল্লা/গ্রামে প্ল্যান্ট স্থাপন করার জন্য আদর্শ স্থান কীরূপ হওয়া উচিত দয়া করে বিস্তারিত বলুন।

7. We visited a few WTPs for our research and we noticed that many were built next to a pond. Was/is there a particular reason for this?

বেশিভাগ প্ল্যান্টই পুকুরের পাড়ে অবস্থিত। এর বিশেষ কোনো কারণ আছে কিনা?

Installation of the WTP

8. How long did the installation process take? How many SIDKO employees worked on installing the plant?

একটি প্ল্যান্ট স্থাপন করতে গড়পড়তা কত দিন সময় লাগে? SIDKO'র কত জন কর্মী সম্পৃক্ত ছিলেন?

9. Does SIDKO work with anyone else or hire anyone else to assist in the installation of the plant?

প্ল্যান্ট স্থাপনের জন্য সিডকোর বাহিরে অন্য কেউ সম্পৃক্ত কিনা?

a. Probe: someone who does the flooring?

অনুসন্ধান যিনি মেজে পাকা করার কাজ করেন?

10. How deep is the pipe that draws water for the plant? How much water can the plant store?

পানি উত্তলনের জন্য মাটির গভীরে কতদূর পর্যন্ত পাইপ নেয়া হয় (ফুট, মিটার, ইত্যাদি)? প্ল্যান্ট কি পরিমাণ পানি সংরক্ষণ করতে পারে?

11. Is the community usually involved in the installation process? How?

নির্মাণের সময় স্থানীয় লোকজন জড়িত ছিলো কিনা? যদি থাকেন, কিভাবে?

a. Probe: free labour/decision making/monitoring or observing/making suggestions?

অনুসন্ধানঃ বিনা মূল্যে শ্রম দেয়া/ সিদ্ধান্ত নেয়া/ পর্যবেক্ষন করা/ পরামর্শ দেয়া?

12. Is the community welcoming and compliant during the installation process?

প্ল্যান্ট নির্মাণের সময় স্থানীয় লোকজন আপনাদের সাদরে গ্রহণ করেছিলো কিনা এবং আপনাদের প্রতি আন্তরিক ছিলো কিনা?

13. Have you ever had any issues with the community during installation of a WTP? If so, what and how was it resolved?

নির্মাণকালে স্থানীয় লোকজন এর সাথে যেকোনো ধরণের অনাকাঙ্ক্ষিত ঘটনা ঘটেছিলো কিনা? যদি ঘটে থাকে, কিভাবে তার সমাধান হয়েছিলো?

Post installation of WTP

14. What needs to take place after the plant has been installed?
প্ল্যান্ট তৈরি হয়ে যাবার পরে করণীয় কাজ কি?

15. Do you train community members on how to maintain the plant appropriately? how do you train them? What do you train them on? How many people do you train? Do you train them on how to change the iron filter? What is the process of changing the iron filter?
প্ল্যান্ট এর যথাযথ রক্ষণাবেক্ষণ/দেখাশুনা কিভাবে করতে হবে সে ব্যাপারে মহল্লার মানুষদের প্রশিক্ষণ দেয়া হয় কিনা? কিভাবে তাদের প্রশিক্ষণ দেয়া হয়? কি ট্রেনিং দেয়া হয়? কতজনকে দেয়া হয়? কিভাবে আয়রন ফিল্টার পরিবর্তন করতে হয় তা কি শেখানো হয়? কিভাবে পরিবর্তন করতে হয়?

16. Do you give community members instructions on how to appropriately make use of the plant? If so, what do you tell them?
যথাযথভাবে প্ল্যান্ট ব্যবহার পদ্ধতি সম্পর্কে মহল্লাবাসীদেরকে নির্দেশনা দেয়া হয় কিনা? কি ধরনের নির্দেশনা দেয়া হয়?

17. How long after installation is the plant fully functional and ready to be used by the community?
প্ল্যান্ট নির্মাণের পর কতদিনের মধ্যে তা পুরোপুরি ব্যবহার উপযোগী হয় এবং স্থানীয় মানুষ ব্যবহার করতে পারে?

18. What is SIDKO's involvement in the plant post installation? Do you check the plants on a regular basis for functionality? If so, how often? If not, why not?
নির্মাণ পরবর্তীকালে SIDKO'র ভূমিকা কি (প্লান্ট সংক্রান্ত)? প্ল্যান্ট যথাযথ ভাবে কাজ করছে কিনা তা তারা নিয়মিত চেক করেন? যদি করে থাকেন, তবে কতদিন পরপর? যদি না করে থাকেন, কেন করেন না?

19. Is there someone from SIDKO who tests the water from these WTPs to see if they are removing the arsenic and iron? If so, how often? If not, why?
প্ল্যান্ট থেকে সংগৃহীত পানিতে কোন আর্সেনিক ও আয়রন আছে কিনা SIDKO'র পক্ষ থেকে তা পরীক্ষা করা হয় কিনা? যদি করা হয় তবে কত দিন পর করা হয়? যদি না করা হয়, তবে কেন করা হয় না?

20. A community leader that we spoke to said that if they keep the water running for 30 minutes they can tell if the water has arsenic/iron in it because there is a colour change from arsenic free water. Another community mentioned that guava leaves or eggplant will turn black if put in arsenic water. Is there any validity to this? Do you know of any way that the water can be tested for arsenic without making use of a test kit?
পানিতে আর্সেনিক/আয়রন আছে কিনা এমন প্রশ্নের জবাবে একজন গ্রামবাসী বললেন - '৩০ মিনিট ধরে পানি ছেড়ে রাখলেই বোঝা যায়। কেননা পানির রং পরিবর্তন হয়ে যাবে'।

আরেকজন বললেন - 'পেয়ারা পাতা কিংবা বেগুণ এর রং কালো হয়ে যাবে যদি আর্সেনিকযুক্ত পানিতে রাখা হয়'। এসব যুক্তির যথার্থতা আছে কিনা? টেস্ট কীট ব্যতীত আর্সেনিক পরীক্ষা করার অন্য কোন উপায় আছে কিনা?

21. Can you provide us a diagram of how the plant works and explain how the water is filtered?

প্ল্যান্ট কিভাবে কাজ করে তার একটি ডায়াগ্রাম/নকশা কি আমাদের দেখাতে পারবেন এবং ফিল্টার কিভাবে কাজ করে তা ব্যাখ্যা করতে পারবেন?

22. What is the rate of filtration?

প্ল্যান্ট থেকে কি হারে পানি সংগ্রহ করা যায়?

a. Probe: Liters per time?

অনুসন্ধানঃ প্রতি ঘন্টায় কত লিটার?

23. When SC/SIDKO installs a plant do they have a certain number of households in mind who are going to be the beneficiaries of this plant? If so, how many households to one WTP? What happens if many more households in the community make use of the plant? Does SC/SIDKO account for this in some manner? Does it affect the plant in any way if more people are using it than those that are supposed to?

সেভ দ্য চিলড্রেন/সিডকো যখন একটি প্ল্যান্ট স্থাপন করার পরিকল্পনা করে তখন কি 'নির্দিষ্ট সংখ্যক' পরিবার বিবেচনা করা হয় কিনা যারা এই প্ল্যান্ট থেকে উপকৃত হবেন? যদি হয়, একটি প্ল্যান্ট থেকে কতগুলো পরিবার সুবিধাভোগ করে থাকে? যদি ঐ মহল্লার আরো বেশি সংখ্যক মানুষজন সুবিধা নিয়ে থাকে তবে কি ঘটবে? সেভ দ্য চিলড্রেন/সিডকো এই বিষয়গুলো বিবেচনা করে কিনা? অধিক সংখ্যক মানুষ এটা ব্যবহার করলে প্ল্যান্ট এর কোনো ক্ষতিসাধন করে কিনা?

24. How much water can be filtered before the filter needs to be replaced? Have any communities replaced their filters as of yet?

প্রতিস্থাপন এর আগ পর্যন্ত একটি ফিল্টার থেকে কত লিটার পানি সংগ্রহ করা যায়? কোন মহল্লা/গ্রাম ইতিমধ্যে তাদের ফিল্টার পরিবর্তন করেছে কি?

25. What is the process of replacing the filter of a plant? Who needs to be contacted? Who replaces the filter? How much does a new filter cost? How much does replacement cost overall?

ফিল্টার প্রতিস্থাপনের ধাপগুলো কি কি? পরিবর্তনের জন্য কার সাথে যোগাযোগ করতে হয়? কে প্রতিস্থাপন করেন? ফিল্টারের জন্য খরচ কি রকম হয়? ফিল্টার প্রতিস্থাপনের জন্য সব মিলিয়ে কি রকম খরচ হয়?

26. On average, how often has SIDKO had to visit the plants for repairing? What kind of problems with the plant require SIDKO involvement (in terms of repairing)? On average how long do these visits take? (to repair the plant).

একটি প্ল্যান্ট মেরামত (ফিল্টার অথবা যে কোনো ধরণের মেরামত) এর জন্য SIDKO কতৃপক্ষ গড়ে কতদিন সেই এলাকায় পরিদর্শন করেন? প্ল্যান্ট এর ঠিক কি ধরণের সমস্যা হলে সেখানে SIDKO’র সম্পৃক্ততা দরকার হয়? গড়ে প্রতিবার পরিদর্শনের জন্য কত (দিন) সময় লাগে?

27. What kind of plant problems would not require SIDKO involvement?
কি ধরণের সমস্যা হলে তা সমাধানের জন্য SIDKO'র হস্তক্ষেপ দরকার হয় না?

a. Probe: broken tap/motor not working etc.
অনুসন্ধানঃ পানির কল ভেঙ্গে যাওয়া/পানির পাম্প (মটর) অকেজো হয়ে যাওয়া, ইত্যাদি

28. Who contacts SIDKO when there is a problem with the plant that they need to repair?
প্ল্যান্টের যদি কোনো মেরামত এর প্রয়োজন হয় তবে SIDKO'র সাথে কে যোগাযোগ করেন?

a. Probe: SC? Community members? PMC?
অনুসন্ধানঃ সেভ দ্য চিলড্রেন কতৃপক্ষ? মহল্লার কেউ? প্লান্ট ম্যানেজমেন্ট কমিটি?

29. Who usually pays for the repairs made by SIDKO?
সাধারণত SIDKO কে মেরামত বাবদ খরচ কে/কারা যোগান দেন?

30. What is the longevity of the plant if properly maintained?
যদি সঠিকভাবে রক্ষণাবেক্ষণ করা হয় তবে একটি প্ল্যান্ট কতদিন পর্যন্ত ঠিক থাকে?

31. Is SIDKO involved, in any way, with the maintenance of these plants post installation? If so, how? For how long?
প্ল্যান্ট স্থাপন পরবর্তী সময়ে এর রক্ষণাবেক্ষণ/দেখাশুনা করার জন্য SIDKO কোনভাবে সম্পৃক্ত কিনা? যদি থাকে, কিভাবে? কত সময় পর্যন্ত?

<u>Closing Questions</u>

32. You have been implementing WTPs for SC since 2009. Has the cost of the WTPs changed over time? If so, how/why?
আপনারা ২০০৮ থেকে সেভ দ্য চিলড্রেন এর সাথে প্ল্যান্ট স্থাপনের কাজ করছেন। এই সময়ের প্ল্যান্ট এর খরচ বৃদ্ধি পেয়েছে কিনা? যদি পায়, তবে কিভাবে/কেন?

33. Have you modified the design of the WTP since you first installed one (before SC even)? If so, how? Is it possible to install a plant if there is no electricity line in an particular area?
শুরু থেকে আজ পর্যন্ত প্ল্যান্ট এর নকশার কোন পরিবর্তন করেছেন কিনা? যদি করেন, কিভাবে? কোন নির্দিষ্ট গ্রামে বিদ্যুৎ না থাকলে সেখানে প্ল্যান্ট স্থাপন করা সম্ভব কিনা?

34. What have been the main challenges that SIDKO has faced in concern to the WTPs within these communities in Meherpur?
এই সকল মহল্লা/গ্রামে প্ল্যান্ট সম্পর্কিত কাজের জন্য SIDKO কি ধরণের সমস্যার সমুক্ষীন হয়েছিলো?

35. Do you have any suggestions for the communities/CCG/PMC/SC in terms of the best ways to maintain and ensure the longevity of the plant?
প্ল্যান্ট এর সার্বিক উন্নয়ন/রক্ষণাবেক্ষণ এর জন্য স্থানীয় মানুষজন/CCG/PMC/SC এর জন্য আপনার কোনো পরামর্শ আছে কি?

36. Do you think that these communities will be able to sustain the plants long term if SC leaves? Why or why not?

সেভ দ্য চিলড্রেন যদি কার্যক্রম বন্ধ করে দেয় তবে মহল্লাবাসী প্ল্যান্ট যথাযথ দেখাশুনা করবে বলে আপনি মনে করেন কি? কেন কিংবা কেন নয়?

37. Do you have any advice for a future community that may be receiving a plant?

ভবিষ্যতে কোন মহল্লায় প্ল্যান্ট করতে চাইলে তার জন্য আপনার কোনো পরামর্শ আছে কি?

a. Probe: Something that maybe the community could do to smoothen the process of of installing and maintaining the WTP?

অনুসন্ধানঃ এমন কোন পরামর্শ যা হয়ত আগে থেকেই আপনার আগের মহল্লায় করলে প্ল্যান্ট স্থাপন এবং রক্ষণাবেক্ষণ সহজতর হত।

38. Is there anything else you would like to tell us about SIDKO and the WTP within these communities?

এই সকল মহল্লা/গ্রাম এবং SIDKO'র ব্যাপারে প্ল্যান্ট সম্পর্কিত আর কোন তথ্য আপনি যুক্ত করতে চান কিনা?

Appendix E

Interview Guide

WTP - Plant Management Committee (PMC)
Duration: 30-45 minutes

Overall Objective: to get an overview of how the WTP intervention was implemented and is being maintained within the community from the perspective of the PMC.

Opening Questions

1. How long have you lived here for?
   আপনি এখানে কতদিন যাবত বসবাস করছেন?
2. What is your role within the Plant Management Committee?
   প্ল্যান্ট ব্যবস্থাপনা কমিটিতে আপনার ভূমিকা কি?
3. How long have you had this position for?
   আপনি ব্যবস্থাপনা কমিটিতে কতদিন যাবত আছেন?
4. When was the PMC formed? How was it formed? Was there someone from SC who encouraged you to form it? Who makes up the PMC?
   PMC কখন/কবে গঠিত হয়েছিলো? কিভাবে গঠিত হয়েছিলো? PMC গঠনের জন্য কি সেভ দ্য চিলড্রেন আপনাদের উৎসাহিত করেছিলো? কারা PMC গঠন করেছিলো?
5. How many households are the beneficiaries of this WTP?
   প্ল্যান্ট থেকে মোট কতগুলো পরিবার সুবিধাভোগ করে থাকেন?

Key Questions

Pre-installation of the WTP

6. Do you know how the site for the WTP was selected? Can you describe the process? Were you involved?
   কিভাবে প্ল্যান্ট স্থাপনের জন্য জায়গা নির্ধারণ করা হয়েছিলো আপনি জানেন কি? আপনি কি এ ব্যাপারে বিস্তারিত বলতে পারবেন? আপনি কি এর সাথে সংযুক্ত ছিলেন?
7. Who was involved in the process? Who in the community gave the land for the site? Do they have extra privileges to the WTP? If yes, what are they?
   সমস্ত প্রক্রিয়া সম্পন্ন করার সময় কারা কারা এর সাথে জড়িত ছিলেন (অনুসন্ধানঃ মহল্লা/SIDKO/StC)? প্ল্যান্ট এর জন্য জমি কে/কারা দান করেছিলেন? প্ল্যান্ট এর যে কোনো বিষয়ে তাদেরকে কি অগ্রাধিকার দেয়া হয় কিনা? যদি দেয়া হয়, তাদেরকে কি ধরণের অগ্রাধিকার দেয়া হয়?
8. How were the final decisions made about the site for the WTP?
   নির্মাণস্থান নির্ধারণের জন্য চূড়ান্ত সিদ্ধান্ত কিভাবে নেয়া হয়েছিলো?

a. Probe: community voting/leadership vote etc.

অনুসন্ধানঃ সর্বসাধারণের ভোট/নীতি নির্ধারকদের ভোট এর মাধ্যমে?

Installation of the WTP

9. Were you involved in the installation process? How?

প্ল্যান্ট স্থাপনের সময় আপনি কি জড়িত ছিলেন? কিভাবে?

a. Probe: Were you physically involved?/Did you observe the installation?/Were you financially involved?

অনুসন্ধানঃ আপনি কি শারিরিক ভাবে সেখানে উপস্থিত ছিলেন (শারিরিক শ্রম দিয়েছিলেন কিনা)?/প্লান্ট স্থাপনের সময়ে পর্যবেক্ষণ করেছিলেন কিনা?/ কোনো আর্থিক সহায়তা প্রদান করেছিলেন কিনা?

10. What was the process that took place to initiate the installation of the WTP?

প্ল্যান্ট স্থাপন করার জন্য প্রাথমিক ভাবে কি কি পদক্ষেপ নেয়া হয়েছিল?

a. Probe: Paperwork involved? Discussions with SC? Who did the community need to talk to to start the process?

অনুসন্ধানঃ কাগজ/দালিলিক সম্পৃক্ততা? সেভ দ্য চিলড্রেন এর সাথে আলোচনা? পুরো প্রক্রিয়া শুরু করার জন্য কে/কারা মহল্লার/গ্রামের প্রতিনিধিত্ব করেছিলেন?

11. Who funded the installation?

প্লান্ট স্থাপনের জন্য আর্থিক সহায়তা কে/কারা প্রদান করেছিলেন?

a. Probe: community members/ community leaders/SC?

অনুসন্ধানঃ মহল্লা/গ্রাম এর মানুষজন/নীতি নির্ধারকগণ/ সেভ দ্য চিলড্রেন?

12. Do you know how the WTP was installed? If so, who installed it? When was it installed? Who were the key actors in the installation process?

কিভাবে প্ল্যান্ট স্থাপন করা হয়েছিল আপনি জানেন কি? প্ল্যান্ট কারা তৈরি করেছিল? কবে তৈরি করা হয়েছিল? প্ল্যান্ট স্থাপনের সময় কারা কারা প্রধান ভূমিকা পালন করেছিলেন?

13. Was the community involved in the installation of the WTP?

প্ল্যান্ট তৈরির সময় মহল্লার মানুষজন জড়িত ছিল কিনা?

a. Probe: free labour/decision making/monitoring or observing/making suggestions?

অনুসন্ধানঃ বিনা মূল্যে শ্রম/সিদ্ধান্ত দেয়া/পর্যবেক্ষন করা/পরামর্শ দেয়া?

14. Did anything have to take place after the plant was installed before water could be taken from the plant by the community?

প্ল্যান্ট স্থাপন করার পরে এর থেকে পানি সংগ্রহ করার জন্য আরও কোনো আনুষ্ঠানিকতা করা হয়েছিলো কিনা?

15. How long was the process from initiation of plant installment to the community being able to use the water from the plant?

প্ল্যান্ট স্থাপন বিষয়ক আলোচনা শুরু হওয়া থেকে প্ল্যান্ট স্থাপনের কাজ শেষ হওয়া পর্যন্ত কত সময় লেগেছিলো?

a. Probe: weeks/months/years?

অনুসন্ধানঃ সপ্তাহ/মাস/বছর?

Maintenance of the WTP

16. Were you trained on how to appropriately look after the plant once it was installed? If so how, and by whom?

প্ল্যান্ট স্থাপনের পরে কিভাবে এর দেখাশুনা করা যায় সে ব্যাপারে আপনাদের কোনো প্রশিক্ষন দেয়া হয়েছিলো কিনা? হলে, কিভাবে এবং কারা প্রশিক্ষন দিয়েছিলো?

17. Who is responsible for maintaining the WTP?

প্ল্যান্ট এর রক্ষণাবেক্ষণ এর দায়িত্বে কে আছেন?

a. Probe: Community members? PMC member? CCG? Cleaning? Guard? Other? Buying tools? *Get details about the different people involved in maintenance of the plant.*

অনুসন্ধানঃ মহল্লার মানুষজন? PMC? CCG? পরিষ্কার পরিচ্ছন্নতা? পাহারা দেয়া? মেরামতের জন্য যন্ত্রাংশ ক্রয় করা? *(প্ল্যান্ট এর রক্ষণাবেক্ষণ এ থাকা সংশ্লিষ্ট সকলের দায়িত্বের বিষয়ে বিস্তারিত জানতে হবে)*

b. If CCG is mentioned: What is the difference in the role of the CCG and PMC regarding the maintenance of the plant?

যদি CCG'র কথা উল্লেখ করা হয়ঃ রক্ষণাবেক্ষণ এর জন্য CCG এবং PMC এর কাজের মধ্যে পার্থক্য কি?

18. Is there someone responsible for money handling/collection for the WTP? If so, where is the money coming from? Community members/leaders? Have you ever had any issues concerning the handling of money?

প্ল্যান্ট এর জন্য টাকা সংগ্রহ/ব্যয় সংক্রান্ত বিষয়াদি পরিচালনা করার জন্য কি কেউ আছেন? যদি থাকেন, টাকা সংগ্রহের উৎস কি (টাকা কারা প্রদান করেন)? মহল্লা/গ্রামের মানুষ/নীতি নির্ধারক? কখনো টাকা পয়সা সংক্রান্ত কোনো সমস্যা হয়েছিলো কিনা?

19. If community members are paying for the upkeep of the WTP, were they informed before the installation of the WTP that they would have to contribute to paying for it? If so, were there any objections to this? If so, how were these objections dealt with?

প্ল্যান্ট সচল রাখতে মহল্লার মানুষদের আর্থিক সহযোগিতা প্রদান করতে হবে - এই বিষয়ে মহল্লার মানুষ প্ল্যান্ট স্থাপনের আগে থেকেই অবগত কিনা? যদি অবগত থাকেন, তারা কি এর বিরোধিতা করেছিলেন? যদি করেন, তাদেরকে কিভাবে রাজি করানো হয়েছিলো?

20. Do you have a bank account where you keep all the money you collect/have for the plant? Are you saving up money for the plant's future?

আপনাদের কি কোনো ব্যাংক একাউন্ট আছে যেখানে সংগৃহীত টাকা জমা রাখা হয়? ভবিষ্যতে ব্যবহারের জন্য আপনারা অর্থ সঞ্চয় করেন কিনা?

21. Is there someone with the community/from SIDKO/from SC who tests the water of the WTP regularly to see if it is removing the arsenic? If so, how often is it checked? If not, is there a way you make sure that the filter is working appropriately? If so, how?

সেভ দ্য চিলড্রেন কিংবা SIDKO থেকে কেউ কি নিয়মিত প্ল্যান্টের পানিতে আর্সেনিক আছে কিনা তা পরীক্ষা করার জন্য আসেন? যদি আসেন, কতদিনে একবার তা পরীক্ষা করা হয়?

যদি না আসেন, ফিল্টার ঠিকমত কাজ করছে কিনা সেটা নির্ণয় করার অন্য কোনো উপায় আছে কিনা?

22. The filter must be changed every 3-5 years. Have they changed the filter yet? If so, who paid for this? How much was it? Who replaced the filter? How long did it take?

সাধারণত ৩-৫ বছর পরপর ফিল্টার পরিবর্তন এর প্রয়োজন হতে পারে। আপনারা কি কখনো ফিল্টার পরিবর্তন করেছিলেন কিনা? পরিবর্তন করে থাকলে, কারা আর্থিক সহায়তা করেছিলো? কারা ফিল্টার প্রতিস্থাপন করেছিলেন? সংস্কার এর জন্য কত টাকা খরচ হয়েছিলো?

23. What is the process for cleaning the filters to remove the arsenic buildup? Do you have any special equipment for this process? If so, where did you get the equipment from? Are specific people assigned specific jobs in terms of cleaning the WTP?

ফিল্টারের আর্সেনিক পরিষ্কার করার প্রক্রিয়া কি? এর জন্য আলাদা কোনো যন্ত্রপাতির প্রয়োজন আছে কি? থাকলে, কোথা থেকে আপনারা সেই যন্ত্রপাতি সংগ্রহ করেন? প্ল্যান্ট পরিষ্কার এর বিভিন্ন ধাপের জন্য আলাদা আলাদা লোক দায়িত্বে আছেন কিনা?

24. Has the plant ever needed minor repairing? If so, is there a community member who can (and does) repair any problems that the water treatment plant incurs? If so, who? Are they able to repair the issue within a reasonable amount of time?

প্ল্যান্ট এর কখনো খুদ্র মেরামত এর প্রয়োজন হয়েছিলো কিনা? যদি হয়, আপনাদের গ্রামে/সমাজে এমন কেউ (মিস্ত্রী) আছেন যিনি প্লান্ট এর কোন মেরামত এর প্রয়োজন হলে তা করতে পারেন (এবং করেন)? যদি থাকেন, তিনি কে? তারা কি যথাযথ সময়ের মধ্যে তা মেরামত করতে সক্ষম?

25. Has the plant ever needed major repairing (assistance from SIDKO)? If so, who paid for the repairing? What was the PMC role in this?

প্লান্ট এর কখনো বড় ধরণের মেরামত প্রয়োজন হয়েছিলো কিনা (SIDKO এর সহযোগিতায়)? যদি হয়, সংস্কারের ব্যয়ভার কারা বহন করেছিলো? তখন PMC এর ভূমিকা কি ছিলো?

26. How long does it take on average to repair the plant if needed? What have been the main problems with the plant?

মেরামতের প্রয়োজন হলে তা সমাধান করতে গড়পড়তা কেমন সময় লাগে?

27. Have you ever needed to buy parts in order to fix the WTP? Where do you get the parts that are needed for repairing the WTP?

মেরামতের জন্য কখনো খুচরা যন্ত্রাংশ ক্রয় করার দরকার হয়েছিলো কিনা? যদি হয়, খুচরা যন্ত্রাংশ কোথা থেকে ক্রয় করেছিলেন?

a. Probe: vandalism/natural disaster/broken parts

অনুসন্ধানঃ মানব সৃষ্ট ক্ষয়ক্ষতি/প্রাকৃতিক দূর্যোগ/ভাঙ্গা যন্ত্রাংশ ইত্যাদি

28. What have been the main challenges that you have faced in concern to the WTP since it was implemented into your community?

প্ল্যান্ট স্থাপনের পর থেকে তা নিয়ে এ পর্যন্ত প্রধানত কি কি সমস্যার সম্মুখীন হতে হয়েছে ?

Closing Questions

29. How often do the SC staff visit your community/plant?
সেভ দ্য চিলড্রেন এর লোকজন আপনাদের গ্রামে/মহল্লায় কতদিন পরপর আসেন?

a. Probe: in a month? in three months?
অনুসন্ধানঃ মাসে একবার? তিনমাসে একবার?

30. What do they do when they visit your community?
এখানে পরিদর্শনে আসার পরে তারা কি করেন?

31. Do you think this intervention is benefiting the community? If so, how?
আপনি কি মনে করেন প্ল্যান্ট থেকে আপনাদের গ্রাম/সমাজ উপকৃত হচ্ছে? যদি হয়, কিভাবে?

32. Do you think the community will be able to sustain the WTP once SC leaves? Why or why not? What are the long term plans for the WTP in this community?
আপনি কি মনে করেন সেভ দ্য চিলড্রেন যদি সহযোগিতা/কার্যক্রম বন্ধ করে দেয় তবে আপনাদের মহল্লা/গ্রাম আপনাদের মহল্লার মানুশজন প্ল্যান্টটি নিজ উদ্যোগে চালু রাখবে, প্রয়োজন হলে মেরামত করবে? কেন কিংবা কেন নয়? প্ল্যান্ট নিয়ে আপনাদের দীর্ঘমেয়াদী পরিকল্পনাসমূহ কি কি?

33. Do you have any suggestions regarding the plant?
প্ল্যান্টের সার্বিক উন্নয়নে আপনার কোনো পরামর্শ আছে কি?

a. Probe: anything that can be done to enhance the benefit of the plant for the community?/increase sustainability of plant by community?
অনুসন্ধানঃ এমন কোন কিছু/উদ্যোগ যা করা হলে প্ল্যান্ট এর জন্য আরো ভালো হয়?/ প্ল্যান্ট এর সার্বিক উন্নয়নে ভূমিকা রাখতে পারে?

34. Do you have any advice for a future community that may be receiving a plant like the one you have?
ভবিষ্যতে অন্য কোনো মহল্লায় যদি এরকম প্ল্যান্ট স্থাপন করা হয় তবে তাদের জন্য আপনার কোনো পরামর্শ আছে কিনা?

a. Probe: Something that maybe your community could have done differently to smoothen the process of of installing and maintaining the WTP?
এমন কিছু যা আপনি হয়ত মনে করেন যে আপনার মহল্লায় প্ল্যান্ট স্থাপন্ এর পূর্বে করলে ভালো হত?

35. Do you have any message you would like to give Save the Children about how you feel about the plant?
প্ল্যান্ট নিয়ে আপনার অনুভূতি কি যা আপনি সেভ দ্য চিলড্রেন কে জানাতে চান?

36. Do you have anything else to say about the WTP and PMC?
প্ল্যান্ট এবং PMC'র ব্যাপারে আর কোন তথ্য কি আপনি যুক্ত করতে চান?

Appendix F

Interview Guide

WTP - Community Core Group (CCG)
Duration: 30-45 minutes

Overall Objective: to get an overview of the implementation of the WTP from the perspective of the community leadership.

Opening Questions

1. How long have you lived here for?
   আপনি এখানে কতদিন যাবত বসবাস করছেন?
2. What is your role within the CCG?
   ব্যবস্থাপনা কমিটিতে আপনার ভূমিকা কি?
3. How long have you had this position for?
   আপনি ব্যবস্থাপনা কমিটিতে কতদিন যাবত আছেন?
4. How many families live in this community?
   এই মহল্লায় কতগুলো পরিবার বসবাস করে?
5. How many households are the beneficiaries of this WTP?
   প্ল্যান্ট থেকে মোট কতগুলো পরিবার সুবিধাভোগ করে থাকেন?
6. How was the CCG formed in this community? Was there someone from SC who encouraged you to form it? Do CCG members make up part of the PMC? What is the dynamic between the CCG and PMC in terms of the WTP?
   এই মহল্লায়/গ্রামে CCG কিভাবে গঠন করা হয়েছিলো? CCG গঠনের জন্য কি সেভ দ্য চিলড্রেন আপনাদের উৎসাহিত করেছিলো? CCG'র সদস্যরা একইসাথে PMC'র সদস্য কিনা? পানি পরিশোধন কেন্দ্র'র ব্যাপারে CCG ও PMC মধ্যকার ভূমিকা কি?
7. Have you seen the WTP? Where is it located?
   আপনি কি পানি পরিশোধন কেন্দ্রটি দেখেছেন? এটা কোথায় অবস্থিত?

Key Questions

Maintenance of the WTP

8. Who is responsible for maintaining the WTP?
   প্ল্যান্ট এর রক্ষণাবেক্ষণ এর দায়িত্বে কে আছেন?

a. Probe: Community members? PMC member? CCG? Cleaning? Guard? Other? Buying tools? *Get details about the different people involved in maintenance of the plant.*
   অনুসন্ধানঃ মহল্লার মানুষজন? PMC? CCG? পরিষ্কার পরিচ্ছন্নতা? পাহারা দেয়া? মেরামতের জন্য যন্ত্রাংশ ক্রয় করা? *(প্ল্যান্ট এর রক্ষণবেক্ষণ এ থাকা সংশ্লিষ্ট সকলের দায়িত্বের বিষয়ে বিস্তারিত জানতে হবে)*

9. Is there someone responsible for money handling/collection for the WTP? If so, where is the money coming from? Community members/leaders? Have you ever had any issues concerning the handling of money?

প্ল্যান্ট এর জন্য টাকা সংগ্রহ/ব্যয় সংক্রান্ত বিষয়াদি পরিচালনা করার জন্য কি কেউ নিযুক্ত আছেন? যদি থাকেন, টাকা সংগ্রহের উৎস কি (টাকা কারা প্রদান করেন)? মহল্লা/গ্রামের মানুষ/নীতি নির্ধারক? কখনো টাকা পয়সা সংক্রান্ত কোনো সমস্যা হয়েছিলো কিনা?

10. If community members are paying for the upkeep of the WTP, were they informed before the installation of the WTP that they would have to contribute to paying for it? If so, were there any objections to this? If so, how were these objections dealt with?

প্ল্যান্ট সচল রাখতে মহল্লার মানুষদের আর্থিক সহযোগিতা প্রদান করতে হবে - এই বিষয়ে মহল্লার মানুষ প্ল্যান্ট স্থাপনের আগে থেকেই অবগত কিনা? যদি অবগত থাকেন, তারা কি এর বিরোধিতা করেছিলেন? যদি করেন, তাদেরকে কিভাবে রাজি করানো হয়েছিলো?

11. If community members are paying for the upkeep of the plant, how was it decided how much each household should pay? What about households who are making use of the WTP but are not contributing to paying for it? Is there some way that you monitor who is making use of the WTP?

প্ল্যান্ট সচল রাখতে যদি মহল্লার মানুষ আর্থিক সহায়তা দিয়ে থাকেন, ঘরপ্রতি কত টাকা করে দেয়া হয়ে সেটা কিভাবে নির্ধারণ করা হয়েছিলো? যেসব পরিবার এই প্ল্যান্ট থেকে উপকৃত হচ্ছে কিন্তু আর্থিকভাবে সহযোগিতা করছে না তাদের ব্যাপারে কি ভাবছেন? এরকম পরিবারগুলোকে সনাক্ত করার কোনো প্রক্রিয়া আছে কি?

12. Is there a record of how much money has been collected so far from the community since the implementation of the WTP? If so, who can be contacted to find out this amount?

এ পর্যন্ত কত টাকা সংগ্রহ করা হয়েছে তার কি কোনো কাগজপত্র আছে? যদি থাকে, কার সাথে যোগাযোগ করলে সে সম্পর্কিত তথ্য পাওয়া যাবে?

13. Do you have a limit on how much water can be collected by each household?

একেকটি পরিবার কি পরিমান পানি সংগ্রহ করতে পারবে তার ব্যাপারে কি কোনো বাধ্যবাধকতা আছে?

14. Do you have a bank account where you keep all the money you collect/have for the plant? Are you saving up money for the plant's future?

আপনাদের কি কোনো ব্যাংক একাউন্ট আছে যেখানে সংগৃহীত টাকা জমা রাখা হয়? ভবিষ্যতে ব্যবহারের জন্য আপনারা অর্থ সঞ্চয় করেন কিনা?

15. Is there someone with the community/from SIDKO/from SC who tests the water of the WTP regularly to see if it is removing the arsenic and iron? If so, how often is it checked? If not, is there a way you make sure that the filter is working appropriately?

সেভ দ্য চিলড্রেন কিংবা SIDKO থেকে কেউ কি নিয়মিত প্ল্যান্টের পানিতে আয়রন এবং আর্সেনিক আছে কিনা তা পরীক্ষা করার জন্য আসেন? যদি আসেন, কতদিনে একবার তা

পরীক্ষা করা হয়? যদি না আসেন, ফিল্টার ঠিকমত কাজ করছে কিনা সেটা নির্ণয় করার অন্য কোনো উপায় আছে কিনা?

16. The filter must be changed every 3-5 years. Have they changed the filter yet? If so, who paid for this? How much was it? Who replaced the filter? How long did it take?

সাধারণত ৩-৫ বছর পরপর ফিল্টার পরিবর্তন এর প্রয়োজন হতে পারে। আপনারা কি কখনো ফিল্টার পরিবর্তন করেছিলেন কিনা? পরিবর্তন করে থাকলে, কারা আর্থিক সহায়তা করেছিলো? সংস্কার এর জন্য কত টাকা খরচ হয়েছিলো? ফিল্টার প্রতিস্থাপন কে করেছিলো? প্রতিস্থাপন এর জন্য কতদিন সময় লেগেছিলো?

17. Has the plant ever needed minor repairing? If so, is there a community member who can (and does) repair minor problems that the water treatment plant incurs? If so, who? Are they able to repair the issue within a reasonable amount of time?

কখনো প্ল্যান্টের খুদ্র মেরামত এর প্রয়োজন হয়েছিলো কিনা? আপনাদের গ্রামে/সমাজে এমন কেউ (মিস্ত্রী) আছেন যিনি প্লান্ট এর কোন মেরামত এর প্রয়োজন হলে তা করতে পারেন (এবং করেন)? যদি থাকেন, তিনি কে? তিনি/তারা কি যথাসময়ের মধ্যে মেরামত সম্পন্ন করেন?

18. Has the plant ever needed major repairing (assistance from SIDKO)? If so, who paid for the repairing? What was the CCG role in this?

প্ল্যান্ট এর কখনো কি বড় ধরনের কোনো মেরামত এর দরকার হয়েছিলো কিনা? যদি হয়, মেরামত এর খরচ কে বহন করেছিলো? মেরামতকালে CCG এর ভূমিকা কি ছিলো?

19. How long does it take on average to repair the plant if needed? What have been the main problems with the plant?

মেরামত প্রয়োজন হলে তার জন্য গড়পড়তা কেমন সময় লাগে? আপনারা মূলত প্ল্যান্ট সংক্রান্ত কি ধরণের সমস্যার সম্মুখীন হন?

a. Probe: vandalism/natural disaster/broken parts etc.

অনুসন্ধানঃ মানবসৃষ্ট ক্ষয় ক্ষতি/প্রাকৃতিক দূর্যোগ/খুচরা যন্ত্রাংশ ভেঙ্গে যাওয়া, ইত্যাদি।

20. Have you ever needed to buy parts in order to fix the WTP? Where do you get the parts that are needed for repairing the WTP? How far is this place from the WTP?

প্ল্যান্ট এর মেরামতের জন্য আপনার কখনো কোন যন্ত্রাংশ কিনতে হয়েছিলো কিনা? মেরামতের জন্য প্রয়োজনীয় যন্ত্রাংশগুলো কোথা থেকে কিনেছিলেন? এখান থেকে তার দূরত্ব কতটুকু?

21. Where do the community collect drinking water from when the WTP is not functional?

প্ল্যান্ট অকেজো হয়ে গেলে মহল্লার মানুষ কোথা থেকে খাবার পানি সংগ্রহ করে?

22. Is there ever a queuing problem at the WTP? If so, when does this usually happen?

পানি সংগ্রহের জন্য কি লাইনে দাঁড়িয়ে থাকতে হয়? যদি হয়, তা কোন সময়টাতে ঘটে?

23. What support do you or any of the CCG members provide to make the WTP functional? If the CCG provides financial support, why do they?

প্ল্যান্ট চালু রাখার জন্য আপনি কিংবা CCG'র সদস্যরা কি ধরণের সহযোগিতা করে থাকেন? যদি CCG সদস্যরা আর্থিক সাহায্য প্রদান করে থাকেন তবে তারা তা কেনো করেন?

24. What have been the main challenges that you have faced in terms of the WTP since it's implementation into your community?

প্ল্যান্ট চালু হবার পর থেকে আজ পর্যন্ত মূলত কি কি সমস্যা আপনারা সম্মুখীন হয়েছেন?

Closing Questions

25. How often do the SC staff visit your community/plant?

সেভ দ্য চিলড্রেন এর লোকজন আপনাদের গ্রামে/মহল্লায় কতদিন পরপর আসেন?

a. Probe: in a month? in three months?

অনুসন্ধানঃ মাস, সপ্তাহ, ১৫ দিন?

26. What do they do when they visit your community?

এখানে পরিদর্শনে আসার পরে তারা কি করেন?

27. Do you think this intervention is benefiting the community? If so, how?

আপনি কি মনে করেন প্ল্যান্ট থেকে আপনাদের গ্রাম/সমাজ উপকৃত হচ্ছে? যদি হয়, কিভাবে?

28. Does the plant meet the community's drinking water needs?

প্ল্যান্ট থেকে প্রাপ্ত পানি কি আপনাদের মহল্লার খাবার পানির যে চাহিদা আছে তার তুলনায় যথেষ্ট?

29. Do you think the community will be able to sustain the WTP once SC leaves? Why or why not? What are the long term plans for the WTP in this community?

আপনি কি মনে করেন সেভ দ্য চিলড্রেন যদি সহযোগিতা/কার্যক্রম বন্ধ করে দেয় তবে আপনাদের মহল্লা/গ্রাম আপনাদের পানি সংশোধন কেন্দ্র নিজ উদ্যোগে চালু রাখবে, প্রয়োজন হলে মেরামত করবে? কেন কিংবা কেন নয়? প্ল্যান্ট নিয়ে আপনাদের দীর্ঘমেয়াদী পরিকল্পনাসমূহ কি কি?

30. Do you have any suggestions to improve the WTPs operations within the community?

আপনাদের মহল্লার প্ল্যান্টের সার্বিক উন্নয়নের জন্য আপনার কোনো পরামর্শ আছে কিনা?

31. Do you have any advice for a future community that may be receiving a plant like the one you have?

ভবিষ্যতে অন্য কোনো মহল্লায় যদি এরকম প্ল্যান্ট স্থাপন করা হয় তবে তাদের জন্য আপনার কোনো পরামর্শ আছে কিনা?

a. Probe: Something that maybe your community could have done differently to smoothen the process of of installing and maintaining the WTP?

এমন কিছু যা আপনি হয়ত মনে করেন যে আপনার মহল্লায় প্ল্যান্ট স্থাপন্ এর পূর্বে করলে ভালো হত?

32. Do you have any message you would like to give Save the Children about how you feel about the plant?

প্ল্যান্ট নিয়ে আপনার অনুভূতি কি যা আপনি সেভ দ্য চিলড্রেন কে জানাতে চান?

33. Do you have anything else to say about the WTP and CCG?

প্ল্যান্ট এবং CCG'র ব্যাপারে আর কোন তথ্য কি আপনি যুক্ত করতে চান?

Appendix G

Interview Guide

WTP - PMC and CCG Combined
Duration: 45-60 minutes

Overall Objective: to get an overview of the implementation of the WTP from the perspective of the community leadership.

Opening Questions

1. How long have you lived here for?
   আপনি এখানে কতদিন যাবত বসবাস করছেন?
2. What is your role within the CCG?
   ব্যবস্থাপনা কমিটিতে আপনার ভূমিকা কি?
3. How long have you had this position for?
   আপনি ব্যবস্থাপনা কমিটিতে কতদিন যাবত আছেন?
4. How many families live in this community? How many households are the beneficiaries of this WTP?
   এই মহল্লায় কতগুলো পরিবার বসবাস করে? প্ল্যান্ট থেকে মোট কতগুলো পরিবার সুবিধাভোগ করে থাকেন?
5. How was the CCG formed in this community? Was there someone from SC who encouraged you to form it? How was the PMC formed? What is the dynamic between the CCG and PMC in terms of the WTP?
   এই মহল্লায়/গ্রামে CCG কিভাবে গঠন করা হয়েছিলো? CCG গঠনের জন্য কি সেভ দ্য চিলড্রেন আপনাদের উৎসাহিত করেছিলো? কিভাবে PMC গঠন করা হয়েছিলো? CCG'র সদস্যরা একইসাথে PMC'র সদস্য কিনা? পানি পরিশোধন কেন্দ্র'র ব্যাপারে CCG ও PMC মধ্যকার ভূমিকা কি?
6. Have you seen the WTP? Where is it located?
   আপনি কি পানি পরিশোধন কেন্দ্রটি দেখেছেন? এটা কোথায় অবস্থিত?

Key Questions

Pre-installation of the WTP

7. Do you know how the site for the WTP was selected? Can you describe the process? Were you involved?
   কিভাবে প্ল্যান্ট স্থাপনের জন্য জায়গা নির্ধারণ করা হয়েছিলো আপনি জানেন কি? আপনি কি এ ব্যাপারে বিস্তারিত বলতে পারবেন? আপনি কি এর সাথে সংযুক্ত ছিলেন?
8. Who was involved in the process? Who in the community gave the land for the site? Do they have extra privileges to the WTP? If yes, what are they?

সমস্ত প্রক্রিয়া সম্পন্ন করার সময় কারা কারা এর সাথে জড়িত ছিলেন (অনুসন্ধানঃ মহল্লা/SIDKO/StC)? প্ল্যান্ট এর জন্য জমি কে/কারা দান করেছিলেন? প্ল্যান্ট এর যে কোনো বিষয়ে তাদেরকে কি অগ্রাধিকার দেয়া হয় কিনা? যদি দেয়া হয়, তাদেরকে কি ধরণের অগ্রাধিকার দেয়া হয়?

9. How were the final decisions made about the site for the WTP?
নির্মাণস্থান নির্ধারণের জন্য চূড়ান্ত সিদ্ধান্ত কিভাবে নেয়া হয়েছিলো?

a. Probe: community voting/leadership vote etc.
অনুসন্ধানঃ সর্বসাধারণের ভোট/নীতি নির্ধারকদের ভোট এর মাধ্যমে?

Installation of the WTP

10. Were you involved in the installation process? How?
প্ল্যান্ট স্থাপনের সময় আপনি কি জড়িত ছিলেন? কিভাবে?

a. Probe: Were you physically involved?/Did you observe the installation?/Were you financially involved?
অনুসন্ধানঃ আপনি কি শারিরিক ভাবে সেখানে উপস্থিত ছিলেন (শারিরিক শ্রম দিয়েছিলেন কিনা)?/প্লান্ট স্থাপনের সময়ে পর্যবেক্ষণ করেছিলেন কিনা?/ কোনো আর্থিক সহায়তা প্রদান করেছিলেন কিনা?

11. What was the process that took place to initiate the installation of the WTP?
প্ল্যান্ট স্থাপন করার জন্য প্রাথমিক ভাবে কি কি পদক্ষেপ নেয়া হয়েছিল?

a. Probe: Paperwork involved? Discussions with SC? Who did the community need to talk to to start the process?
অনুসন্ধানঃ কাগজ/দালিলিক সম্পৃক্ততা? সেভ দ্য চিলড্রেন এর সাথে আলোচনা? পুরো প্রক্রিয়া শুরু করার জন্য কে/কারা মহল্লার/গ্রামের প্রতিনিধিত্ব করেছিলেন?

12. Who funded the installation?
প্লান্ট স্থাপনের জন্য আর্থিক সহায়তা কে/কারা প্রদান করেছিলেন?

a. Probe: community members/ community leaders/SC?
অনুসন্ধানঃ মহল্লা/গ্রাম এর মানুষজন/নীতি নির্ধারকগণ/ সেভ দ্য চিলড্রেন?

13. Do you know how the WTP was installed? If so, who installed it? When was it installed? Who were the key actors in the installation process?
কিভাবে প্ল্যান্ট স্থাপন করা হয়েছিল আপনি জানেন কি? প্ল্যান্ট কারা তৈরি করেছিল? কবে তৈরি করা হয়েছিল? প্ল্যান্ট স্থাপনের সময় কারা কারা প্রধান ভূমিকা পালন করেছিলেন?

14. Was the community involved in the installation of the WTP?
প্ল্যান্ট তৈরির সময় মহল্লার মানুষজন জড়িত ছিল কিনা?

a. Probe: free labour/decision making/monitoring or observing/making suggestions?
অনুসন্ধানঃ বিনা মূল্যে শ্রম/সিদ্ধান্ত দেয়া/পর্যবেক্ষন করা/পরামর্শ দেয়া?

15. Did anything have to take place after the plant was installed before water could be taken from the plant by the community?

প্ল্যান্ট স্থাপন করার পরে এর থেকে পানি সংগ্রহ করার জন্য আরও কোনো আনুষ্ঠানিকতা করা হয়েছিলো কিনা?

16. How long was the process from initiation of plant installment to the community being able to use the water from the plant?

প্ল্যান্ট স্থাপন বিষয়ক আলোচনা শুরু হওয়া থেকে প্ল্যান্ট স্থাপনের কাজ শেষ হওয়া পর্যন্ত কত সময় লেগেছিলো?

a. Probe: weeks/months/years?

অনুসন্ধানঃ সপ্তাহ/মাস/বছর?

Maintenance of the WTP

17. Were you trained on how to appropriately look after the plant once it was installed? If so how, and by whom?

প্ল্যান্ট স্থাপনের পরে কিভাবে এর দেখাশুনা করা যায় সে ব্যাপারে আপনাদের কোনো প্রশিক্ষন দেয়া হয়েছিলো কিনা? হলে, কিভাবে এবং কারা প্রশিক্ষন দিয়েছিলো?

18. Who is responsible for maintaining the WTP?

প্ল্যান্ট এর রক্ষণাবেক্ষণ এর দায়িত্বে কে আছেন?

a. Probe: Community members? PMC member? CCG? Cleaning? Guard? Other? Buying tools? *Get details about the different people involved in maintenance of the plant.*

অনুসন্ধানঃ মহল্লার মানুষজন? PMC? CCG? পরিষ্কার পরিচ্ছন্নতা? পাহারা দেয়া? মেরামতের জন্য যন্ত্রাংশ ক্রয় করা? *(প্ল্যান্ট এর রক্ষণাবেক্ষণ এ থাকা সংশ্লিষ্ট সকলের দায়িত্বের বিষয়ে বিস্তারিত জানতে হবে)*

b. What is the difference in the role of the CCG and PMC regarding the maintenance of the plant?

যদি CCG'র কথা উল্লেখ করা হয়ঃ রক্ষণাবেক্ষণ এর জন্য CCG এবং PMC এর কাজের মধ্যে পার্থক্য কি?

19. Is there someone responsible for money handling/collection for the WTP? If so, where is the money coming from? Community members/leaders? Have you ever had any issues concerning the handling of money?

প্ল্যান্ট এর জন্য টাকা সংগ্রহ/ব্যয় সংক্রান্ত বিষয়াদি পরিচালনা করার জন্য কি কেউ নিযুক্ত আছেন? যদি থাকেন, টাকা সংগ্রহের উৎস কি (টাকা কারা প্রদান করেন)? মহল্লা/গ্রামের মানুষ/নীতি নির্ধারক? কখনো টাকা পয়সা সংক্রান্ত কোনো সমস্যা হয়েছিলো কিনা?

20. If community members are paying for the upkeep of the WTP, were they informed before the installation of the WTP that they would have to contribute to paying for it? If so, were there any objections to this? If so, how were these objections dealt with?

প্ল্যান্ট সচল রাখতে মহল্লার মানুষদের আর্থিক সহযোগিতা প্রদান করতে হবে - এই বিষয়ে মহল্লার মানুষ প্ল্যান্ট স্থাপনের আগে থেকেই অবগত কিনা? যদি অবগত থাকেন, তারা কি এর বিরোধিতা করেছিলেন? যদি করেন, তাদেরকে কিভাবে রাজি করানো হয়েছিলো?

21. If community members are paying for the upkeep of the plant, how was it decided how much each household should pay? What about households who are

making use of the WTP but are not contributing to paying for it? Is there some way that you monitor who is making use of the WTP?

প্ল্যান্ট সচল রাখতে যদি মহল্লার মানুষ আর্থিক সহায়তা দিয়ে থাকেন, ঘরপ্রতি কত টাকা করে দেয়া হয়ে সেটা কিভাবে নির্ধারণ করা হয়েছিলো? যেসব পরিবার এই প্ল্যান্ট থেকে উপকৃত হচ্ছে কিন্তু আর্থিকভাবে সহযোগিতা করছে না তাদের ব্যাপারে কি ভাবছেন? এরকম পরিবারগুলোকে সনাক্ত করার কোনো প্রক্রিয়া আছে কি?

22. Is there a record of how much money has been collected so far from the community since the implementation of the WTP? If so, who can be contacted to find out this amount?

এ পর্যন্ত কত টাকা সংগ্রহ করা হয়েছে তার কি কোনো কাগজপত্র আছে? যদি থাকে, কার সাথে যোগাযোগ করলে সে সম্পর্কিত তথ্য পাওয়া যাবে?

23. Do you have a bank account where you keep all the money you collect/have for the plant? Are you saving up money for the plant's future?

আপনাদের কি কোনো ব্যাংক একাউন্ট আছে যেখানে সংগৃহীত টাকা জমা রাখা হয়? ভবিষ্যতে ব্যবহারের জন্য আপনারা অর্থ সঞ্চয় করেন কিনা?

24. Do you have a limit on how much water can be collected by each household?

একেকটি পরিবার কি পরিমান পানি সংগ্রহ করতে পারবে তার ব্যাপারে কি কোনো বাধ্যবাধকতা আছে?

25. Is there someone with the community/from SIDKO/from SC who tests the water of the WTP regularly to see if it is removing the arsenic and iron? If so, how often is it checked? If not, is there a way you make sure that the filter is working appropriately?

সেভ দ্য চিলড্রেন কিংবা SIDKO থেকে কেউ কি নিয়মিত প্ল্যান্টের পানিতে আয়রন এবং আর্সেনিক আছে কিনা তা পরীক্ষা করার জন্য আসেন? যদি আসেন, কতদিনে একবার তা পরীক্ষা করা হয়? যদি না আসেন, ফিল্টার ঠিকমত কাজ করছে কিনা সেটা নির্ণয় করার অন্য কোনো উপায় আছে কিনা?

26. The filter must be changed every 3-5 years. Have they changed the filter yet? If so, who paid for this? How much was it? Who replaced the filter? How long did it take?

সাধারণত ৩-৫ বছর পরপর ফিল্টার পরিবর্তন এর প্রয়োজন হতে পারে। আপনারা কি কখনো ফিল্টার পরিবর্তন করেছিলেন কিনা? পরিবর্তন করে থাকলে, কারা আর্থিক সহায়তা করেছিলো? সংস্কার এর জন্য কত টাকা খরচ হয়েছিলো? ফিল্টার প্রতিস্থাপন কে করেছিলো? প্রতিস্থাপন এর জন্য কতদিন সময় লেগেছিলো?

27. What is the process for cleaning the filters to remove the arsenic buildup? Do you have any special equipment for this process? If so, where did you get the equipment from? Are specific people assigned specific jobs in terms of cleaning the WTP?

ফিল্টারের আর্সেনিক পরিষ্কার করার প্রক্রিয়া কি? এর জন্য আলাদা কোনো যন্ত্রপাতির প্রয়োজন আছে কি? থাকলে, কোথা থেকে আপনারা সেই যন্ত্রপাতি সংগ্রহ করেন? প্ল্যান্ট পরিষ্কার এর বিভিন্ন ধাপের জন্য আলাদা আলাদা লোক দায়িত্বে আছেন কিনা?

28. Has the plant ever needed minor repairing? If so, is there a community member who can (and does) repair minor problems that the water treatment plant incurs? If so, who? Are they able to repair the issue within a reasonable amount of time?

কখনো প্ল্যান্টের খুদ্র মেরামত এর প্রয়োজন হয়েছিলো কিনা? আপনাদের গ্রামে/সমাজে এমন কেউ (মিস্ত্রী) আছেন যিনি প্লান্ট এর কোন মেরামত এর প্রয়োজন হলে তা করতে পারেন (এবং করেন)? যদি থাকেন, তিনি কে? তিনি/তারা কি যথাসময়ের মধ্যে মেরামত সম্পন্ন করেন?

29. Has the plant ever needed major repairing (assistance from SIDKO)? If so, who paid for the repairing? What was the CCG role in this?

প্ল্যান্ট এর কখনো কি বড় ধরনের কোনো মেরামত এর দরকার হয়েছিলো কিনা? যদি হয়, মেরামত এর খরচ কে বহন করেছিলো? মেরামতকালে CCG এর ভূমিকা কি ছিলো?

30. How long does it take on average to repair the plant if needed? What have been the main problems with the plant?

মেরামত প্রয়োজন হলে তার জন্য গড়পড়তা কেমন সময় লাগে? আপনারা মূলত প্ল্যান্ট সংক্রান্ত কি ধরণের সমস্যার সম্মুখীন হন?

a. Probe: vandalism/natural disaster/broken parts etc.

অনুসন্ধানঃ মানবসৃষ্ট ক্ষয় ক্ষতি/প্রাকৃতিক দূর্যোগ/খুচরা যন্ত্রাংশ ভেঙ্গে যাওয়া, ইত্যাদি।

31. Have you ever needed to buy parts in order to fix the WTP? Where do you get the parts that are needed for repairing the WTP? How far is this place from the WTP?

প্ল্যান্ট এর মেরামতের জন্য আপনার কখনো কোন যন্ত্রাংশ কিনতে হয়েছিলো কিনা? মেরামতের জন্য প্রয়োজনীয় যন্ত্রাংশগুলো কোথা থেকে কিনেছিলেন? এখান থেকে তার দূরত্ব কতটুকু?

32. Where do the community collect drinking water from when the WTP is not functional?

প্ল্যান্ট অকেজো হয়ে গেলে মহল্লার মানুষ কোথা থেকে খাবার পানি সংগ্রহ করে?

33. Is there ever a queuing problem at the WTP? If so, when does this usually happen?

পানি সংগ্রহের জন্য কি লাইনে দাঁড়িয়ে থাকতে হয়? যদি হয়, তা কোন সময়টাতে ঘটে?

34. What support do you or any of the CCG members provide to make the WTP functional? If the CCG provides financial support, why do they?

প্ল্যান্ট চালু রাখার জন্য আপনি কিংবা CCG'র সদস্যরা কি ধরণের সহযোগিতা করে থাকেন? যদি CCG সদস্যরা আর্থিক সাহায্য প্রদান করে থাকেন তবে তারা তা কেনো করেন?

35. What have been the main challenges that you have faced in terms of the WTP since it's implementation into your community?

প্ল্যান্ট চালু হবার পর থেকে আজ পর্যন্ত মূলত কি কি সমস্যা আপনারা সম্মুখীন হয়েছেন?

Closing Questions

36. How often do the SC staff visit your community/plant?
সেভ দ্য চিলড্রেন এর লোকজন আপনাদের গ্রামে/মহল্লায় কতদিন পরপর আসেন?

a. Probe: in a month? in three months?
অনুসন্ধানঃ মাস, সপ্তাহ, ১৫ দিন?

37. What do they do when they visit your community?
এখানে পরিদর্শনে আসার পরে তারা কি করেন?

38. Do you think this intervention is benefiting the community? If so, how?
আপনি কি মনে করেন প্ল্যান্ট থেকে আপনাদের গ্রাম/সমাজ উপকৃত হচ্ছে? যদি হয়, কিভাবে?

39. Does the plant meet the community's drinking water needs?
প্ল্যান্ট থেকে প্রাপ্ত পানি কি আপনাদের মহল্লার খাবার পানির যে চাহিদা আছে তার তুলনায় যথেষ্ট?

40. Do you think the community will be able to sustain the WTP once SC leaves? Why or why not? What are the long term plans for the WTP in this community?
আপনি কি মনে করেন সেভ দ্য চিলড্রেন যদি সহযোগিতা/কার্যক্রম বন্ধ করে দেয় তবে আপনাদের মহল্লা/গ্রাম আপনাদের পানি সংশোধন কেন্দ্র নিজ উদ্যোগে চালু রাখবে, প্রয়োজন হলে মেরামত করবে? কেন কিংবা কেন নয়? প্ল্যান্ট নিয়ে আপনাদের দীর্ঘমেয়াদী পরিকল্পনাসমূহ কি কি?

41. Do you have any suggestions to improve the WTPs operations within the community?
আপনাদের মহল্লার প্ল্যান্টের সার্বিক উন্নয়নের জন্য আপনার কোনো পরামর্শ আছে কিনা?

42. Do you have any advice for a future community that may be receiving a plant like the one you have?
ভবিষ্যতে অন্য কোনো মহল্লায় যদি এরকম প্ল্যান্ট স্থাপন করা হয় তবে তাদের জন্য আপনার কোনো পরামর্শ আছে কিনা?

a. Probe: Something that maybe your community could have done differently to smoothen the process of of installing and maintaining the WTP?
এমন কিছু যা আপনি হয়ত মনে করেন যে আপনার মহল্লায় প্ল্যান্ট স্থাপন্ এর পূর্বে করলে ভালো হত?

43. Do you have any message you would like to give Save the Children about how you feel about the plant?
প্ল্যান্ট নিয়ে আপনার অনুভূতি কি যা আপনি সেভ দ্য চিলড্রেন কে জানাতে চান?

44. Do you have anything else to say about the WTP and CCG/PMC?
প্ল্যান্ট এবং CCG'র ব্যাপারে আর কোন তথ্য কি আপনি যুক্ত করতে চান?

Appendix H

FGD Question Guide

WTP - Women of the Community (5-6 women from each community)
Duration: 30-45 minutes

Overall Objective: to understand the communities perceptions of the WTP from the point of view of the women within the community.

Other objectives: 1) To identify any major barriers to access of the WTP. 2) To obtain more information about the sustainability of this plant within this community.

Engagement Questions

1. How long have you lived here?
   আপনি এখানে কতদিন যাবত বসবাস করছেন?

a. Probe: all your life?/did you move here? When?
   অনুসন্ধানঃ জন্ম থেকেই?/এখানে স্থানান্তর হয়েছিলেন কিনা? কেন?

2. If you moved here, why did you decide to move to this community?
   অন্য যায়গা/গ্রাম/মহল্লা থেকে এখানে আসার কারণ কি?

3. Where do you collect your drinking water from? (if from the water plant) Why? Can you collect arsenic-free safe drinking water from somewhere else? Do you? Why or why not?
   খাবার পানি আপনি কোথা থেকে সংগ্রহ করেন? (যদি পানি শোধনাগার থেকে হয়) কেন? আর্সেনিকমুক্ত নিরাপদ খাবার পানি সংগ্রহের জন্য অন্য কোন উৎস আছে কিনা? আপনি সেখান থেকে পানি সংগ্রহ করেন কিনা? কেন করেন অথবা কেন করেন না?

4. Where did you used to collect drinking water from before the plant was installed?
   প্ল্যান্ট স্থাপনের আগে কোথা থেকে পানি সংগ্রহ করতেন?

5. Does the WTP meet your and your families drinking water needs?
   প্ল্যান্ট থেকে যে পরিমান পানি পাওয়া যায় তা স্থানীয় মানুষজনের নিরাপদ খাবার পানির চাহিদা পূরণ করতে পারে কি?

6. What do you think of the quality of the water? Have you ever felt that the water was not safe to drink? If so, when and why?
   সংগৃহীত পানির মান এর ব্যাপারে আপনার মতামত কি? আপনার কি কখনো মনে হয়েছে প্ল্যান্ট থেকে সংগৃহীত পানি নিরাপদ নয়? যদি হয়, তবে কবে এবং কেন?

7. Do you ever worry about getting diarrhea from drinking the water? Why or why not?
   প্ল্যান্টের পানি পান করার ফলে আপনার ডায়রিয়া হতে পারে - এমন কখনো মনে হয়েছে?

8. Do you use the water that you collect from the plant for anything else other than drinking? If so, what? Why?

প্ল্যান্ট থেকে যে পানি সংগ্রহ করেন সেই পানি পান করা ব্যতীত অন্য কোনো কাজে ব্যবহার করেন কি? করে থাকলে, কি কাজে ব্যবহার করেন? কেন ব্যবহার করেন?

9. Where do you get the water from to use for other purposes other than drinking and cooking?

খাবার পানি ও রান্নার পানি ব্যতীত অন্যান্য কাজের জন্য ব্যবহার্য্য পানি আপনারা কোথা থেকে সংগ্রহ করেন?

10. How much water do you take on average in a day from the WTP? In terms of jugs? In terms of liters?

প্রতিদিন কি পরিমান পানি আপনারা সংগ্রহ করেন? কত জগ/কলস? কত লিটার?

Exploration Questions

11. Are there certain times when the plant is open to collect water? If so, what are the open times of the plant? What times do you prefer to collect water? Why?

প্ল্যান্ট থেকে পানি সংগ্রহের জন্য কি নির্দিষ্ট কোনো সময় সময় আছে? যদি থাকে, পানি সংগ্রহের জন্য প্ল্যান্ট কখন খুলে দেয়া হয়? আপনি কখন পানি সংগ্রহের করতে পছন্দ করেন? কেন?

12. Would you want to change the times the plant is open if you could? If so, what changes would you make?

প্ল্যান্ট থেকে পানি সংগ্রহের যে সময় সীমা আছে তা কি আপনি পরিবর্তন করতে চান? যদি চান, কি ধরণের পরিবর্তন আপনি করতে চান?

13. Was there a time when you wanted to collect water but weren't able to collect it? If yes, why?

এমন কখনো হয়েছে যে আপনি পানি সংগ্রহ করতে চেয়েছিলেন/গিয়েছিলেন কিন্তু পারেন নি? যদি হয়, কেন পারেন নি/কি ঘটেছিল?

14. Are the open hours of the WTP sufficient for your water collection needs? Have there been times when the WTP was not open when it was supposed to be open?

পানি সংগ্রহ করার জন্য যতক্ষণ সময় নির্ধারিত থাকে (গেট খোলা থাকে) তা পানি সংগ্রহের জন্য যথেষ্ট কি? পানি সংগ্রহের জন্য নির্ধারিত সময়ে গেট খোলা থাকার কথা কিন্তু গেট খোলা ছিলো না - এমন কখনো কি হয়েছে?

15. When the plant was first installed was the community given instructions on how to make use of the plant appropriately? If so, what were they?

যখন এখানে প্রথম প্ল্যান্ট স্থাপন করা হয়েছিলো, তা যথাযথভাবে ব্যবহার কিভাবে করতে হবে সেটা সম্পর্কে আপনাদের পরামর্শ/নির্দেশ দেয়া হয়েছিলো? কি কি নির্দেশ/পরামর্শ দেয়া হয়েছিলো?

16. Do you think the implementation of the WTP has benefited you and your families lives? If so, how?

আপনি কি মনে করেন যে পানি শোধনাগার স্থাপন করার ফলে আপনার ও আপনার পরিবারের লোকজন উপকৃত হয়েছে? যদি উপকৃত হয়, তবে কিভাবে?

17. Were you or your family personally involved in the installation of the plant? If so, how?

শোধনাগার স্থাপনের সময় আপনি কিংবা আপনার পরিবারের কেউ সম্পৃক্ত ছিলেন কিনা? যদি থাকেন, কিভাবে সম্পৃক্ত ছিলেন?

a. Probe: labour/financially/assist in maintenance/other?

অনুসন্ধানঃ শ্রম/আর্থিক/দেখা শোনা/অন্যান্য?

18. Has the plant ever needed minor repairing? If so, is there a community member who can (and does) repair any problems that the water treatment plant incurs? If so, who? Are they able to repair the issue within a reasonable amount of time?

প্ল্যান্টের কখনো ক্ষুদ্র মেরামত প্রয়োজন হয়েছিলো কিনা? আপনাদের মহল্লায় এমন কেউ কি আছেন যিনি প্ল্যান্ট এর সমস্যা হলে তা মেরামত করতে পারেন? যদি থাকেন, তিনি কে? তিনি/তারা কি পরিমিত সময়ের মধ্যে মেরামত করতে সক্ষম কিনা?

19. How long does it take on average to repair the plant if needed? What have been the main problems with the plant?

যদি কোনো মেরামতের দরকার হয় তবে সর্বোচ্চ কতক্ষণ সময় লাগবে বলে আপনি মনে করেন? শোধনাগার এর সচরাচর কি কি সমস্যা দেখা যায়?

a. Probe: vandalism/natural disaster/broken parts

অনুসন্ধানঃ প্রাকৃতি দূর্যোগ, মানব সৃষ্ট ক্ষয়ক্ষতি, ভেঙ্গে যাওয়া, ইত্যাদি

20. Have they ever needed to buy parts in order to fix the WTP? Where do you get the parts that are needed for repairing the WTP? How far is this place from the WTP?

শোধনাগারটি মেরামত এর জন্য কখনো কোনো খুচরা যন্ত্রাংশ ক্রয় করতে হয়েছিলো কি? প্রয়োজনীয় খুচরা যন্ত্রাংশ গুলো কোথা থেকে ক্রয় করেছিলেন? এখান থেকে দোকানের দূরত্ব কত?

21. Where do you collect water from when the plant is not functional?

প্ল্যান্ট অকেজো হয়ে গেলে আপনারা কোথা থেকে পানি সংগ্রহ করেন?

22. Are you willing to contribute to the payment of repairs for the WTP if needed?

শোধনাগার এর মেরামত প্রয়োজন হলে আপনি স্বেচ্ছায় অংশগ্রহণ (টাকা প্রদান) করবেন কি?

23. Do you currently pay any money to support the plant? If so, how much do you usually pay? How often? Is it a monthly/weekly etc. payment? What are you paying for in the WTP when you make these payments?

প্ল্যান্ট এর জন্য আপনি কি কোন আর্থিক সহায়তা প্রদান করেন? যদি করেন, কত টাকা করে প্রদান করেন? কত দিন পর পর? মাসে একবার/সপ্তাহে একবার? প্ল্যান্টের কোন কাজের জন্য আপনারা এই টাকা প্রদান করেন?

a. Probe: electricity bill? filter change? etc

অনুসন্ধানঃ বিদ্যুৎ বিল? ফিল্টার পরিবর্তন? ইত্যাদি

24. If you are contributing to the WTP financially currently, are you willing to continue your contribution in the future?

আপনি যদি স্বেচ্ছায় প্ল্যান্টের জন্য এখন টাকা প্রদান করে থাকেন, ভবিষ্যতেও আপনি স্বেচ্ছায় টাকা প্রদান করবেন কি?

25. How do you earn the money that you are providing monthly for the plant?
আপনার পরিবারের আয়ের উৎস কি?

26. If money is given by community members who collects the money? How is the money collected/deposited?
আপনারা যে টাকা প্রদান করেন তা কার কাছে জমা থাকে? টাকা কিভাবে সংগ্রহ/জমা দেয়া হয়?

Exit Questions

27. Do you have any suggestions of how the plant operations can be improved?
প্ল্যান্ট এর সার্বিক উন্নয়নের জন্য আপনার কোন পরামর্শ আছে কি?

a. Probe: anything that can be done to enhance the benefit of the plant for the community?
অনুসন্ধানঃ স্থানীয় মানুষজন প্ল্যান্ট থেকে আরো বেশি উপকৃত হতে পারে এরকম যে কোনো পরামর্শ?

28. What is the vision you see for the plant in the future? Do you think the community will be able to sustain the plant if SC leaves/without SC support?
ভবিষ্যতে পানি পরিশোধন কেন্দ্রটি নিয়ে আপনাদের পরিকল্পনা কি? আপনি কি মনে করেন সেভ দ্য চিলড্রেন যদি সহযোগিতা/কার্যক্রম বন্ধ করে দেয় তবে আপনাদের মহল্লা/গ্রাম আপনাদের পানি সংশোধন কেন্দ্র নিজ উদ্যোগে চালু রাখবে, প্রয়োজন হলে মেরামত করবে?

29. Do you have any advice for a future community that may be receiving a plant like the one you have?
ভবিষ্যতে অন্য কোনো মহল্লায় যদি এরকম প্ল্যান্ট স্থাপন করা হয় তবে তাদের জন্য আপনার কোনো পরামর্শ আছে কিনা?

a. Probe: Something that maybe your community could have done differently to smoothen the process of of installing and maintaining the WTP?
এমন কিছু যা আপনি হয়ত মনে করেন যে আপনার মহল্লায় প্ল্যান্ট স্থাপন এর পূর্বে করলে আপনার মহল্লা আরো উপকৃত হত?

30. Do you have any message you would like to give Save the Children about how you feel about the plant?
প্ল্যান্ট নিয়ে আপনার অনুভূতি কি যা আপনি সেভ দ্য চিলড্রেন কে জানাতে চান?

31. Is there anything else you would like to mention/discuss about the WTP?
শোধনাগার সম্পর্কে আর এমন কোনো তথ্য আছে যা আপনি যোগ করতে চান?

Appendix I

Interview Guide

Non-Functional WTP - Plant Management Committee (PMC)
Duration: 30-45 minutes

Overall Objective: to get an understanding of what happened to the WTP in this community and what they are doing to try and restore the plant.

Other Objective: to understand what the community will do differently in order to prevent this from happening again.

Opening Questions

1. How long have you lived here for?
   আপনি এখানে কতদিন যাবত বসবাস করছেন?
2. What is your role within the Plant Management Committee?
   প্ল্যান্ট ব্যবস্থাপনা কমিটিতে আপনার ভূমিকা কি?
3. How long have you had this position for?
   আপনি ব্যবস্থাপনা কমিটিতে কতদিন যাবত আছেন?
4. How many households are the beneficiaries of this WTP?
   প্ল্যান্ট থেকে মোট কতগুলো পরিবার সুবিধাভোগ করে থাকেন?

Key Questions

Pre-installation of the WTP

5. Do you know how the site for the WTP was selected? Can you describe the process? Were you involved?
   কিভাবে প্ল্যান্ট স্থাপনের জন্য জায়গা নির্ধারণ করা হয়েছিলো আপনি জানেন কি? আপনি কি এ ব্যাপারে বিস্তারিত বলতে পারবেন? আপনি কি এর সাথে সংযুক্ত ছিলেন?
6. Who in the community gave the land for the site? Were there any problems in terms of donating the land/choosing a location for the plant?
   প্ল্যান্ট এর জন্য জমি কে/কারা দান করেছিলেন? জায়গা নির্বাচণ সম্পর্কিত কোন সমস্যা হয়েছিলো কিনা?

Installation of the WTP

7. Who funded the installation? When was the WTP installed?
   প্লান্ট স্থাপনের জন্য আর্থিক সহায়তা কে/কারা প্রদান করেছিলেন? কবে স্থাপন করা হয়েছিলো?

a. Probe: community members/ community leaders/SC?
   অনুসন্ধানঃ মহল্লা/গ্রাম এর মানুষজন/নীতি নির্ধারকগণ/ সেভ দ্য চিলড্রেন?

কিভাবে প্ল্যান্ট স্থাপন করা হয়েছিল আপনি জানেন কি? প্ল্যান্ট কারা তৈরি করেছিল? কবে তৈরি করা হয়েছিল? প্ল্যান্ট স্থাপনের সময় কারা কারা প্রধান ভূমিকা পালন করেছিলেন?

Maintenance of the WTP

8. Were you trained on how to appropriately look after the plant once it was installed? If so how, and by whom?

প্ল্যান্ট স্থাপনের পরে কিভাবে এর দেখাশুনা করা যায় সে ব্যাপারে আপনাদের কোনো প্রশিক্ষন দেয়া হয়েছিলো কিনা? হলে, কিভাবে এবং কারা প্রশিক্ষন দিয়েছিলো?

9. Who is responsible for maintaining the WTP?

প্ল্যান্ট এর রক্ষণাবেক্ষণ এর দায়িত্বে কে আছেন?

a. Probe: Community members? PMC member? CCG? Cleaning? Guard? Other? Buying tools? *Get details about the different people involved in maintenance of the plant.*

অনুসন্ধানঃ মহল্লার মানুষজন? PMC? CCG? পরিষ্কার পরিচ্ছন্নতা? পাহারা দেয়া? মেরামতের জন্য যন্ত্রাংশ ক্রয় করা? *(প্ল্যান্ট এর রক্ষণাবেক্ষণ এ থাকা সংশ্লিষ্ট সকলের দায়িত্বের বিষয়ে বিস্তারিত জানতে হবে)*

b. If CCG is mentioned: What is the difference in the role of the CCG and PMC regarding the maintenance of the plant?

যদি CCG'র কথা উল্লেখ করা হয়ঃ রক্ষণাবেক্ষণ এর জন্য CCG এবং PMC এর কাজের মধ্যে পার্থক্য কি?

10. Is there someone responsible for money handling/collection for the WTP? If so, where is the money coming from? Community members/leaders? Have you ever had any issues concerning the handling of money?

প্ল্যান্ট এর জন্য টাকা সংগ্রহ/ব্যয় সংক্রান্ত বিষয়াদি পরিচালনা করার জন্য কি কেউ আছেন? যদি থাকেন, টাকা সংগ্রহের উৎস কি (টাকা কারা প্রদান করেন)? মহল্লা/গ্রামের মানুষ/নীতি নির্ধারক? কখনো টাকা পয়সা সংক্রান্ত কোনো সমস্যা হয়েছিলো কিনা?

11. If community members are paying for the upkeep of the WTP, were they informed before the installation of the WTP that they would have to contribute to paying for it? If so, were there any objections to this? If so, how were these objections dealt with?

প্ল্যান্ট সচল রাখতে মহল্লার মানুষদের আর্থিক সহযোগিতা প্রদান করতে হবে - এই বিষয়ে মহল্লার মানুষ প্ল্যান্ট স্থাপনের আগে থেকেই অবগত কিনা? যদি অবগত থাকেন, তারা কি এর বিরোধিতা করেছিলেন? যদি করেন, তাদেরকে কিভাবে রাজি করানো হয়েছিলো?

12. How many households were paying for the plant every month before it became non-functional? How much were they paying? Are there households who are still making monthly payments for the plant? If so, how many?

সচল থাকা অবস্থায় কতগুলো পরিবার প্লান্ট এর জন্য অর্থ প্রদান করত? কত করে? এখনো কোন পরিবার অর্থ প্রদান করে কিনা? করে থাকলে, কতগুলো পরিবার?

13. Do you have a bank account where you keep all the money you collect/have for the plant? Are you saving up money for the plant's future?

আপনাদের কি কোনো ব্যাংক একাউন্ট আছে যেখানে সংগৃহীত টাকা জমা রাখা হয়? ভবিষ্যতে ব্যবহারের জন্য আপনারা অর্থ সঞ্চয় করেন কিনা?

14. Before it became non-functional, did the plant ever need minor repairing? If so, is there a community member who can (and did) repair any problems that the water treatment plant incurs? If so, who? Were they able to repair the issue within a reasonable amount of time?

অকেজো হয়ে যাবার আগে প্ল্যান্ট এর কখনো খুদ্র মেরামত এর প্রয়োজন হয়েছিলো কিনা? যদি হয়, আপনাদের গ্রামে/সমাজে এমন কেউ (মিস্ত্রী) আছেন যিনি প্লান্ট এর কোন মেরামত এর প্রয়োজন হলে তা করতে পারেন (এবং করেন)? যদি থাকেন, তিনি কে? তারা কি যথাযথ সময়ের মধ্যে তা মেরামত করতে সক্ষম?

15. Has the plant ever needed major repairing (assistance from SIDKO)? If so, who paid for the repairing? What was the PMC role in this?

প্লান্ট এর কখনো বড় ধরণের মেরামত প্রয়োজন হয়েছিলো কিনা (SIDKO এর সহযোগিতায়)? যদি হয়, সংস্কারের ব্যয়ভার কারা বহন করেছিলো? তখন PMC এর ভূমিকা কি ছিলো?

16. Have you ever needed to buy parts in order to fix the WTP? Where do you get the parts that are needed for repairing the WTP?

মেরামতের জন্য কখনো খুচরা যন্ত্রাংশ ক্রয় করার দরকার হয়েছিলো কিনা? যদি হয়, খুচরা যন্ত্রাংশ কোথা থেকে ক্রয় করেছিলেন?

a. Probe: vandalism/natural disaster/broken parts

অনুসন্ধানঃ মানব সৃষ্ট ক্ষয়ক্ষতি/প্রাকৃতিক দূর্যোগ/ভাঙ্গা যন্ত্রাংশ ইত্যাদি

17. Before the plant became non-functional, what were the main problems with the plant? Were there any problems in terms of maintenance and/or leadership of the plant? Were there any problems in terms of electricity payment for the plant?

অকেজো হয়ে যাবার আগে প্ল্যান্ট এর মূলত কি কি সমস্যা হত? দেখাশুনা কিংবা লিডারশীপ নিয়ে কোন সমস্যা হয়েছিলো কিনা? বিদ্যুৎ বিল সংক্রান্ত কোন সমস্যা হয়েছিলো কিনা?

18. Why is the plant not functioning? What happened to it? What do you think is needed to fix it? Has anyone in the PMC/CCG communicated with SC or SIDKO to help you with the problem? If so, who and what happened?

প্লান্ট অকেজো হবার কারণ কি বলে আপনি মনে করেন? কি ঘটেছিলো? মেরামত/সচল করতে কি করা প্রয়োজন বলে আপনি মনে করেন? PMC/CCG এর কেউ কি এই বিষয়ে সেভ কিংবা SIDKO এর সাথে যোগাযোগ করেছিলো?

Closing Questions

19. Do you think the WTP was benefiting the community when it was functional? If so, how?

আপনি কি মনে করেন প্ল্যান্ট থেকে আপনাদের গ্রাম/সমাজ উপকৃত হচ্ছে? যদি হয়, কিভাবে?

20. If the plant were to be fixed, would you/the PMC do anything differently in order to maintain the functionality of the plant? If so, what?

প্ল্যান্ট যদি ঠিক হয় তবে এটা সচল রাখতে আপনি কিংবা কমিটির কেউ অন্য কোন ভাবে এই প্ল্যান্ট এর রক্ষণাবেক্ষণ এর পরিকল্পনা করবেন কিনা? যদি করেন, তবে সেটা কি?

21. If the plant is fixed, do you think the community will be able to sustain the plant if SC leaves/without SC support? Why or why not? What are the long term plans for the WTP in this community?

প্ল্যান্ট সচল হবার পরে আপনি কি মনে করেন সেভ দ্য চিলড্রেন যদি সহযোগিতা/কার্যক্রম বন্ধ করে দেয় তবে আপনাদের মহল্লা/গ্রাম আপনাদের মহল্লার মানুশজন প্ল্যান্টটি নিজ উদ্যোগে চালু রাখবে, প্রয়োজন হলে মেরামত করবে? কেন কিংবা কেন নয়? প্ল্যান্ট নিয়ে আপনাদের দীর্ঘমেয়াদী পরিকল্পনাসমূহ কি কি?

22. Do you have any suggestions regarding the operations of the plant?

প্ল্যান্টের সার্বিক উন্নয়নে (চালু রাখা) আপনার কোনো পরামর্শ আছে কি?

a. Probe: anything that can be done to enhance the benefit of the plant for the community?/increase sustainability of plant by community?

অনুসন্ধানঃ এমন কোন কিছু/উদ্যোগ যা করা হলে প্ল্যান্ট এর জন্য আরো ভালো হয়?/ প্ল্যান্ট এর সার্বিক উন্নয়নে ভূমিকা রাখতে পারে?

23. Do you have any advice for a future community that may be receiving a plant like the one you have?

ভবিষ্যতে অন্য কোনো মহল্লায় যদি এরকম প্ল্যান্ট স্থাপন করা হয় তবে তাদের জন্য আপনার কোনো পরামর্শ আছে কিনা?

a. Probe: Something that maybe your community could have done differently to smoothen the process of of installing and maintaining the WTP?

এমন কিছু যা আপনি হয়ত মনে করেন যে আপনার মহল্লায় প্ল্যান্ট স্থাপন এর পূর্বে করলে ভালো হত?

24. Do you have any message you would like to give Save the Children about how you feel about the plant?

প্লান্ট নিয়ে আপনার অনুভূতি কি যা আপনি সেভ দ্য চিলড্রেন কে জানাতে চান?

25. Do you have anything else to say about the WTP and PMC?

প্লান্ট এবং PMC'র ব্যাপারে আর কোন তথ্য কি আপনি যুক্ত করতে চান?

Appendix J

FGD Question Guide

Non-Functional WTP - Women of the Community (5-6 women)
Duration: 30-45 minutes

Overall Objective: to understand the communities perceptions of the WTP from the point of view of the women within the community.

Other objectives: 1) To identify how the plant became non-functional. 2) To obtain more information about the sustainability of this plant within this community.

Engagement Questions

1. How long have you lived here?
   আপনি এখানে কতদিন যাবত বসবাস করছেন?

a. Probe: all your life?/did you move here? When?
   অনুসন্ধানঃ জন্ম থেকেই?/এখানে স্থানান্তর হয়েছিলেন কিনা? কেন?

2. If you moved here, why did you decide to move to this community?
   অন্য যায়গা/গ্রাম/মহল্লা থেকে এখানে আসার কারণ কি?

3. Where do you collect your drinking water from currently? Why? Can you collect arsenic-free safe drinking water from somewhere else? Do you? Why or why not?
   বর্তমানে খাবার পানি আপনি কোথা থেকে সংগ্রহ করেন? কেন? আর্সেনিকমুক্ত নিরাপদ খাবার পানি সংগ্রহের জন্য অন্য কোন উৎস আছে কিনা? আপনি সেখান থেকে পানি সংগ্রহ করেন কিনা? কেন করেন অথবা কেন করেন না?

4. Are you collecting water from an arsenic contaminated water source? If so, why?
   আপনি আর্সেনিকযুক্ত পানি সংগ্রহ করছেন কিনা? যদি করেন, কেন?

5. Where did you used to collect drinking water from before the plant was installed?
   প্ল্যান্ট স্থাপনের আগে কোথা থেকে পানি সংগ্রহ করতেন?

6. Did the WTP meet your and your families drinking water needs?
   প্ল্যান্ট থেকে যে পরিমান পানি পাওয়া যেত তা স্থানীয় মানুষজনের নিরাপদ খাবার পানির চাহিদা পূরণ করতে পারত কি?

7. What did you think of the quality of the water from the WTP? Have you ever felt that the water was not safe to drink? If so, when and why?
   সংগৃহীত পানির মান এর ব্যাপারে আপনার মতামত কি? আপনার কি কখনো মনে হয়েছে প্ল্যান্ট থেকে সংগৃহীত পানি নিরাপদ নয়? যদি হয়, তবে কবে এবং কেন?

8. How much water did you take on average in a day from the WTP? In terms of jugs? In terms of liters?
   প্রতিদিন কি পরিমান পানি আপনারা সংগ্রহ করতেন? কত জগ/কলস? কত লিটার?

Exploration Questions

9. When the plant was first installed was the community given instructions on how to make use of the plant appropriately? If so, what were they?

যখন এখানে প্রথম প্ল্যান্ট স্থাপন করা হয়েছিলো, তা যথাযথভাবে ব্যবহার কিভাবে করতে হবে সেটা সম্পর্কে আপনাদের পরামর্শ/নির্দেশ দেয়া হয়েছিলো? কি কি নির্দেশ/পরামর্শ দেয়া হয়েছিলো?

10. Do you think the implementation of the WTP has benefited you and your families lives? If so, how?

আপনি কি মনে করেন যে পানি শোধনাগার স্থাপন করার ফলে আপনার ও আপনার পরিবারের লোকজন উপকৃত হয়েছে? যদি উপকৃত হয়, তবে কিভাবে?

11. Were you or your family personally involved in the installation of the plant? If so, how?

শোধনাগার স্থাপনের সময় আপনি কিংবা আপনার পরিবারের কেউ সম্পৃক্ত ছিলেন কিনা? যদি থাকেন, কিভাবে সম্পৃক্ত ছিলেন?

a. Probe: labour/financially/assist in maintenance/other?

অনুসন্ধানঃ শ্রম/আর্থিক/দেখা শোনা/অন্যান্য?

12. Did the plant ever need minor repairing before it became non-functional? If so, was there a community member who can (and did) repair any problems that the water treatment plant incurred? If so, who? Were they able to repair the issue within a reasonable amount of time?

প্ল্যান্টের কখনো ক্ষুদ্র মেরামত প্রয়োজন হয়েছিলো কিনা? আপনাদের মহল্লায় এমন কেউ কি আছেন যিনি প্ল্যান্ট এর সমস্যা হলে তা মেরামত করতে পারেন? যদি থাকেন, তিনি কে? তিনি/তারা কি পরিমিত সময়ের মধ্যে মেরামত করতে সক্ষম কিনা?

13. Before the plant became non-functional, what were the main problems with the plant? Were there any problems in terms of maintenance and/or leadership of the plant? Were there any problems in terms of electricity payment for the plant?

প্ল্যান্ট অকেজো হবার আগে এর মূলত কি কি সমস্যা ছিল? দেখাশুনা করা কিংবা প্ল্যান্ট এর কর্তাব্যক্তিদের নিয়ে কোন সমস্যা ছিল কিনা? বিদ্যুৎ বিল সংগ্রহ করা নিয়ে কোন সমস্যা হয়েছিল কিনা?

a. Probe: vandalism/natural disaster/broken parts

অনুসন্ধানঃ প্রাকৃতি দূর্যোগ, মানব সৃষ্ট ক্ষয়ক্ষতি, ভেঙ্গে যাওয়া, ইত্যাদি

14. What happened to the plant? Why is it non-functional? Who do you think is responsible for the non-functionality of the plant?

প্ল্যান্ট এর কি ঘটেছিলো? অকেজো হবার পেছনে কারণ কি? কেন এমনটা হয়েছে বলে আপনারা মনে করেন?

15. Are you willing to contribute to the payment of repairs for the WTP to make it functional again?

শোধনাগার এর মেরামত এর জন্য আপনি স্বেচ্ছায় অংশগ্রহণ (টাকা প্রদান) করবেন কি?

16. Before the plant became nonfunctional, did you pay any money to support the plant? If so, how much did you usually pay? How often? Is it a monthly/weekly etc. payment? What are you paying for in the WTP when you make these payments? Are you currently still making payments for the plant? If so, why?

প্ল্যান্ট সচল থাকাকালীন আপনি কি কোন আর্থিক সহায়তা প্রদান করতেন? যদি করেন, কত টাকা করে প্রদান করেন? কত দিন পর পর? মাসে একবার/সপ্তাহে একবার? প্ল্যান্টের কোন কাজের জন্য আপনারা এই টাকা প্রদান করেন? আপনি কি এখনো প্ল্যান্ট এর জন্য টাকা প্রদান করেন?

a. Probe: electricity bill? filter change? etc

অনুসন্ধানঃ বিদ্যুৎ বিল? ফিল্টার পরিবর্তন? ইত্যাদি

17. If you are contributing to the WTP financially currently, are you willing to continue your contribution in the future if the WTP becomes functional again?

আপনি যদি স্বেচ্ছায় প্ল্যান্টের জন্য এখন টাকা প্রদান করে থাকেন, ভবিষ্যতে এটা চালু করতেও আপনি স্বেচ্ছায় টাকা প্রদান করবেন কি?

18. How do you earn the money that you are providing monthly for the plant?

আপনার পরিবারের আয়ের উৎস কি?

19. If money is given by community members who collects the money? How is the money collected/deposited?

আপনারা যে টাকা প্রদান করেন তা কার কাছে জমা থাকে? টাকা কিভাবে সংগ্রহ/জমা দেয়া হয়?

Exit Questions

20. Do you have any suggestions of how the plant can become functional again?

এটা পুনরায় সচল করতে আপনার পরামর্শগুলো কি কি?

21. If the plant becomes functional again, do you have any suggestions of how the plant operations can be improved? Would you do anything differently in terms of how you use the plant?

প্লান্ট আবার চালু হলে, এটা আরো ভালোভাবে চালানোর জন্য আপনার পরামর্শ কি? আপনি কি আগের চেয়ে আলাদা কোন কিছুর ব্যাপারে ভাবছেন?

a. Probe: anything that can be done to enhance the benefit of the plant for the community?

অনুসন্ধানঃ স্থানীয় মানুষজন প্ল্যান্ট থেকে আরো বেশি উপকৃত হতে পারে এরকম যে কোনো পরামর্শ?

22. What is the vision you see for the plant in the future? If the plant is fixed, do you think the community will be able to sustain the plant if SC leaves/without SC support?

ভবিষ্যতে পানি পরিশোধন কেন্দ্রটি নিয়ে আপনাদের পরিকল্পনা কি? প্লান্ট সচল হবার পরে, আপনি কি মনে করেন সেভ দ্য চিলড্রেন যদি সহযোগিতা/কার্যক্রম বন্ধ করে দেয় তবে আপনাদের মহল্লা/গ্রাম আপনাদের পানি সংশোধন কেন্দ্র নিজ উদ্যোগে চালু রাখবে, প্রয়োজন হলে মেরামত করবে?

23. Do you have any advice for a future community that may be receiving a plant like the one you have?

ভবিষ্যতে অন্য কোনো মহল্লায় যদি এরকম প্ল্যান্ট স্থাপন করা হয় তবে তাদের জন্য আপনার কোনো পরামর্শ আছে কিনা?

a. Probe: Something that maybe your community could have done differently to smoothen the process of of installing and maintaining the WTP?

এমন কিছু যা আপনি হয়ত মনে করেন যে আপনার মহল্লায় প্ল্যান্ট স্থাপন এর পূর্বে করলে আপনার মহল্লা আরো উপকৃত হত?

24. Do you have any message you would like to give Save the Children about how you feel about the plant?

প্ল্যান্ট নিয়ে আপনার অনুভূতি কি যা আপনি সেভ দ্য চিলড্রেন কে জানাতে চান?

25. Is there anything else you would like to mention/discuss about the WTP?

শোধনাগার সম্পর্কে আর এমন কোনো তথ্য আছে যা আপনি যোগ করতে চান?

Appendix K

Structured Observations Form

WTP - General Plant Upkeep and Current State

Duration: 20-30 minutes

Date:
Start time of observation:
End time of observation:

6. Is the water treatment plant functional? (Are people collecting water? If no one is collecting then we can ask community members if it is functional/if they collected water that day?)
    . Yes
    a. No. If so, why?
        . Vandalism
        i. Natural disaster
        ii. Broken part
        iii. No electricity
        iv. Other_____

7. Are there people at the treatment plant watching over its functionality? (is there
    . Yes. If so, then who?
        . Security No._____
        i. Maintenance people No._____
        ii. Community members No._____
        iii. Other_____
    a. No

8. Is the water treatment plant accessible?
    . Yes
    a. No. If no, why?
        . Long queue
        i. It is locked
        ii. There is no water/electricity
        iii. It is broken
        iv. Other_____

9. Is the plant area clean? (no visible mud, leaves, etc surrounding and within the plant).
    . Yes
    a. No. If so, why?
        . Mud
        i. Leaves
        ii. Other_____

10. How many people collect water during observation period?
    . No._____

11. Is there a problem of water wastage?
    . Yes. If so, how?
        . Leaky faucet
        i. Community members not closing the taps properly
    a. No

Appendix L

EMORY UNIVERSITY | Institutional Review Board

May 21, 2015

Anushree Mahajan
SPH: Environmental Health

RE: Determination: No IRB Review Required
Title: *Documenting Community Health Interventions in Meherpur District, Bangladesh*
PI: Anushree Mahajan

Dear Ms. Mahajan:

Thank you for requesting a determination from our office about the above-referenced project. Based on our review of the materials you provided, we have determined that it does not require IRB review because it does not meet the definition of "research" with human subjects, as set forth in Emory policies and procedures and federal rules, if applicable. Specifically, in this project, you will assist in a public health practice project with Save the Children. This does not cover the use of the data outside of reports for Save the Children. If you opt to use this data in your thesis, you will need to come back to the IRB for a determination for that use..

Please note that this determination does not mean that you cannot publish the results. This determination could be affected by substantive changes in the study design or subject populations. If the project changes in any substantive way, please contact our office for clarification.

Thank you for consulting the IRB.

Sincerely,

Heather Smith, MS
Research Protocol Analyst

Emory University
1599 Clifton Road, 5th Floor - Atlanta, Georgia 30322
Tel: 404.712.0720 - Fax: 404.727.1358 - Email: irb@emory.edu - Web: http://www.irb.emory.edu

Ver. 1/17/2014

Appendix M

EMORY UNIVERSITY | Institutional Review Board

February 4, 2016

Anushree Mahajan
Emory University
Atlanta, GA 30322

RE: Determination: No IRB Review Required
eIRB#: 86966
Title: *Documenting Implementation and Assessing Community Perceptions of a Water Treatment Plant Intervention for Arsenic Removal in Bangladesh*
PI: Anushree Mahajan

Dear Anushree:

Thank you for requesting a determination from our office about the above-referenced project. Based on our review of the materials you provided, we have determined that it does not require IRB review because it does not meet the definitions of "research" with human subjects or "clinical investigation" as set forth in Emory policies and procedures and federal rules, if applicable. Instead, this is a program evaluation project that is designed to evaluate a water treatment plant intervention that is being used to remove arsenic from contaminated groundwater in Bangladesh. Specifically, this project aims to examine the mechanism by which a Sidko Ltd WTP filters out arsenic, iron, reactive phosphate, and manganese from groundwater and report on local perspectives on sustainability of the program.

Please note that this determination does not mean that you cannot publish the results. If you have questions about this issue, please contact me.

This determination could be affected by substantive changes in the study design, subject populations, or identifiability of data. If the project changes in any substantive way, please contact our office for clarification.

Thank you for consulting the IRB.

Sincerely,

Carolyn Sims, MPA
Research Protocol Analyst

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