

Climate Resilience WASH Programming in Coastal Areas of Bangladesh

An End-Line Study



House 97 B Road 25

Block-A, Banani, Dhaka 1213

www.wateraid.org/bangladesh



Disaster Management Watch

856/1 A, Kajipara, Mirpur, Dhaka-1216. Contact No: 01717064843, 01717232615, Email: dm.watch.bd@gmail.com

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Abbreviation

AAS	Atomic Absorption Spectrophotometer
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BDS	Bangladesh Drinking Standard
DoE	Department of Environment
DTW	Deep Tube well
COP	Convention on Climate Change
CBO	Community Based Organization
CFU	Colony Forming Unit
DA	Daily Allowance
DPHE	Department of Public Health Engineering
FGD	Focus Group Discussion
GoB	Government of Bangladesh
IPCC	Intergovernmental Panel on Climate Change
KII	Key Informant Interview
LGI	Local Government Institutes
LOQ	Level On Quantization
MFM	Membrane Filtration Method
NGO	Non Government Organization
NAPA	National Adaptation Programme of Action
PSF	Pond-Sand Filter
RWH	Rain Water Harvesting
RO	Reverse Osmosis
STW	Shallow Tube Well
TA	Travel Allowance
TTC	Thermo Tolerance Coliform
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations International Children's Emergency Fund
UDMC	Union Disaster Management Committee
UP	Union Parishad
WASH	Water, Sanitation and Hygiene
WAB	WaterAid Bangladesh
WSP	water Safety Plan
WDC	Ward Development Committee
WDMC	Ward Disaster Management Committee
WatSan	Water and Sanitation
WBA	Well Being Analysis

Summary Table: Comparison between baseline and endline

Sl.no.	Indicators measured	Baseline	Endline
1.	Income level of household	Average household income, taka 5,405 per month. The amount is much lower than the average household income in rural areas (taka 9,648) in Bangladesh as per National Household Income and Expenditure Survey (HIES) 2010.	Average household income 9188. The amount is lower than the average household income in rural areas (taka 9,648) in Bangladesh as per National Household Income and Expenditure Survey (HIES) 2010.
2.	Type of drinking water sources	90.8% household had an opportunity to access to improved drinking water sources.	94% households have access to improved drinking water which is higher than national rural average of 82.4%. Exactly 50% households were found to access PSF as source for drinking water which is 5% higher than baseline.
3.	Ownership of water sources	9.9% households in the surveyed areas had their own source of water. The community owned 10% of water source.	In consideration with the poverty line and main source of safe drinking water obviously the greater quintile of ownership went to the community which is 58% and 48% higher than baseline. The poor wellbeing status of the majority also contributed to the ownership of other sources where the second highest ownership was found as neighbor (18%) and individual ownership takes only 10%.
4.	Types of context-specific water supply screened and tested	Overall 42.3% acceptable at source level and 15.5% in household level for PSF, 75% at source level and 14.3% at household level for DTW, 41.7% at source level and 16.7% at household level.	For STW, in Assasuni, when the facility level acceptance was 43%, household level was 86%, the level improved by 27% from baseline. In the case of Reverse Osmosis, all households were found at acceptance level. For rain water harvesting, in Assasuni no facilities were found at acceptance level but in Shyamnagar, 67% were found at that level. DTW sample was collected from Shyamnagar where 50% acceptance was found in facility level but 100% at household level
5.	Distance and time consumption for water collection	Households having sources within 164 feet periphery is 16.6% in Shyamnagar and 35.4% in Assasuni. Round trip was 38 minutes and 33 minutes respectively.	Majority of the respondents (75%) accessed water within a distance of less than or equal to 164 feet(50 meters) away. On average they spent 34 minutes which is slightly lower than baseline (36 min) in the study areas without any significant differences between two Upazilas.
6.	Physical condition of water sources	73.5% respondents said tubewell platform were good, 62.5% said drainage system were okay	In observation of STW, no latrine was found within the catchment area of 30 feet of 72%. No garbage was found in the connected drain of 61%, no damage in the connected drain

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of 78%, no water logging on the platform of 79%, no contaminated water is using for plucking water of 76%. 83% STW's nut bolts were found in proper place and 93% of the facilities' bottom was not loose

PSF

- 98% of the PSFs connection pipe was intact
- 97% of the PSFs' sand filter were unblocked and clean;
- 94% of the PSFs' storage chamber were found covered;
- 88% of the PSFs' wall was seen clean;
- 77% of PSFs' was out of any latrine or cow shade within the catchment area of 30 feet of the pond;
- 75% of the PSFs' bank were unbroken through where rain water or other dirty water from outside can enter into the pond;
- In 73% of the PSFs' pond no man or cattle or poultry were found not taking bath or used for other purposed like washing utensils or clothes;
- 73% of the PSFs' water collection tap was good;

<p>7. % of household access to Improved sanitation facilities</p>	<p>Average improved latrine user was 62%</p>	<p>The average improved sanitation facilities in the study area is at 8 percent point higher in compare with the average national rural Bangladesh of 54.5%. The improve sanitation facilities contain 39% of pit latrine with lid and 24% of slab latrine with water seal where <i>compare to baseline open defecation and hanging latrine reduced by 4%</i>.</p>
<p>8. Hygiene practice</p>	<p>47% HH were found practicing hand wash before meal and 73.9% after defecation. Nine-tenth (91.1 per cent) of the households had no special device or arrangement for hand wash.</p>	<p>This study recorded practice of seven times of hand washing – before having meal 65%, after defecation 96%. Nearly 1/3rd have separate place for hand washing using soap and water beside the latrine whereas most of all (96%) were keeping soap used by 97% and water (99%) at household for hand washing after latrine use which was not practiced in baseline among 91% households.</p>
<p>9. Awareness of risk</p>	<p>7.9% households were fully aware of the risk factors</p>	<p>39% of the households were found fully aware of the risk</p>

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	factors due to climate change	of climate change.	factors of climate change. 43% respondents mentioned that they learnt on these risks factors from the NGO training.
10.	Awareness about the disease of contaminated water	-	Households of 86% were found aware about the diseases of drinking contaminated water
11.	Prevalence of water borne diseases	61% households were affected by water borne disease in the baseline. The average day loss was 7 days. The treatment cost of water borne disease was BDT 1169.	From the survey period to last three months 28% households were found to be affected by water borne diseases.. The average day loss was 5.5. The treatment cost of water borne disease was BDT 525.
12.	Household participation in CBO		23% of the household members of the study participants were formal member of WDMCs but 62% of the household members are aware about these institution's activities in their community.
13.	Household participation in local level planning	Community households did not participate in UP's annual planning of their own.	WDMC members participate in all ward meetings of UP and propose WASH demand to be incorporated in UP's annual planning.
14.	Practice of identification and documentation of WaSH vulnerabilities	Community did not practice to identify and document of WASH vulnerabilities.	WDMC identifies and documents all kinds of WASH vulnerabilities in the project area through regular meeting. It also coordinates other different groups demand like adolescent, mothers and students.
15.	allocation and utilization of WaSH budget by Union Parishad	Due to lack of orientation on WASH, local Government's budget on water and sanitation was very poor.	While UP faces constraints of budget but due to proper orientation on WASH it always tries to provide support from other types of allocation.

Executive Summary

Lack of potable water, proper sanitation and poor hygiene behaviour and practice cause a huge toll and tremendous burden among people and coastal areas of Bangladesh are one of the major victims of this. It is clear that climate change will affect the medium of water most of all: affecting the source of water supplies; and water quality (e.g. pollution) and hygiene. Poor water, sanitation and hygiene (WASH) exacerbate the impact of the climate change in the coastal Bangladesh. It causes and reinforces each other in a different way. This report draws on the endline evaluation of a project implemented by WaterAid Bangladesh in two sub-districts of Satkhira district to address the need of climate resilience WASH system.

This study collected data from 17 August to 1st September 2014 using both quantitative and qualitative method. Quantitative data has been collected through a structured survey from 605 sample households from randomly selected 55 wards of 11 unions of Assasuni and Shamnagar sub-district. Household head or spouse was selected as the study respondent. For collection of qualitative data, 2 Unions from 2 Upazilas were randomly selected considering same union to triangulate data and Q² analysis. 8 FGDs, 13 KIIs and 4 case studies were conducted to supplement qualitative information. Secondary data was also collected and analyzed. To triangulate the quality of the water, 60 samples (30 from facility level and the other 30 from households) were collected and lab-tested for arsenic, iron and TTC/Fecal Coliform level in the regional center of DPHE under Khulna Division. Collected water samples were carefully collected and tested in the laboratory within 6 hours after collection with the utmost importance.

About 26% and 39% HHs belong to lower and upper poverty line respectively which is quite higher than the national average and points toward the persistence of the spatial inequality of poverty in the southwest Bangladesh. Nearly all households were male headed and married. 2/3rd (67%) of them were not able to cross the education of primary level and 1/3rd (34%) had never been to school. Among respondents, 38% were female and mostly married. The significant participation of female respondents contributed to highest occupational category of housewife. Almost 15% of the respondents were found working in formal and informal sector. Another 50% of the respondents were engaged in informal sector.

According to the respondents' perception 83% surveyed population mentioned that their water is pure. In the case of underground water most of the STW and DTW were found labeled as green color which means to safe to drink. Nearly the entire except only 8% households have access to improved drinking water which is higher than national rural average of 82.4%. Exactly 50% households were found to access PSF as source for drinking water which is 5% higher than baseline.

Water for domestic purposes (cooking, laundry and hand washing) was mainly fetched from pond (83%). Qualitative data validated that earlier the people used to take the dish, clothes and even animal in the pond for washing. But after the introduction of PSF, to keep the pond water clean they take the pond water out and do the same at other places like.

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Most of the PSF and STW were found at satisfactory level in terms of maintenance. 76% respondents said that their drinking water sources needed to repair in last one year and to repair the sources most of them (users) jointly contributed (76%).

58% water sources were owned by the community which is 48% higher than baseline where individual ownership takes only 10%. Increase in community ownership is a reflection in the increase in access to safe water as well. Majority of the respondents (75%) accessed water within a distance of less than or equal to 50 meters away. On average they spent 34 minutes which is slightly higher than baseline (36 min) in the study areas without any significant differences between two Upazilas.

December to August is the water crisis period with different kind of upward and downward mobility. September to December found to be the lowest crisis period. Draught (40%), salinity (29%), lower ground water level (15%) and damage of water source (12%) were some major reasons found behind the crisis sector.

Traditional portrait of “*women are collecting water with pitcher*” still observed as the everyday scenario in the study area. More than half of the households were found to clean their water pot once in a day. As customary practice, majority (84%) were using pitcher to collect water, mostly with cover on water pot. To cover 1/3rd (34%) used traditional coconut skull where the other significant number of cover was found made of plastic and steel. After collection with pitcher 64% preserved water in the same pot, 34% used drum or jar. About 65% households were found to keep pot on the floor with cover, 26% were found to keep it in a higher place than the floor. While preserving, all used cover for water pot. All used mostly three types of pot which were plastic 35%, coconut 26% and melamine 15%. More than half of the households cleaned the pot 2-3 times in a week.

Water Test result revealed that the acceptance level of water quality was better than facilities from where the people collect water except iron level. All tube well except 29% STW in Assasuni were found free from arsenic. Iron test result showed that all PSF was out of iron contamination but no acceptance level was found in STW which indicates that people of the study area was in at high risk of illness due to drinking of iron contaminated water. So whole test results concluded that except iron overall water quality was safer than before.

The average improved sanitation facilities in the study area is at 63% which is 8 percentage points higher in compare with the average national rural Bangladesh of 54.5%. The improve sanitation facilities contain 39% of pit latrine with lid and 24% of slab latrine with water seal where *compare to baseline open defecation and hanging latrine reduced by 4%*. In between two Upazilas Shyamnager is significantly left behind which is 5 percent point less against national average. It was observed that the changing landscape and crop pattern specially shrimp farming in contributing to scarcity of land that is influencing not to build the facilities. On the other hand, water crisis is influencing not to use water seal which is the third highest category of sanitation facilities. The standard distant between water source and latrine facility should 30 feet which is critically associated with land scarcity. But nearly all households own individually of their latrine. Cleanliness of the latrine is an important part of the hygiene practice behavior where just half of the households are in satisfactory level which has been improved by 4% as per baseline.

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This study recorded practice of specific seven times of hand washing which is two times more than baseline. Before having meal increased 18% which was 47% at baseline, 36% practice after having meal, 96% wash hands after defecation which increased up to more 5% from baseline, after catching something dirty decreased by 5% which was 48%, before preparing food increased 5% from baseline which was 8% and before serving food decreased by 4.5% which was 6.5% . 67% households put garbage in a specific pit of the household.

Moreover, 39% of the households compare to 7.9% in the baseline were found fully aware of the risk factors of climate change where Shyamnager respondents were found significantly four times higher than Ashashuni Upazila. Specifically more than 1/4th (26%) responded mentioned about the risk of increased natural disaster. The other significant risk factors were told by the community people were increased of prevalence of diseases (23%), temperature (21%) and salinity (19%). 43% respondents mentioned that they learnt on these risks factors from the NGO training.

Households were also found with good knowledge on the *how to cope with* this changing climatic realities. Just 1/4th belief that the community people should take the initiative to plant more green trees, 22% focused on maintaining water sources, 16% remaining neat and clean, 13% on arranging alternative sources of drinking water and some 7% on building sanitary latrine.

86% of the households were found aware about the diseases of drinking contaminated water. 28% households were found to be affected by water borne diseases in the last three month which was 61% since 6 months back of the baseline. Among them, Diarrhea though in higher level but reduced by 13% which was 51% at baseline. Fever and dysentery decreased by 35% and 23% which was 63% and 48% respectively.

Among 28% household members who were affected by water borne diseases in last three months, 44% of them lost working days. This loses effected on their health seeking behavior which resulting 71% of the affected households sought support from local level quack or village doctors. Only 2% went to MBBS doctor.

To aware on WASH issue a community based organization is functional in the name of Ward Disaster Management Committee (WDMC). 23% of the household members of the study participants were formal member of this committee but 62% of the household members were aware about these institution's activities in their locality. Triangulation of qualitative data revealed that this organization built a horizontal relationship among the community people through assessing the community demand of WASH needs, disaster preparedness activities, coordinating and participating to repair and maintenance of the facilities, court yard meeting to aware on climate change and DRR issues. WDMC has succeeded in allocating budget for STW and ring-slab for the extreme poor community households, allocating budget for different development works like re-excavation of canal, repairing connecting roads, tree plantation and plinth and latrine rising. For this they advocated in the Union Parishad.

Coordinated community approach has been suggested based on the findings. Further interventions were suggested to ensure "safe water chain" in every households. Management of the facilities is a key concern for ensuring uninterrupted flow of safe water. Role of WDMC is key in this regard to ensure proper management. Although almost every household were found to own latrine but owning a latrine

can be disastrous if the hygiene and cleanliness are not maintained. Community sanitation systems can be a solution in the event of land and water scarcity. Community was found knowledgeable about climate change, safe water and sanitation as well as hygiene. However, this knowledge has not been reflected in their practice in line with their knowledge level for which there is a need for a more behavior change program.

Under the initiative of behavioral change, this project focused on schools to orient students on WASH. For instance, WaterAid has intervened in 152 schools of 11 unions in Shyamnagar and Ashasuni upazilla where WFP continued school feeding initiatives. In these schools, WaterAid has provided support for drinking water and sanitation facilities along with improved hygiene practices. Among water and sanitation facilities in schools, the project installed 93 Rainwater Harvesting Systems (RWHS), constructed 78 new latrines and 42 latrines were repaired. To improve hygienic practices in schools, the project provided training to students and school management committees on water safety plans, improved sanitation, hygienic behavior, disaster and menstrual hygiene management.

Section 1: Introduction

Lack of potable water, proper sanitation and poor hygiene behaviour and practice cause a huge toll and tremendous burden among people and coastal areas of Bangladesh are one of the major victim of this (Shimi, et al, 2010). It is clear that climate change will affect the medium of water most of all: affecting the source of water supplies; and water quality (e.g. pollution) and hygiene. Poor water, sanitation and hygiene (WASH) exacerbate the impact of the climate change in the coastal Bangladesh. It causes and reinforces each other in a different way. However, impacts on water resources and water-dependent services have yet to be adequately addressed in the coastal areas of Bangladesh (Calow, R. et al, 2011). Following the strategic process of the government, Water Aid Bangladesh is targeting the goal of improving human well-being and dignity of the people of coastal areas of Bangladesh (Water Aid, 2011). WaterAid initiated to implement a time honored intervention that addresses the need of a climate resilient WASH system in part of the coastal Bangladesh. This was a three years project implemented in two Upazilas of Satkhira District titled 'Climate Resilience WASH Programming in Coastal Areas'. The commencement period of the project was July 2011, which has come to an end in September 2014. Thus, it is high time to explore whether the program has been able to make any contribution and/or change in improving the Water, Sanitation and hygiene problem in the intervention areas or not. This report draws on the endline study of this project which has been conducted during July to October 2014.

Section 2: Background and Context

'Water crisis' or 'water-shortage' are some of the commonly know phrase in today's world but we actually live in a 'water desperate' world, rather than in water crisis. Millions of people in developing countries are living as 'water poor' and, in fact, they are 'water desperate' (Mara, 2003). One of the millennium goals is to reduce by half the number of people without adequate water supplies by the end of 2015 (Development Goals), and the same commitment was recently repeated at the Johannesburg Earth Summit. But till date 83% of countries have fallen significantly behind the national targets they have set for sanitation (Johannessen et al., 2014).

In a report of Intergovernmental Panel on Climate Change (IPCC) and Stern Review it is concluded that the impacts of climate change on humanity will be felt 'mainly through water' (Stern, 2006 & Bates et al. 2008). Water is also predicted to be the primary medium through which early climate change impacts will be felt. There are strong evidences available that freshwater resources are vulnerable, and have the potential to be strongly impacted (Roger et al., 2011).

As mentioned climate change is likely to have a significant impact on water and sanitation, greatest change is predicted in coastal aquifers, where it is very likely there will be significant incursion of salt water directly associated within sea-level rise (Kundzewicz, 2007). India, China and Bangladesh are especially susceptible to ingress of saline sea water in coastal areas (Cruz, 2007). Climate change is also likely to exacerbate existing water quality issues. Water-borne disease (e.g. cholera, diarrhoeal disease, dermatosis, cardiovascular disease and gastrointestinal disease) may therefore increase with climate change if soil contaminants are washed into surface water resources and shallow groundwater sources.

There are undoubtedly clear links between access to safe, reliable water sources and human health which could be exacerbated by greater climate variability (Hunter, 2010). Increased flooding of latrines and unimproved sources could lead to a significant rise in diarrhoeal disease and infant mortality, and warmer water temperatures could lead to greater transmission of disease (ibid). Reduced functioning of water supplies during extended droughts could also increase the burden of disease as people use poorer quality, 'last resort' sources. In recent years, there have been a total of 1.7 million deaths annually due to inadequate WASH conditions and services. Dry lands have the highest infant-mortality of all eco-systems (World Bank, 2005).

The number and scale of natural disasters across the world is increasing. The frequency and scale of floods and droughts is already creating major 'water insecurity' challenges. The number of recorded natural disasters has doubled from approximately 200 to over 400 per year over the past two decades. The number of floods and cyclones is rising dramatically as a proportion of these disasters (UNEP, 2007). Such natural disasters often result in a sharp deterioration of environmental health conditions, particularly in terms of access to basic water and sanitation services. According to the World Bank, roughly 38% of the land area is exposed to some level of drought, thereby affecting 70% of the world's population (World Bank, 2005).

Water safety in a community depends on a range of factors, from the quality of source water to storage and handling in the domestic setting (Kalyan, 2007). Water quality is already under threat in South Asia as a result of poor sanitation (less than 70% of rural populations have access to proper sanitation) and intensive use of fertilizers (JMP, 2008). Surface water and shallow groundwater quality is widely reported to deteriorate seasonally in South Asia (Godfrey, 2005). This is as a result of intense rainfall events during the wet season causing increased turbidity of the water (suspended solid content) and enabling higher concentrations of pathogens to be transported through the sub-surface (Taylor et al., 2009).

2.1. Project Overview

WaterAid is a leading non-governmental international organization, which enables the world's poorest people to gain access to safe water, sanitation and hygiene education. WaterAid has been working in Bangladesh since 1986 with a significant attention to the coastal area of Bangladesh. In the discourse of climate change it is well documented that the scarcity of potable drinking water is common in coastal areas of Bangladesh (Rahman, M. M., & Islam, A., 2013). Shallow aquifers in these areas contain excessive iron and arsenic while both the deep and shallow aquifers have high concentration of saline. People mainly depend on freshwater ponds and rainwater harvesting for drinking water. In some cases, pond-water is filtered through Pond-Sand Filter (PSF) while a few tube-wells are found in sweet water pockets of deep aquifer. Other than, this high tidal surge during cyclone usually overflows the protection embankments, inundates freshwater ponds, and damages other water infrastructures like tube wells, PSFs and rainwater harvesting plants. Due to destruction of sanitation facilities, open defecation often revives in the communities. People take refuge in cyclone shelters and temporary shelters embankments, schools etc. However, people's sufferings increases as most of the cyclone shelters do not have adequate water and sanitation facilities. The women, adolescent girls, disabled and aged people are the most vulnerable in this regard.

With this setback of hazards, Water Aid's project titled *Climate Resilience WASH Programming in Coastal Areas* is being implemented with the goal to contribute to improve human well being and dignity of poor in coastal areas of Bangladesh. The expected outcomes of the project are as follows:

1. Poor and climate vulnerable population in coastal areas are able to demand and participate in context-specific water supply and sanitation services
2. Poor, disadvantaged and vulnerable population in selected coastal areas has established their access to sustainable water supply, sanitation and hygiene facilities.
3. Policy-makers, local governments and service agencies are sensitised on safe water supply, sanitation & hygiene in coastal areas

Number of Unions covered by the project in two Upazilas and number of beneficiaries targeted as a whole are given in the following table:

District	Upazila	No of Unions	Targeted beneficiaries in total
Satkhira	Shyamnagar	6	Water-68,390 Sanitation-70,060
Satkhira	Assasuni	5	Hygiene-310,000

2.2. Rationale of the Study

As the project will be completed in September 2014 an end line study of the project is needed to understand the achievement in terms of result of project activities, community involvement, sensitisation of local government and potential for sustainability in the backdrop of realities in climate change affected areas. The results of the end line study will help to grasp the achievements of the project as well as identify the gaps for further improvement.

2.3. Main Study Objectives

- To know to what extent the poor and climate vulnerable population in coastal areas were aware of WASH and were organised to demand context-specific water supply and sanitation services;
- To understand the level of accessibility of the poor, disadvantaged and vulnerable population in intervention areas to sustainable water supply, sanitation and hygiene facilities;
- To comprehend the role of local government in addressing WASH needs of the poor and climate vulnerable population in the communities;

2.4. Specific Study Objectives

- To know the proportion of households in intervention areas had access to context specific safe drinking water supply;
- To understand the proportion of households in intervention areas were practicing water safety plan (WSP);

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- To know the proportion of households in intervention areas had access to improved sanitation facilities;
- To understand the prevalence of water-borne diseases in the intervention areas;
- To find out the level of TTC, Iron and Arsenic in the water of the facilities in intervention areas;
- To know the proportion of households had hand washing devices near the latrines and what portion of households practiced hand washing at five critical times;
- To comprehend level of involvement of the poor and vulnerable in local level planning;
- To understand the role of community in operation and maintenance of the water facilities;
- To elicit information regarding involvement of the local government (Union Parishad) to meet the WASH needs in the communities;
- To appraise level of understanding of the people living in intervention areas about the risks and impacts of climate change on water, sanitation and hygiene practice;

Section 3: Methodology

This study was a cross-sectional study using both secondary data of baseline and primary data of endline. Primary data of endline was collected from 17 August to 1st September 2014 using both quantitative and qualitative method. The study methodology comprises study design and approach, study area, data collection method, study population, and sampling; quality assurance during data collection; data management and analysis and limitation. With the objective of producing a blended (Quantitative and Qualitative findings) report in line with baseline, the study was designed with both quantitative and qualitative methods which triangulated at each level of data collection and analysis considering data validity and reliability.

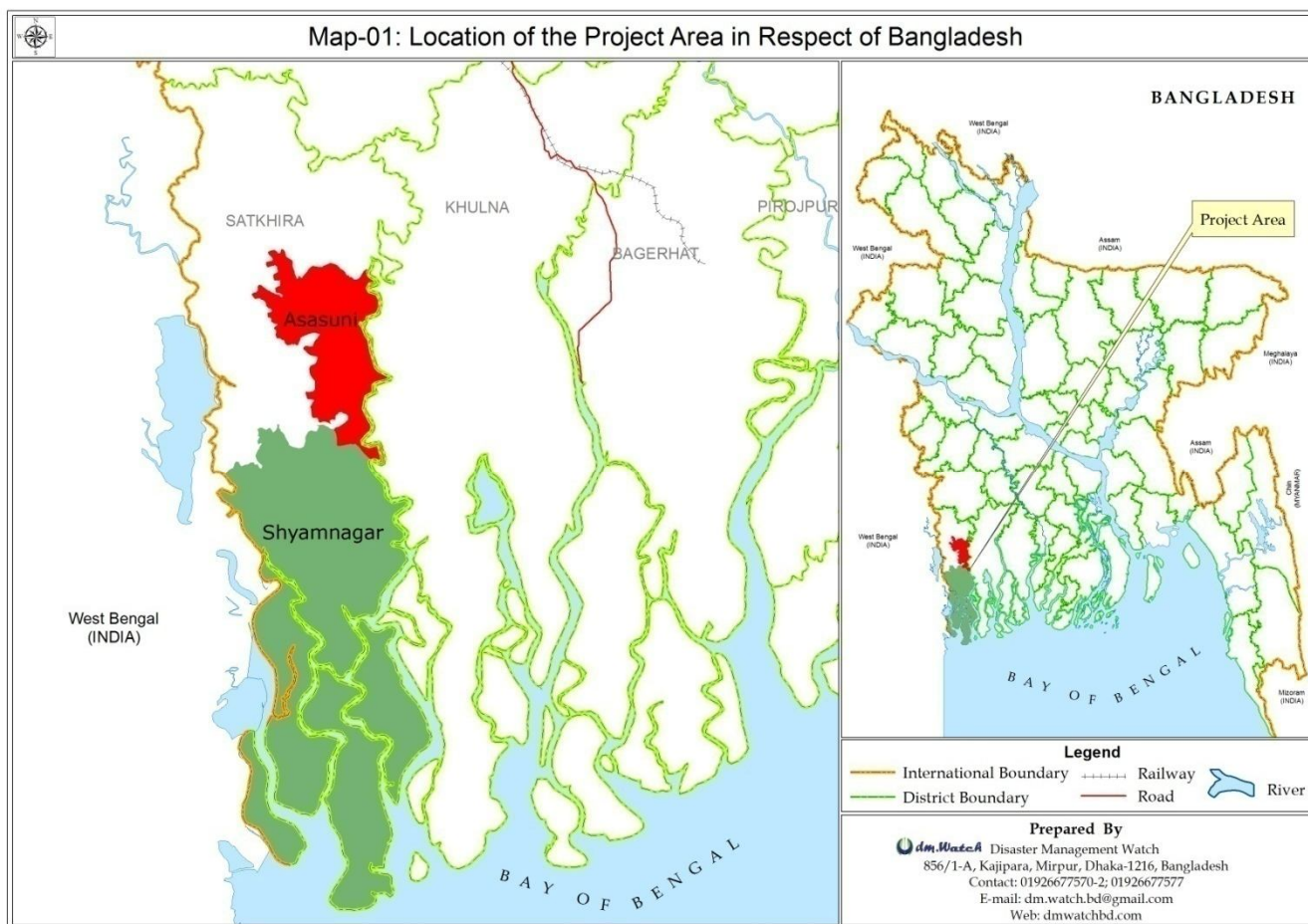
3.1. Study design and approach

This study was designed using both qualitative and quantitative approach. For quantitative part, this study used a structured and pre-coded quantitative questionnaire. As its focus was to capture the outcome of the project intervention, the questionnaire was prepared based on the specific objectives. Once the draft instrument was prepared it was piloted to finalise. After finalizing the questionnaire, a comprehensive guideline was developed for enumerator and supervisor for conducting interview, which specifically described important definitions, terminology, question objective, data input instructions, skipping etc. This guideline was easy to use and understand the survey objective and data collection.

For qualitative part, the main objective was to capture a comprehensive and in-depth depiction of the process of change in the indicators-to-be-measured, which may go unnoticed in the quantitative research. To collect qualitative data; different checklists were developed for key informant interviews (KII) and Focus Group Discussions (FGDs), Case studies and observation.

3.2. Study area

The demographic statistics of the Upazilas where the project is implementing since 2011 reveals the socioeconomic analysis of the context triangulated with collected study data.



3.2.1. Assasuni Upazila:

The area of the Upazila is 402.36 sq km, located in between 22°21' and 22°40' north latitudes and in between 89°03' and 89°17' east longitudes. Total population is 249244 with male 126399 and female 122845. Literacy rate in this upazila is literacy 40.30% (male 47.97%, female 32.51%). Sources of drinking water are Tube-well 81.84%, pond 13.56%, tap 1.03% and others 3.57%. Presence of arsenic in shallow tube-well water of the upazila is excessive. In a research conducted by BGS and DP H in 2001 it known that the average presence of arsenic in shallow tube-well is 133 microgram. However, about 67% of tube-well water contains arsenic more than 150 microgram. *Sanitation* 40.91% (rural 40.05% and urban 62.77%) of dwelling households of the upazila use sanitary latrines and 44.40% (rural 45.05% and urban 27.73%) of dwelling household use non-sanitary latrines; 14.69% of households do not have latrine facilities. It has 1 Upazila health complex, 1 rural health center, and 7family welfare centers (Banglapedia, 2012a).

3.2.2. Shyamnagar Upazila

The area of the Upazila is 1968.24 sq km, located in between 21°36' and 22°24' north latitudes and in between 89°00' and 89°19' east longitudes. Total Population of this upazila is 313781 with male 160294

and female 153487. Literacy rate in this upazila is 39.69% (male 47.75%, female 31.33%). Sources of drinking water are Tube-well 35.94, tap 6.46%, pond 50.74% and others 6.86%. Total 44.84% (rural 43.10% and urban 80.71%) of dwelling households of the upazila use sanitary latrines and 47.47% (rural 42.35% and urban 2.36%) of dwelling households use non-sanitary latrines; 7.69% of households do not have latrine facilities. It has 1 Upazila health complex, 10 union health centers and family planning centre and 38 clinics (Banglapedia, 2012b).

3.3. Data collection method

To collect both qualitative and quantitative data, temporarily recruited 10 research assistants were trained for 4 days and were divided into two groups. Each group was led by a field supervisor who worked in one Upazila. Each group was consisted of 4 Research Assistants for quantitative data collection and 2 Research Assistants were responsible for qualitative data collection. Also a Research Associate and 2 field coordinators were available in the field for assisting the field supervisors and Research Assistants. To collect data the team followed the approach below.

Data collection methods	Respondent Groups/Stakeholders	Area/Location	Number of Work	# of respondent
Quantitative	HH head of Project beneficiary households	Union level	605	605
Qualitative				
FGD	Project beneficiary (Male and Female)	Union level	4 (2 FGD in 1 union) X 8 Person	32
	Union WATSAN committee/Union Disaster Management Committee	Union level	2 (1 FGD in 1 Union) X 8 person	16
	WDMC	Union level	2 (1 FGD in 1 Union) X 8 person	16
Key Informant Interview	Up Chairman	Union level	2 (1 in 1 union)	2
	NGOs Working on WASH (BRAC etc)	Union level	2 (1 in 1 union)	2
	PNGOs staffs	Upazila level	2 (1 in each Upazila)	2
	Sub Assistant Engineer DPHE	Upazila level	2 (1 in 1 upazila)	2
	Caretaker of water source point	Union level	2 (1 in 1 UP)	2
	School Teacher	Union level	2 (1 in 1 UP)	2
	Project Coordinator/ Project Manager	WaterAid	1	1
	UNO	Upazila level	2 (1 from each upazila)	2

Case Study (significant change and learning)	Beneficiary Household	Union level	2 (1 in 1 UP)	2
	Successful WDMC	Union level	2 (1 in 1 UP)	2
Total				683

3.4. Study population and sampling

For quantitative survey, the study followed widely used statistical formula for calculating the sample size. Since there were three types of beneficiaries in three intervention areas – Water, Sanitation and Hygiene where the beneficiaries are 68390, 70060 and 310000 respectively;

Following the formula the sample size was:

$$SS = \frac{Z^2 * (p) * (1-p)}{c^2}$$

$$=600.25$$

Where:

SS = Sample size

Z = Z value (e.g. 1.96 for 95% confidence level)

p = percentage picking a choice, expressed as decimal
(.5 used for sample size needed)

c = confidence interval, expressed as decimal
(e.g., .04 = ±4)

After calculating the approximate Sample size i.e., SS; we find out the appropriate sample size. For that purpose, a correction for finite population was needed that are as follows:

$$\text{new ss}(599.449) = \frac{\text{ss}(600.25)}{1 + \frac{\text{ss}(600.25)-1}{\text{pop}(448450)}}$$

$$=599.449$$

Where: pop = population

By following the formula, the study fixed the appropriate household sample size of 600.

This study finally collected data from 605 sample households that extracted following three systematic steps –

1. 6 unions from Shyamnagar and 5 unions from Assasuni upazila that means in total 11 unions were selected where the Project was implemented;
2. Among 11 Ups 55 wards were selected randomly which is more than 50% of the total number of wards;
3. 11 households were randomly selected from the list

of WBA prepared by WDMC in each ward. Household head or spouse was selected as the study respondent.

For collection of qualitative data, 2 Unions from 2 Upazilas were randomly selected considering same union to triangulate data and Q² analysis. 8 FGDs, 13 KIIs and 4 case studies were conducted to collect qualitative data (Annex 1: table 3). Secondary data was collected from Union Parishad, local level government office, NGO of national and international organizations.

3.5. Sample for Water Quality Test

To triangulate the quality of the water, 60 samples (30 from facility level and the other 30 from households) were collected (See annex 1: table 1 and 2). Strategically samples were collected from those points of both levels – facility and households considering the *ratio of facilities and users, from where they collect and store water and geographical coverage*. This strategy technically put away overlapping of three tests – arsenic, iron and TTC/Fecal Coliform at household level samples as the water was tested of those facilities from where the households were collected water. On the date of 31st August, all samples were collected carefully in sterilized bottle and tested in the regional center of DPHE under Khulna Division. Collected water was tested in the laboratory within 6 hours after collection with the utmost importance.

3.6. Quality assurance during data collection

To ensure quality of data, a number of validation checks were conducted during data collection:

- **Accompany check:** The supervisor reviewed the process of the interview by accompanying the enumerator.
- **Spot check:** The supervisor went back to the respondent and validate or accurate the collected data.
- **Back check:** After data collection has been completed, 5% questionnaires were randomly chosen, and get back to the field for further investigation.

3.7. Data management and analysis

At the end of the data collection, the Research Assistants completed coding. After completion of coding, trained data entry operators entered data in through the CSPro software under a close observation of a statistician. Finally data base was imported and analysed using SPSS.

Qualitative data analysis was organized in four steps:

- a) Preliminary analysis of the findings with supervisor in a separate session;
- b) Thematic coding of data according to content and specific categories;
- c) Compiling data by themes to systematically analyse qualitative data;
- d) Compiling qualitative observations by themes and selecting cases and appropriate quotations;

3.8. Limitation

The survey collected data at the monsoon period and recorded data of water borne diseases for the *last three months* which is the prime time of water crisis and water borne diseases as well. This time preference factor contributed on higher prevalence of water borne diseases.

Section 4: Demographic profile of households and respondents

4.1. Profile of the Households

The lower (26%) and upper poverty (39%) level of the studied households were quite higher than the national average which points toward the persistence of the spatial inequality of poverty in the southwest Bangladesh (Annex: 2 Table: 11). The mean household income and expenditure was lower than national average but significantly increased from baseline. The mean monthly income and expenditure was increased by BDT 5160 and BDT 2451 respectively. The below table describes in detail.

Table1: HH income-expenditure dynamics (taka)

	Baseline	Endline	National
Total HH income (mean)	5405	9188	11482
HH income Shyamnagar	6173	8715	
HH income Assashuni	4487	9661	
Total HH expenditure (mean)	5444	7895	11200
HH expenditure Shyamnagar	5535	7520	
HH expenditure Assashuni	5352	8269	

Nearly all of the study participants' households were male headed (Annex: 2 Table: 2) where the heads are mainly married (Annex: 2 Table: 5). 79% of them were middle aged comprising with 7% younger and 14% elderly (Annex: 2 Table: 66). 2/3rd (67%) of them were not able to cross the education of primary level and 1/3rd (34%) had never been to school (See Table: 3).

With this low educational status more than 1/3rd (33%) household heads were maintaining their livelihood through daily laboring, 1/5th (21%) are engaged with informal small business, 1/6th (17%) depend on agriculture in own land, other 23% were engaged in formal and service sector which go with trend found in the national labour force participation survey (Planning Commission, 2011).

Table2: Occupation of Household head

Occupation	Number	Percent
Small Business	125	21
Daily Labor	123	20
Agriculture (Own Land)	105	17
Agriculture (Others Land)	81	13
Skilled Labourer	29	5
Driver (Rickshwa, Van, Auto)	26	4
Service (Non-Govt.)	21	3
Fisherman	16	3
Unable to work	14	2
Others	65	8

Total	605	100
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4.2. Profile of the Respondents

Though nearly all were male head headed households, more than 1/3rd (38%) respondents were female (Annex: 2 Table: 1) but mostly married (94%) (Annex: 2 Table: 5). 72% of them are middle aged comprising with 17% younger and 11% elderly (Annex: 2 Table: 66).

Without significant gender gap more than 50% have education including 1/3rd (33%) in primary school, 1/5th (21%) in secondary school and more than 1/3rd (37%) have never been to school.

Table3: Education level of respondent and household head

Level of Education	Respondent		Household Head	
	Number	Percent	Number	Percent
No education	222	37	203	34
Primary	199	33	197	33
Secondary	130	21	142	23
Higher secondary+	41	7	45	7
Only read and write	13	2	18	3
Total	605	100	605	100

The significant participation of female respondents contributed to highest occupational category of housewife. 15% of the respondents were found working in formal and informal sector¹. 50% of the respondents were engaged in informal sector, 13% were in other formal and service sector where other 5% were unable to work, unemployed and students (Annex: 2 Table: 6).

¹ Formal sector refers as service, working in the factory etc. and informal refers mainly working in the agricultural sector and self employed activities.

Section 5: Access to safe drinking water

Access to safe drinking water facilities is one of the key determinants of a healthy nation and community. This study measured the level of access of safe drinking water on the basis of indicators of time and distance.

5.1. Sources of drinking water:

All the year round, nearly the entire except only 8% households (Annex: 2 Table: 20) without any significant difference with baseline have access to improved drinking water sources which is higher than national rural average of 82.4% (UNICEF, 2011). The spatial specialty of the southwest region of Bangladesh is the availability of pond which is the traditionally main source of water both drinking and other uses. In the context of climate resilience safe drinking water sources, these ponds were utilised to introduce PSF as an ‘intermediate technology’ to ensure safe drinking water. Exactly 50% households were found to catch this source which is 5% higher than baseline. The other significant sources were found STW, DTW, supply tank water and bottle water which were 23%, 17%, 3% and 2% respectively (Annex: 2 Table: 12). Compare to baseline DTW increased significantly by 13.6% where the STW decreased by 4.2%.

5.2. Sources of water used for other purposes:

With the exception of drinking there were various uses of water in the households like dish washing, cooking, etc which demand a huge quantity of water. Water for domestic purposes (cooking, laundry and hygiene activities) was mainly fetched from pond (83%) which have taken a slide changes on using method in the context of PSF (Annex: 2 Table: 21). It was found in the qualitative data that earlier the people used to take the dish, clothes and even animal in the pond for washing. But after the introduction of PSF, to keep the pond water clean they take the pond water out and do the same at other places like beside pond or homestead. STW (9%), DTW (4%) and PSF (4%) were the other used sources of water for dish washing and cooking. It is to be noted that the highest no of households are using PSF for drinking purposes but not for domestic purposes.

5.3. Availability of water sources in crisis:

Across the Upazilas, the trend of crisis of availability of access to safe drinking water shows both up and downward mobility – with the first Bengal month holds the pick crisis period followed by a upward mobility starting from December which continue upto April and May and then take a downward

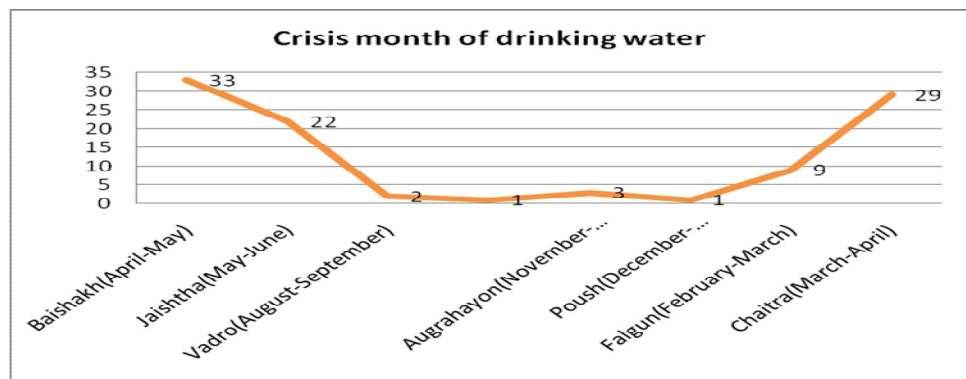


Figure 1: Crisis month of drinking water

mobility up to August. September to December found to be the lowest crisis period. (Also see: Annex: 2 Table: 13). Four significant underlying factors were found responsible for crisis of half of the year – draught (40%), salinity (29%), lower ground water level (15%) and damage of water source (12%) (Annex: 2 Table: 14).

To cope with the crisis the highest percentage of the households gets access of water from PSF which was 14% lower than usual time. This decrease trend also recorded for STW by 13%. This gap was found to be adjusted with the increased access to DTW and pond water by 12% and 13% respectively (Annex: 2 Table: 15). Qualitative data confirmed that draught causes lowering pond water and ground water as well. In this context PSF and STW become unable to function in full swing leading to go to DTW which is more far compare to these sources and using pond water directly which is not safe. The qualitative data also explored that though the decrease of water level results continuous pressure on DTW but in Shyamnagar there was no scope to install more DTW as DPHE found a layer of stone (*Source: Interview with Assistant Engineer, DPHE, Shyamnagar*). It was also observed that local shop keepers were selling pet water in these seasons which was not affordable by the poor people but in many cases they also bound to have this water.

To cope with disaster the highest percentages (38.5) of the households get access of water from PSF which was 11% lower than usual time. This decrease trend also recorded for STW and DTW by 4% and 1% respectively. This gap was found to be adjusted with the significant increased access to rain water harvesting and pond water compare to usual time by 17% and 4% respectively (Annex: 2 Table: 16). *This is to note that using pond water even in the period of disaster has been reduced by 16%*. Qualitative data confirmed that the community faces disaster mainly in monsoon seasons which causes dysfunction of many PSFs and STWs. But the scope of using rain water builds the ability to cope with the disaster. In this point, the FGD data argued that to store rain water it needs large water pot which is not affordable by most of the extreme poor households (*Source: FGD with female group, Bhurulia, Shyamnagar*). It is also to be noted that increase of using pond water which was not safe and may impact on health.

5.4. Ownership of the source of drinking water:

Ownership of the water point sources is critical in terms of accessing safe drinking water. In consideration with the poverty line and main source of safe drinking water obviously the greater quintile of ownership went to the community which is 58% and 48% higher than baseline. The poor wellbeing status of the majority also contributed to the ownership of other sources where the second highest ownership was found as neighbor (18%) and individual ownership takes only 10% (Annex: 2 Table: 19). Increase in community ownership is a reflection in the increase in access to safe water as well.

5.5. Maintenance of water sources:

5.5.1. Pond Sand Filters (PSF):

PSF was found as the significantly key source of drinking water from where half of the households are collecting water for drink. Based on the significant contribution of this technology, all PSF samples were observed critically comparing with the standard indicators. In the context of new technology where community is the key responsible to make it uninterrupted most of the PSF were found at satisfactory level in terms of maintenance which is described in the box. No significant differences were found between two Upazilas.

Box 1: Physical status of PSF

- 98% of the PSFs connection pipe was intact
- 97% of the PSFs' sand filter were unblocked and clean;
- 94% of the PSFs' storage chamber were found covered;
- 88% of the PSFs' wall was seen clean;
- 77% of PSFs' was out of any latrine or cow shade within the catchment area of 30 feet of the pond;
- 75% of the PSFs' bank were unbroken through where rain water or other dirty water from outside can enter into the pond;
- In 73% of the PSFs' pond no man or cattle or poultry were found not taking bath or used for other purposed like washing utensils or clothes;
- 73% of the PSFs' water collection tap was good;
- (Annex: 2 Table: 32)

5.5.2. Sallow Tube Well (STW):

In observation of STW, no latrine was found within the catchment area of 30 feet of 72%. No garbage was found in the connected drain of 61%, no damage in the connected drain of 78%, no water logging on the platform of 79%, no contaminated water is using for plucking water of 76%. 83% STW's nut bolts were found in proper place and 93% of the facilities' bottom was not loose (Annex: 2 Table: 33). No significant differences were found between two Upazilas and with baseline also.

5.5.3. Rain Water Harvesting:

4 rain water harvesting sources which were found were only in Ashshuni Upazila. Using diversified indicators all these facilities were observed where – no tank and cover of the tank were found damage or broken for all facilities. 3 facilities were found no broken or damaged first flashing pipe, no chamber was dirty or jam or broken and no dirt inside of the tank. 2 facilities were found to be with no dirt or garbage or dust on the roof or in the gutter and no garbage or latrine around 30 feet of the collected pipe or tank (Annex: 2 Table: 34). No significant differences were found between two Upazilas.

76% respondents said that their drinking water sources needed to repair in last one year (Annex: 2 Table: 35) and to repair the sources most of them (users) jointly contributed (76%) (Annex: 2 Table: 36).

5.6. Distance, transportation and time factors:

The distance is a major indicator to assess time that respondents allot to collecting water from the water sources. Majority of the respondents (75%) accessed water within a distance of less than or equal to 50

meters away. On average they spent 34 minutes which is slightly lower than baseline (36 min) in the study areas without any significant differences between two Upazilas. While 107 households were collecting from within the range of 1000-3000 meter generating a highest water collection time on an average (more than 60 minutes). (Annex: 2 Table: 62, 63 and 64). The time spent for fetching water is calculated on the basis of both going to the water source and returning to the dwelling place. Qualitative data explores that the quality and lifespan of the filter plays a significant role to determine the time preference. Especially in drought, the dirty and muddy pond water causes jam of the filter of PSF. It needs to clean 2/3 times per day which creates a long queue and more time to collect water (*Source: Interview with caretaker of PSF, Assasuni*). Many times this impacts social and economic losses in the community. Experience of one respondent is stated below.

“Bhupen was a day labour. One day he came at home to take lunch and found his wife could not cook as there was no water at home. The PSF was too far. He went to collect water. It was a long queue. It took two hours. After having meal he went back to the field. His employer scolded him and cut down half wage.”

5.7. Quality of water pot and storage:

Traditional portrait of “women are collecting water with pitcher” still observed as the everyday scenario in the study area. More than half of the households were found to clean their water pot once in a day and 5% households clean their water pot twice in a day, 1% household more than twice in a day and 6% households once in every two days; where the 1/4th were cleaned 2-3 times in a week (Annex: 2 Table: 37). As customary practice, majority (84%) were using pitcher to collect water (Annex: 2 Table: 39), mostly with cover on water pot (Annex: 2 Table: 38). To cover 1/3rd used traditional coconut skull where the other significant number of cover were found made of plastic and steel (Annex: 2 Table: 40). After collection with pitcher 2/3rd preserved water in the same pot, 1/3rd used drum or jar (Annex: 2 Table: 42). 2/3rd households were found to keep pot on the floor with cover, 1/4th were found to keep it in a higher place than the floor (Annex: 2 Table: 46). While preserving, all used cover for water pot (Annex: 2 Table: 44). All used mostly three types of pot which were plastic 35%, coconut 26% and melamine 15% (Annex: 2 Table: 45). More than half of the households cleaned the pot 2-3 times in a week, 7% once in a day, 3% twice in a day, 1% more than twice in a day, 15% once in every two days (Annex: 2 Table: 43). To carry water and storage no significant differences were found between base and end line study.

5.8. Water Quality:

This section explores the quality of water based on the scientific standard indicators. Three types of water tests were done at DPHE, Khulna – TTC in both household and facility level but iron and arsenic at facility level only. The facilities were PSF, STW, DTW, Reverse Osmosis and Rain water harvesting. The water quality was triangulated with the respondents’ perception. The box below states the perception while the test results is described in the later following parts of this section.

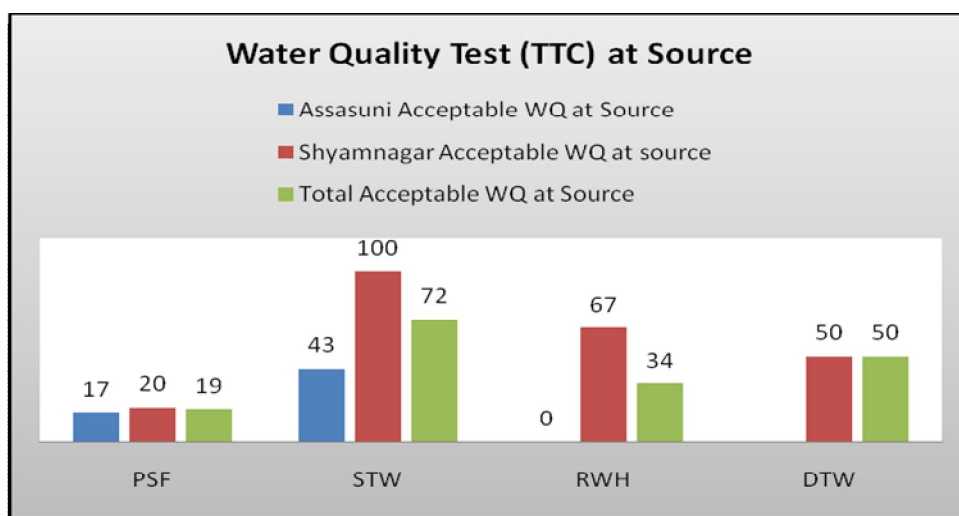
Box 2: Perception of water quality

Perception regarding safe drinking water is important which impact on the accessing behaviour. From community perspective, the safe water was perceived by the respondents with diversified meaning where safe water to them means; clean water (27.6%), arsenic free water (21.7%), water with no germ (19.8%) and sweet water (10.7%) (Annex: 2 Table: 18). Though these are not the synonyms of safe water but these may be regarded as uncontaminated water. According to the respondents perception 83% surveyed population mentioned that their water was pure which 65% at the baseline was. Other responses account statistically insignificant but with the concern of risk factors it is a subject to be noted which were: contaminated by arsenic 5%, saline 5%, odd smelled 3%, contaminated by iron 2% and dirty/clay mixed/turbid 2% (Annex: 2 Table: 17). In the case of STW and DTW, most were found labeled as green color which means to safe to drink (Annex: 2 Table: 24) where 57% tubewell were not colored at the period of baseline.

5.8.1. TTC:

The TTC² test result revealed that in Assasuni and Shyamnagr (17% and 20%) PSF were within the acceptance level. Qualitative data of the interview explained that some bacteria grew at facility level. For STW, in Assasuni, 43% facilities are in acceptance level

Figure 2: Water quality test – TTC at source

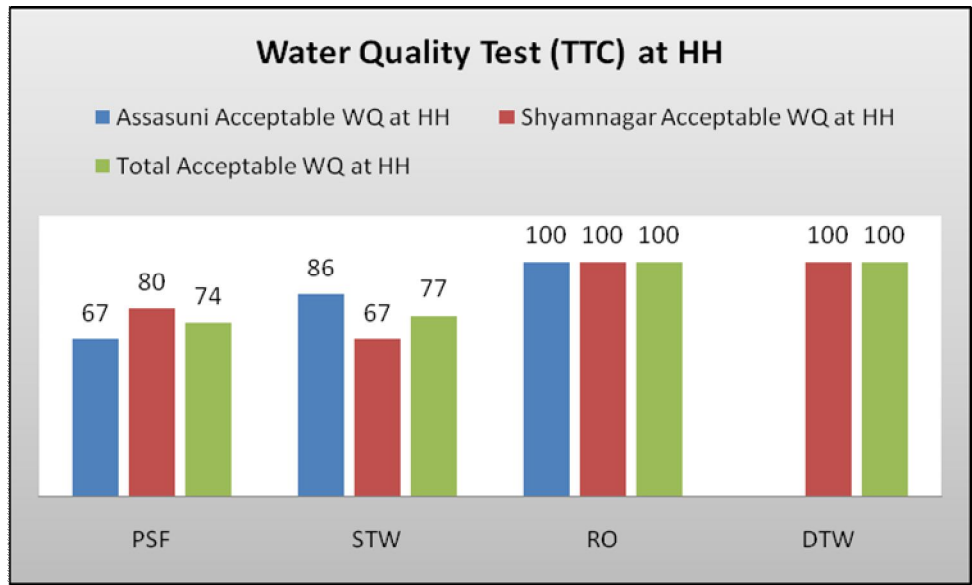


²Based on the Bangladesh Drinking Standard value of *CFU/100ml*, *BDS: 0* (Fecal Coliform) TTC was tested using MFM: Membrane Filtration Method in four types of facilities – PSF, STW, RO and RWH in Assasuni Upazila and five types of facilities – PSF,STW, RO, RWH and DTW in Shyamnagar Upazila. Household level samples that were collecting water from selected facilities were also collected.

which is 100% at shyamnagar. 67% of rain water harvesting was in acceptance level at shayamnagar. DTW facilities of 50% in both Upazilas were in acceptance level.

In the case of household, the acceptance level of PSF was higher even from the baseline which results that the storing system of the households has been improved. Household level of STW was 19% higher in Assashuni than Shayamnagar. Household level acceptance level was improved by 27% from

Figure 3: Water quality test result – TTC at HH



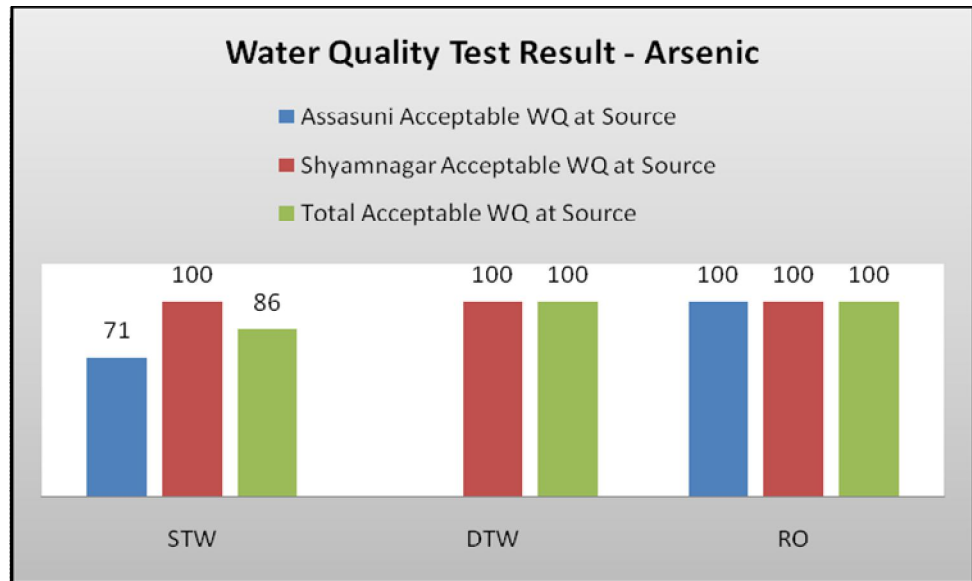
baseline. In the case of Reverse Osmosis, all households were found at acceptance level. DTW sample was collected from Shyamnagar where acceptance level was found 100% at household level (Annex: 2 Table: 59).

Figure 4: Water quality test result - Arsenic

So it proves that most households' storage system is good.

5.8.2. Arsenic (Source level):

The Arsenic test³ result revealed that acceptance level of STW in Assasuni was 71%, but in Shyamnagar, it was found as 100% which indicate that people of Assasuni was in at



moderate risk of Arsenic contamination. In the case of Reverse Osmosis, all facilities were found with 100% arsenic acceptance level. DTW sample was collected from Shyamnagar where 100% acceptance

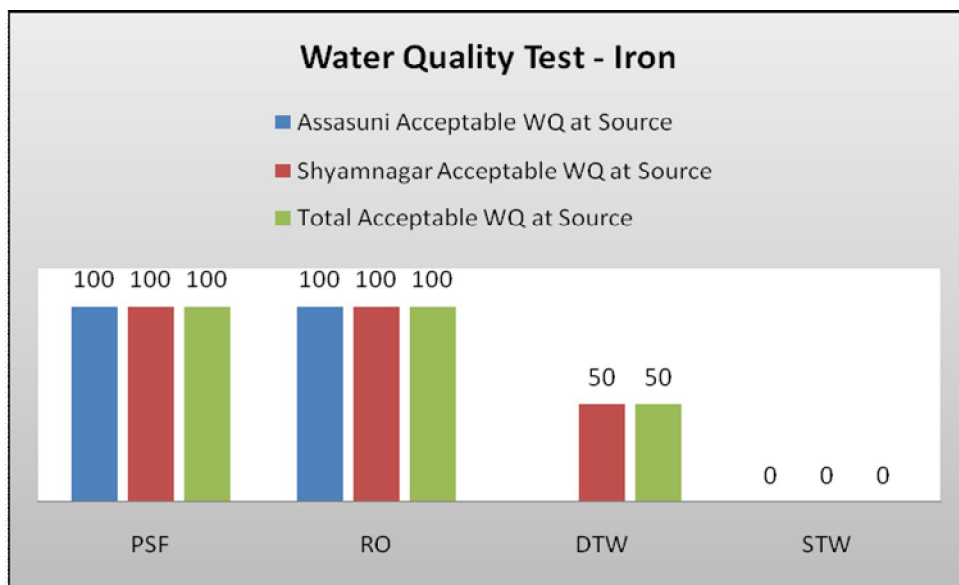
³Based on the standard value of LOQ:0.001, BDS: 0.05 – Arsenic (mg/L) Arsenic was tested using AAS: Atomic Absorption Spectrophotometer method in three types of facilities – PSF, STW, RO in Assasuni Upazila and three types of facilities – STW, RO and DTW in Shyamnagar Upazila.

level was found in all 4 facilities (Annex: 2 Table: 60). So, all tube well except 29% STW in Assasuni were found free from arsenic.

5.8.3. Iron (Source level):

The Iron test⁴ result revealed that in both Upazilas 100% PSF were within acceptance level. Qualitative data of the interview explained that PSF is based on surface water where possibility of iron contamination at surface level is very rare in fact unusual as if have it silt down. For STW, in both Assasuni

Figure 5: Water quality test result - Iron



and Shyamnage Upazilas, all facilities were found no acceptance which indicates that people of the study area was in at high risk of illness due to drinking of iron contaminated water. In the case of Reverse Osmosis, all facilities were found 100% iron acceptance level. DTW sample was collected from Shyamnagar where 50% was found at iron acceptance level (Annex: 2 Table: 61). So, all PSF was out of iron contamination but no acceptance level was found in STW which indicates that people of the study area was in at high risk of illness due to drinking of iron contaminated water. Half of the DTW was found in out of risk.

5.8.4. Salinity:

Salinity was not tested at any source level though it is a very common phenomenon in the southwest of Bangladesh. The coastal area covers about 32% of the country. Due to influence of tide and presence of salinity in coastal rivers, the livelihoods of over 50 million inhabitants of coast area depend on groundwater for meeting domestic, municipal, industrial and other needs. As salinity in the groundwater is a key factor, a clear idea of the extent of fresh – saline groundwater in various depths is required for optimal development and use of this precious potable water resource. The southwestern coastal region is characterized by the Ganges tidal flood plains with low relief, criss-crossed by rivers, tidal marshes and swamps. Although groundwater is abundant in the region, saline water intrudes into the aquifer system due to reduction of upstream freshwater flow, shrimp farming and over abstraction of groundwater makes the situation worse (Habiba, Umma. et al, 2013). The natural disaster also worsens the surface water resulting migration of the community people. One key informant explained,

⁴Based on the standard value of LOQ:0.01, BDS: 0.3-1 – Iron (mg/L) Iron was tested using CFU: Colony Forming Unit method in three types of facilities – PSF, STW, RO in Assasuni Upazila and four types of facilities – PSF,STW, RO and DTW in Shyamnagar Upazila.

“Cyclone Aila damaged or fully destroyed many embankments in the southwest coastal belt region, allowing salt water to inundate the land for months at a time. While the Water Development Board, GoB and other civil society actors worked hard to rebuild these protective walls, many were either poorly reconstructed or not addressed quickly enough. As a result, many people were displaced for months or in some cases, years afterwards. Many other parts of the affected areas experienced flooding twice daily with each high tide for up to two years following Aila.”

Qualitative data covered poor nutrition in salinity areas has been linked to birth defects, stunted growth, night blindness, increased incidences of childhood diseases and increases in miscarriages, maternal morbidity and mortality. Other indirect health affects as a result of salinity include increases in waterborne diseases as a result of less frequent boiling of water due to decreased sources of fuel such as wood.

5.9. Observation of WSP at household:

As part of testing of the level WSP, all research assistants were trained to take a glass of water from each surveyed household. The observation result show in the box below:

Box 3: How people serve drinking water (Annex2: Table: 50)

Positive	Negative
11% glass were provided properly	1/3 rd of the households had no cover of water pot
10% glass were washed with clean water	27% of them were holding glass in its upper side
3% glass were holding in its middle or lower part	11% of glass were not clean
	4% finger touched the water

The above table significantly contrast that the study households are in satisfactory practice of WSP but only 11% served water in a proper way.

Section 6: Access to improved sanitation

Access to sanitation facilities is one of the key determinants of a healthy nation and community. This study measured the level of access of sanitation through types of latrine use and cleanliness. The table below shows the types of latrine that the study households use.

Table 4: Type of latrine used by HH

Type of latrine	Shyamnagar	Assasuni	Total
Pit latrine with lid	25	52	39
Slab latrine with water seal	25	22	24
Slab latrine without water seal	23	19	21
Pit latrine without lid	14	2	8
Open Place	13	0	6
Hanging latrine	0	1	1
Pit latrine but connected with drain/canal	0	3	1

The average improved sanitation facilities (63%) in the study area is at 8 percent point higher in compare with the average national rural Bangladesh of 54.5% (UNICEF, 2011) though no significant improvement was recorded against the baseline status. The improve sanitation facilities contain 39% of pit latrine with lid and 24% of slab latrine with water seal. *But compare to baseline open defecation and hanging latrine reduced by 4%.* In between two Upazilas of Shyamnager were significantly left behind which was 5 percent point less against national average. It was observed that the changing landscape and crop pattern specially shrimp farming in contributing to scarcity of land that is influencing not to build the facilities. On the other hand, water crisis is influencing not to use water seal which is the third highest category of sanitation facilities. The qualitative data explored, *“Water seal demands more water. But as the people live within the environment of water crisis, many people break it just to save water to use for other purposes.”*

The standard distant between water source and latrine facility should 30 feet which is critically associated with land scarcity. But nearly all households own individually of their latrine (Annex: 2 Table: 26) which may have a negative projection of using improved sanitation where the concept of community led latrine may be introduced.

Cleanliness of the latrine is an important part of the hygiene practice behavior where just half of the households are in satisfactory level which has been improved by 4% as per baseline. The other half facilities' were found to spread bad smell over the time (Annex: 2 Table: 27).

Section 7: Hygiene

This study recorded practice of specific seven times of hand washing which is two times more than baseline. Before having meal increased 18% which was 47% at baseline, 36% practice after having meal, 96% wash hands after defecation which increased up to more 5% from baseline, after catching something dirty decreased by 5% which was 48%, before preparing food increased 5% from baseline which was 8% and before serving food decreased by 4.5% which was 6.5% (see table below).

Table 5: Hand Washing Practice

Percentages and totals are based on respondents or case or HH	Shyamnagar		Assasuni		Total	
	Number of HH/case	Perc ent	Number of HH/case	Perc ent	HH/c ase	Perc ent
After having meal	162	58.91	48	14.55	210	36.72
Before having meal	175	63.64	222	67.27	397	65.45
After defecation	265	96.36	314	95.15	579	95.75
Whenever hands become dirty	155	56.36	99	30.00	254	43.18
Before preparing food	57	20.73	15	4.55	72	12.63
Before serving food	5	1.82	7	2.12	12	1.96
Before touching a baby	0	0.00	2	0.61	2	0.30
Don't know	0	0.00	3	0.91	3	0.45
Don't use soap ever	1	0.36	1	0.30	2	0.33
Total	275	298.18	330	215.45	605	256.77

Hygiene practice was observed using seven indicators where as in baseline it was only observed that whether the study households had any hand washing arrangement or not. In baseline 91% households were out of using any hand washing devise or arrangement while the seven indicators is stated in the below table.

Table 6: Hygiene practices at household levels

Question	Answer	Shyamnagar	Assasuni	Total
Is there any place for washing hands beside the latrine?	Yes	16	43	30
	No	84	57	70
Is there any soap for washing hands beside the latrine?	Yes	18	30	24
	No	82	70	76
If there is no soap beside the latrine, does	Yes	98	95	96

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any soap at HH?	No	2	5	4
Is the soap used?	Yes	100	95	97
	No	0	5	3
Is there water beside the latrine for washing hands?	Yes	20	30	25
	No	80	70	75
If there is no water beside the latrine, does any water at HH for washing hands?	Yes	100	99	99
	No	0	1	1
Is the HH and its around side are neat and clean?	Yes	32	45	39
	No	68	55	61

The above table shows that the households who wash their hands after defecation, most of them (96%) washed their hand after latrine use at home rather than beside the latrine. Nearly 1/3rd have separate place for hand washing using soap and water beside the latrine whereas most of all (96%) were keeping soap used by 97% and water (99%) at household for hand washing after latrine use which was not practiced in baseline among 91% households.

As part of being neat and clean, 67% households put garbage in a specific pit of the household (Annex: 2 Table: 48).

Section 8: Risks and impacts of climate change on water, sanitation and hygiene practice

Environmentally, Bangladesh is considered extremely fragile and one of the world’s most vulnerable countries to the negative effects of climate change and natural disasters. According to the World Bank, 60% of the global deaths caused by cyclones in the last 20 years occurred in Bangladesh. In 2012 Bangladesh was ranked fifth in the World Risk Index for natural disasters. Two recent tropical cyclone Sidr (2007) and Aila (2009) caused extensive damage to the southwest.

While natural disasters playing a significant impact in Bangladesh, human-induced slow-onset disasters such as salinity are having an increasing negative effect in the southwest in particular. It is the mixture of both natural and human-induced disaster that creates chronic poverty in the delta.

Regionally, the southwest coastal belt of Bangladesh is an intricate system of biodiversity which includes the Sundarbans, the largest mangrove forest in the world. The coastal zone spans over 580 km of coastline and is prone to multiple hazards. According to World Bank (2012), Sixty-two percent of coastal land has elevation up to five meters above mean sea level; making this region also extremely vulnerable to sea-level rise. The region constitutes 32% of total land area in Bangladesh and hosts nearly 28% of the population (nearly 42 million). Historically how both livelihoods and natural environment are extremely fragile under both human- induce and climate change is stated below.

Box 4: Time line of climate change in southwest of Bangladesh

Timeline	Lives and livelihood of the southwest people
Pre 1950's	Farming activities in the southwest were centered on the natural tidal system which occurred throughout the regions river and canal system. Soil was rich and fertile, benefiting from the sedimentation which built up throughout the year, making agricultural farming profitable.
1950's	While this natural tidal system worked to enhance the fertility of the region, it was nevertheless vulnerable to hazards such as floods and cyclones. In the 1950's a series of devastating cyclones struck the region causing the Government of East Pakistan's Water and Power Development Authority (EPWPDA) to convert the area into a dry zone and work towards enhancing protection of the coastal belt.
1960's	With the goal of enhancing resilience in the region, the World Bank assisted East Pakistan (and later the Government of Bangladesh (GoB)) to establish a series of polders and embankments designed to enhance agricultural production and protect the region from the intrusion of saline water, floods and other disasters.
1970's	During the 1970's some farmers, entrepreneurs and the GoB recognized the opportunity for an expansion of commercial shrimp farming in the region. With an increasing demand and high price for shrimp on the international market, shrimp farming was seized upon

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	as part of a 'Blue Revolution', seen as an opportunity to bring economic stability and prosperity to both the southwest and the national economy alike.
1980's	Twenty years after its implementation and under increasing pressure, the embankment system began to struggle. Maintenance of sluice gates and management of sedimentation build-up within the river and canal systems were poor.
1990's	By 1994 the GoB, in favor of the shrimp industry, declared the coastal area a "free zone" for shrimp cultivation. Quickly, the most powerful villagers and outside business people entered the region and established extensive illegal pipes and gates to trap brackish water to cultivate shrimp in agricultural land. Installing these piping systems through embankment walls significantly weakened infrastructure, obstructed the flow of water and increased the risk of flood from embankment breach or collapse.
Now	<p>Shrimp production in Bangladesh is highly concentrated in the southwest with Satkhira, Khulna and Bagerhat producing 80% of Bangladesh's bagda (saltwater) shrimp. Intensive shrimp production has led to a substantial decrease in diversified livelihood options, reduced resilience and enhanced the vulnerability of communities.</p> <p>As saline water now infiltrates local water tables, many communities are facing safe drinking water crises. As a result, women and children are required to walk longer distances to fetch fresh drinking water or are forced to rely on rain water collection or on water vendors.</p> <p>High salinity levels are also affecting people's health. Women in particular reported a rapid increase in skin and genital diseases due to pollution and the use of salty water for washing.</p>

(Source: Key informants and FGD)

Households of 39% compare to 7.9% in the baseline were found fully aware of the risk factors of climate change where Shyamnager respondents were found significantly four times higher than Ashashuni Upazila (Annex: 2 Table: 28).

Specifically more than 1/4th responded about the risk of increased natural disaster which is associated with climate change factor. The other significant risk factors were told by the community people were increased of prevalence of diseases (23%), temperature (21%) and salinity (19%) (Annex: 2 Table: 29). Households of 43% respondents mentioned that they learnt on these risks factors from the Shushilon's (NGO) training. The significant other sources were recorded as Media (19%), WDMC (14%) and self learning (12%) (Annex: 2 Table: 31). The key threat of natural disaster was explored more in the interview with key informant that is stated in the box below.

The households aware on the risk of climate change from Shushilon and Rupantor(NGO) and other sources were found that they have good knowledge base on the *how to cope with* this changing realities as per table below.

Table7: How to cope with the risk of climate change

<i>Initiative to take</i>	Shyamnagar (%)	Assasuni (%)	Total (%)
Remain neat clean	24.1	7.0	15.5
Plant more green trees	15.2	33.7	24.5
Arrangement of first-aid	15.0	4.7	9.8
Maintained water source	14.1	29.1	21.6
Keep Torch/Candle	12.0	1.2	6.6
Arrange alternative sources of drinking water	10.3	16.3	13.3
Build Sanitary Latrine	9.1	5.8	7.4
Don't know	0.2	2.3	1.3
Total	100.0	100.0	100.0

Just 1/4th belief that the community people should take the initiative to plant more green trees, 22% focused on maintaining water sources, 16% remaining neat and clean, 13% on arranging alternative sources of drinking water and some 7% on building sanitary latrine. The other few initiatives were also found – arrangement of fast-aid, keeping torch and candle.

Section 9: Prevalence of water-borne disease

This section explores three key issues relating to water borne diseases – understanding about water contaminated disease, rate of affected persons, socio-economic impact of diseases. Households of 86% were found aware about the diseases of drinking contaminated water (Annex 2: Table: 51). More than 1/3rd reported Diarrhoea. The other diseases were found dysentery (22%), cholera (18%), eczema/skin diseases (13%) and abdominal pain (10%) respectively (Annex 2: Table: 52).

NGO training (Rupantor/Shushilon) was found to play a vital role to aware on the diseases in accordance with 35% of the respondents. Except NGO training the households learnt about the diseases from various sources – 21% from self learning, 16% from media, 10% from WDMC, 9% from doctor, 7% from other NGOs and other insignificant sources (Annex: 2 Table: 54).

9.1. Status of water borne disease:

Though all respondents weren't found aware of contaminated water but water borne diseases. The highest response that is 38% mentioned about Diarrhoea. The other significant diseases mentioned by the respondent were dysentery (29%), skin diseases (14%) jaundice 7% and fever 7% respectively (Annex: 2 Table: 53).

From the survey period to last three months 28% households were found to be affected by water borne diseases which was 61% in the baseline⁵ (Annex: 2 Table: 51). The table below shows about the diseases that the 28% was affected.

Table 8: Type of water-borne diseases that affected HH members?

<i>Type of water borne disease</i>	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Diarrhoea	13	41.9	52	33.3	65	37.6
Fever	8	25.8	47	30.1	55	28.0
Dysentery	6	19.4	49	31.4	55	25.4
Cold	3	9.7	0	0.0	3	4.8
Skin disease	1	3.2	6	3.8	7	3.5
Malaria	0	0.0	1	0.6	1	0.3
Dengue	0	0.0	1	0.6	1	0.3
Total	31	100.0	156	100.0	187	100.0

Among the households, 38% were affected by diarrhoea which was 51% in baseline; the other most significant prevalence of diseases was fever (28%) and dysentery (25%) which was 63% and 48% respectively at the baseline. Except earlier diseases the households responded on cold, skin disease, malaria and dengue. Although prevalence of water born diseases found to be reduced compare to the baseline but the current prevalence higher which is not the dominant picture of disease. Basically, data was collected in the monsoon season and recorded water borne diseases of three months of dry season

⁵ Baseline collected water borne disease data for last six month where as the end line framed for three months.

when the prevalence remain at high level. According to the qualitative data of status of borne diseases is significantly reduced. One of the Chairman of Assasuni Upazila said,

"2/3 years ago, people were used to queue to the medicine seller to buy oral saline but the scenario has been changed as the people practice sanitary latrine, keep their surrounding neat and clean and drink safe water (Source: KII with UP Chairman)."

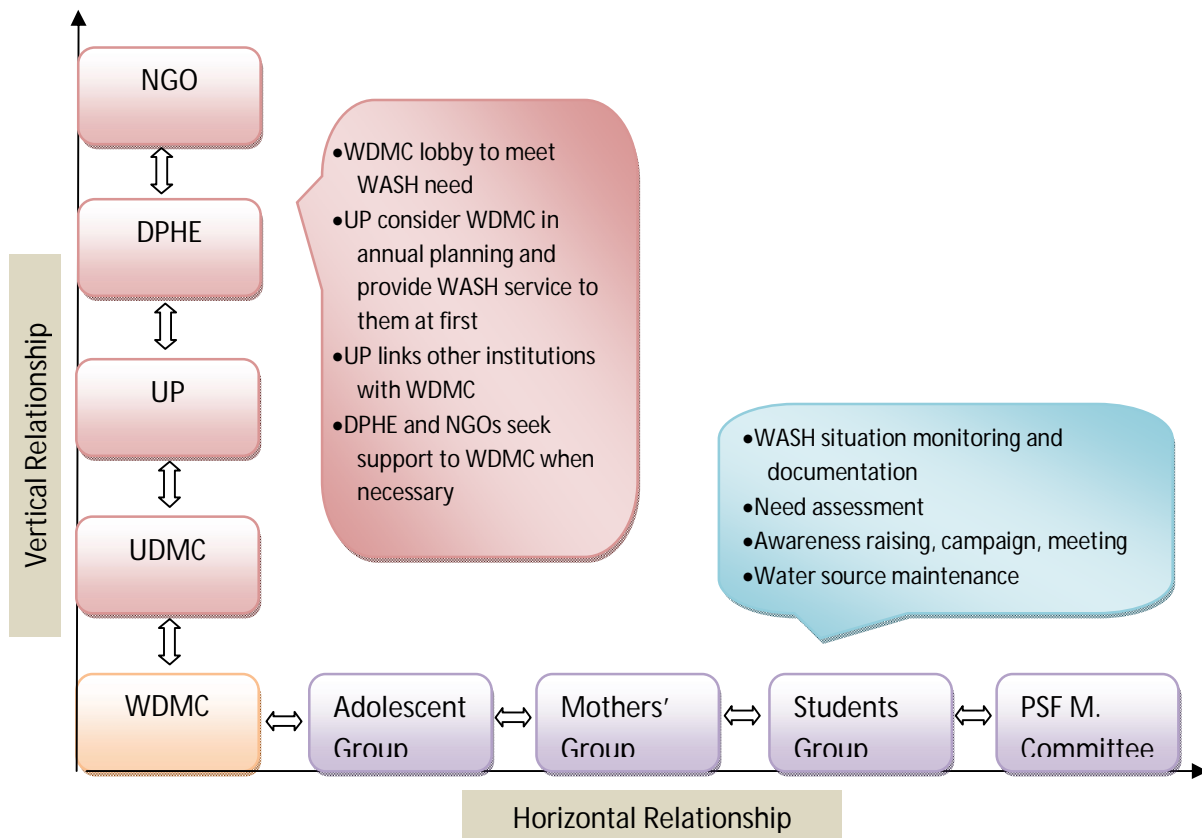
Significantly half of the households were affected by drinking contaminated water. The other half were from diversified causes like scruffy environment, water logging, natural disaster, weather change, and erratic rainfall (Annex: 2 Table: 56).

9.2. Health seeking behavior and consequences of diseases:

Among 28% household members who were affected by water borne diseases in last three months, 44% of them lost working days. The average day loss was 5.5 which were 7 days at baseline. This loses effected on their health seeking behavior which resulting 71% of the affected households sought support from local level quack or village doctors. 17% were found to visit different health facilities where as 9% from medicine seller, only 2% went to MBBS doctor. (Annex: 2 Table: 57). Female FGD data confirmed that the people earlier used to go to local level doctors or medicine seller as most people are poor and the transport communication is not good. But in the case of severity they used to go to hospital or MBBS doctors (Source: FGD with female group, Bhurulia, Shyamnagar). Loss of working days due to water born diseases thus results in an economic burden for the family. The treatment cost of water borne disease was BDT 525 which was BDT 1169 at the baseline. On the other hand vulnerable pattern of health seeking behavior is also a concern which can deteriorate the health condition of the family.

Section 10: Role of community and local government

With the effort of the project community based organizations were formed in the name of Ward Disaster Management Committee (WDMC) and were found to be functional to address the WASH issues in their locality. 23% of the household members of the study participants were formal member of this committee but 62% of the household members are aware about these institution’s activities in their locality (Annex: 2 Table: 58) which means the WDMC are playing an active role although their visibility needs to increase. This WDMC build a horizontal and vertical relationship with different community organizations and other GO-NGO institutions which is portrait in the chart below.



Triangulation of qualitative data reveals that this organization built a horizontal relationship among the community people through assessing the community demand of WASH needs, disaster preparedness activities, coordinating and participating to repair and maintenance of the facilities, court yard meeting to aware on climate change and DRR issues. As part of the assessment of the adolescent group said, “we find out the problems through monthly meeting and inform WDMC about the identified problems” (Source: FGD with adolescent girls). To meet the assessed demand this organization created a vertical relationship with the local government and other respective government offices. Within the above structured relationship community role on operation and maintenance of the water facilities and UP involvement to meet wash needs are described below.

10.1. Role of community in operation and maintenance of the water facilities:

Qualitative data shows that before commencement of this project NGOs worked on WASH earlier in this locality. Those projects also formed different committees. The Manager of Shushilon said that those committees did not work well as the community people were not aware of the impact of climate change. Under this project, committees and caretakers were trained on the negative impact of climate change and the importance and method of operation and maintenance of water sources. After getting training one of the participants said,

“Earlier my understanding on safe drinking water was nothing to mention but now I am aware about the problem of safe drinking water in our area. Who will maintain our water sources if we do not?” (Source: KII with member of PSF maintenance committee)”.

The importance of maintenance of water sources created through a series of different types of sessions, courtyard meeting and drama playing. With the assistance of PNGO, WDMC formed a five members committee to repair and maintenance of PSF. This committee designated one person as caretaker. To maintain the cost all users contribute 3-5 taka per month except the extreme poor households. One of the caretaker said, *“Earlier people were used to bath cattle in pond which is totally disappeared now. People are very aware about the importance of the facilities – nobody theft any tap or parts of the facilities, always keep clean the surroundings, don’t wash utensils in the pond and maintain the queue to collect water.”*(Interview with PSF caretaker, Shyamnagar). All community people perceive the same thing that if PSF dysfunctions, they will be deprived to get access to safe drinking water. So they are more aware than any time before to operate and maintain the water sources in a proper way.

Box 5: Role of WDMC to function PSF mitigate conflict

Usually PSF is installed in a private pond where the NGO bear the installation cost, the pond owner share his or her pond and the community donates maintenance cost. In Assasuni, a pond owner refused to use his pond after one year of installation. He wanted to release fish for farming. At that point the PSF committee reported to WDMC. WDMC sought support from the UP Chairman. The Chairman and the member of WDMC succeed to motivate him for the sake of the local people after a series of discussion.

10.2. Involvement of the local government (Union Parishad) to meet the WASH needs in the communities:

UP member as president of WDMC and member of UDMC as well, bridges between the committee and UP to raise assessed community demand allocate budget. For instance, to ensure water access in the Upazila of Ashashuni, the committee with the assistance of UP, negotiated with the water development board to get a government water body and succeed. Based on the link with UP and DPHE WDMC ensured to allocate budget for STW and ring-slab for the extreme poor community households. They

also succeed to allocate budget to different development works like re-excavation of canal, repairing connecting roads, tree plantation and plinth and latrine raising. One of the Chairman said, *“We have very limited budget against local demand. Earlier we did not consider allocating budget for WASH while we are focusing this issue in recent days. While we are facing constraints of budget; we always are trying to provide support from other type of allocation.”* (Chairman, Bhurulia, Shyamnagar). FGD data of WDMC confirmed that UP accepted their three projects that were placed at the annual planning.

As part of building horizontal relationship this committee receives various demands from different community based club and pursue to the respective government department. One WDMC member said,

“We used to identify problems like water scarcity through discussion with local people. Some problems which are within our ability, we do these collectively. For instance, we save the TA/DA allowance provided by NGO and invest to install new latrines for the extreme poor households on priority basis. But which we can't afford, we share with UP through Ward meeting or to other GO-NGO departments.”(Source: FGD, WDMC, Borodal, Assasuni).

Section 11: Discussion and Conclusion

The endline findings suggest that there is an increased demand for safe water sources in the communities. Although improvements noticed in access, practices and behavior of the community people, there is a challenge of maintaining the “safe water chain”. All the families should have a clear understanding how a break in the chain generates a high risk of contamination.

In the survey, 83% respondent mentioned that the water they access is pure. However, increased access to PSF and other water sources justifies the claim.

All the year round, nearly the entire except only 8% households (Annex: 2 Table: 20) without any significant difference with baseline have access to improved drinking water sources which is higher than national rural average of 82.4% (UNICEF, 2011). The community was also found to be increasingly aware about keeping the spot clean to access safe water uninterruptedly. The project was found to be successful in creating increased ownership of the water sources by the community which has been reflected when it was found that they jointly (76%) contributed to maintain/repair the source when required.

December to August is the water crisis period with different kind of upward and downward mobility. September to December found to be the lowest crisis period. Draught (40%), salinity (29%), lower ground water level (15%) and damage of water source (12%) were some major reasons found behind the crisis sector. These findings suggest to design further projects/intervention considering the seasonality factor.

Although after the intervention the quality of the water source has improved, but it is remember that water storage and handling system has much more impact on the water quality and consequently on the health of a population. It is proved that vulnerable water storage containers contribute to increased microbial contamination and decreased microbial quality. There is also increased risk of waterborne infectious diseases from inadequately stored water compare to water stored in an improved vessel. Findings reflected that water storage practices of many of the respondents are traditional and unsafe so true about the handling practice as well. Community friendly messages can be delivered to encourage people to keep containers clean, safely covered, and out of reach from children. Appropriated messages should also be delivered to the community people about safe water storage and handling system. 64% respondents reported to keep the water in the same vessel after collection where it is best if people use a different container for collecting water and storing water. Type of vessels and cover used for storage and also matters a lot to keep the water safe.

All tube well except 29% STW in Assasuni were found free from arsenic. Hence customized interventions are suggested to address the iron contamination problem in Assasuni area.

The average improved sanitation facilities in the study area is at 63% which is 8 percentage points higher in compare with the average national rural Bangladesh of 54.5%. But such findings refer to the further need of intervention to achieve 100% safe sanitation in the community. However, there is a also a need to long terms interventions to achieve gross and sustained success in this regard. In between two Upazilas Shyamnager is significantly left behind which is 5 percent point less against national average.

Thus this indicates about the need of a regional focus as well while planning any future intervention. However, the causes also need to be explored that is contributing to regional discrepancies in different indicators. .

It was observed that the changing landscape and crop pattern specially shrimp farming in contributing to scarcity of land that is influencing not to build the facilities. On the other hand, water crisis is influencing not to use water seal which is the third highest category of sanitation facilities. The standard distant between water source and latrine facility should 30 feet which is critically associated with land scarcity. But nearly all households own individually of their latrine. Cleanliness of the latrine is an important part of the hygiene practice behavior where just half of the households are in satisfactory level which has been improved by 4% as per baseline.

This study recorded practice of specific seven times of hand washing which is two times more than baseline. However, concern still remained there regarding garbage management as 67% households were found to put garbage in a specific pit of the household and rest mostly have harmful practices.

39% of the households compare to 7.9% in the baseline were found fully aware of the risk factors of climate change where Shyamnager respondents were found significantly four times higher than Ashashuni Upazila. Households were also found with good knowledge on the *how to cope with* this changing climatic realities.

The project has succeeded in some of the health indicators as 86% of the households were found aware about the diseases of drinking contaminated water. 28% households were found to be affected by water borne diseases in the last three month which was 61% since 6 months back of the baseline. Among them, Diarrhea though in higher level but reduced by 13% which was 51% at baseline. Fever and dysentery decreased by 35% and 23% which was 63% and 48% respectively. However among 28% household members who were affected by water borne diseases in last three months, 44% of them lost working days and mostly sought support from local level quack or village doctors. This suggests further comprehensive package of intervention that delivers health awareness and health access related messages in the community.

Coordinated community approach has been suggested based on the findings. Further interventions were suggested to ensure "safe water chain" in every household. Management of the facilities is a key concern for ensuring uninterrupted flow of safe water. Role of WDMC is key in this regard to ensure proper management. Although almost every household were found to own latrine but owning a latrine can be disastrous if the hygiene and cleanliness are not maintained. Community sanitation systems can a solution in the event of land and water scarcity. Community was found knowledgeable about climate change, safe water and sanitation as well hygiene. However this knowledge has not reflected in their practice in line with their knowledge level for which there is a need of more behavior change program.

The project facilitated increased community participation which is key to sustainability, however, that didn't include all of the community. Hence community mobilization is still a daunting challenge to achieve success in a full swing. On the other hand, management of the facilities is a key concern for ensuring uninterrupted flow of safe water. Hence. WDMC and the community can jointly come up with

contingency plans on how to sustain the facility and how joint community initiative can play a vital role in this.

Knowledge and practice are two different things. From the study results, we have found that people have high knowledge on certain things on climate changes issues, hygiene, safe water and sanitation, but, this knowledge has not reflected in their practice in line with their knowledge level. This state of reality urges to focus on behavioural changes.

Under the initiative of behavioural change, this project focused on school to orient students on WASH. For instance, WaterAid has intervened⁶ in 152 schools of 11 unions at Shyamnagar and Ashashuni upazilla where WFP continued school feeding initiatives. In these schools WaterAid has provided support for drinking water and sanitation facilities along with improved hygiene practice. Among water and sanitation facilities in schools, project installed 93 Rainwater Harvesting System (RWHS), constructed 78 new latrines and 42 latrines were repaired. To improve hygienic practice in school project provided training to students and school management committee on water safety plan, improve sanitation, hygienic behavior, disaster and menstrual hygiene management.

Active community involvement in all phases of the work is vital to the sustainability of activities. Developing a sense of ownership and responsibility among community members and leadership for the activities can be achieved through participatory approaches. This study would suggest the following specific recommendations apart from those mentioned above:

1. Poor understanding regarding the safe water chain and noticeable unhygienic practice from collection to storage to consumptions refers to the need of a comprehensive package of intervention guided by behavior change communications. It is imperative that all the families should have a clear understanding how a break in the chain generates a high risk of contamination and thus this understanding should also be reflected in the practice level to avoid the water from contamination.
2. From the findings it has been found that seasonality is one of the confounding factors behind the water crisis in the respective project areas. Thus there is a need to design further projects/intervention considering the seasonality factor.
3. In many of the indicators there have been found regional disparities between Shyamnagar and Ashashuni upazilla e.g. iron level, sanitation practice, knowledge regarding climate change etc. However, causes behind those dissimilarities were not within the scope of the current study to explore. To address such regional/locational dissimilarities it is suggested to have further study to find out the root causes behind those factors or underachievements which is necessary for

⁶ This project was part of PLB initiative. Project Laser Beam, a five-year, multimillion dollar public-private partnership, was established in 2009. It aimed to find new solutions to persisting problems in the area of child malnutrition. It brings together the expertise of the United Nations and other public agencies with that of Fortune 500 companies, governments, non-governmental organisations (NGOs) and local companies in Bangladesh. Under PLB initiative, Unilever is supporting World Food Programme (WFP), WaterAid, BRAC and the Friendship charity to provide nutritional support, livelihood promotion, health improvement and enhance access to safe water, sanitation and hygienic practice in vulnerable coastal area.

further program planning. Thus future program planning should consider geographical and cultural factors of each of the intervening areas.

4. Although prevalence of water borne diseases has reduced but still this has remained as concern. On the other hand the treatment seeking behavior reflect the communities' reluctance about water born diseases which can deteriorate the health condition further resulting in loss of lives and/or productive days. Hence, any future program should be inbuilt with referral mechanism along with information on health services delivery points.
5. As mentioned management of the facilities is a key concern for ensuring uninterrupted flow of safe water. Role of WDMC is key in this regard to ensure proper management. Also the WDMC and the community can jointly come up with contingency plans on how to sustain the water facilities.
6. Water storage system needs an attention. Poor people have very few or worst options available to store water. Intervention may be taken to ensure large and safe storage system.
7. PSFs were found the most accessed source in the community. However it was found that some of the owner of a pond are reluctant or do not allow to install a PSF in their pond, in this case some motivation program or incentives system should be there so that the whole community can be benefitted at large.
8. Community people were found concerned more about disasters like flood/tidal surge etc which destroy the dam and ultimately the whole community suffers which include the water, sanitation and hygiene system of the area as well. Hence, some big projects might be jointly implemented with government, other NGO through a coordinated approach so the community can be protected from big disasters.

9. Annex 1: Sampling

Table 1: Sampling for water quality test from Facility level/source point and household level⁷

Type of available sources	Shyamnagar Upazila												Total
	Shyamnagar Sadar UP		Vurulia UP		Kashimari UP		Noor Nagar UP		Koikhali UP		Ramzan Nagar UP		
	Source point	HH level	Source point	HH level	Source point	HH level	Source point	HH level	Source point	HH level	Source point	HH level	
PSF	1	1	1	1	1	1			1	1	1	1	10
Rain Water Harvesting (School/Madrasha)	1	-	-	-	-	-	-	-	-	-	1	-	2
Rain Water Harvesting (Individual/group)	-	-			-	-	1	1	-	-	-	-	2
Reverse Osmosis (Community level)	-	-	-	-	-	-	1	1	-	-	-	-	2
Shallow Tube well			1	1					1	1			4
Deep Tube well (Community level)	1	1	-	-	1	1	-	-	1	1	1	1	8
Ring well (Community level)	1	1	-	-	-	-	-	-	-	-	-	-	2
Total	4	3	2	2	2	2	2	2	3	3	3	2	30

⁷ Household level water denotes the water collected from source of facility level and which was stored in Jar, bucket etc at the household. According to DPHE's advice, there was no need to arsenic and iron test for this stored water from HH level and Rain Water Harvesting but Fecal Coliform test was done. On the other hand, all three types of tests (1. Arsenic, 2. Iron and 3. TTC/Fecal Coliform) was done for water from sources of facility level/community level.

Table 2: Sampling for water quality test from Facility level/source point and household level

Type of available sources	Assasuni Upazila										Total
	Assasuni Sadar UP		Budhata UP		Baradal UP		Kulla UP		Kadakati UP		
	Source point	HH level	Source point	HH level	Source point	HH level	Source point	HH level	Source point	HH level	
PSF	1	1	1	1	1	1	1	1	1	1	10
Rain Water Harvesting (School/Madrasha)	1	-	-	-	1	-	-	-	-	-	2
Rain Water Harvesting (Individual/group)	-	-	1	1	-	-	1	1	-	-	4
Reverse Osmosis (Community level)	-	-	-	-	-	-	-	-	1	1	2
Shallow Tube well			1	1			1	1			4
Deep Tube well (Community level)	1	1	-	-	1	1	-	-	1	1	6
Ring well (Community level)	1	1	-	-	-	-	-	-	-	-	2
Total	4	3	3	3	3	2	3	3	3	3	30

Annex 2: Statistical tables

Table 1: Sex distribution of Respondent by Upazila

Sex	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Male	187	68	190	58	377	62
Female	88	32	140	42	228	38
Total	275	100	330	100	605	100

Table 2: Sex distribution of Household Head by Upazila

Sex	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Male	264	96	316	96	580	96
Female	11	4	14	4	25	4
Total	275	100	330	100	605	100

Table 3: Education level of respondent and household head

Level of Education	Respondent		Household Head	
	Number	Percent	Number	Percent
No education	222	37	203	34
Primary	199	33	197	33
Secondary	130	21	142	23
Higher secondary+	41	7	45	7
Only read and write	13	2	18	3
Total	605	100	605	100

Table 4: Education of respondents based on gender (Percent)

Level of education	Male	Female
Primary	34	32
No education	33	43
Secondary	22	21
Higher secondary+	9	4
Only read and write	3	1
Total	100	100

Table 5: Marital status of respondent and household head

Marital status	Respondent		Household head	
	Number	Percent	Number	Percent
Married	567	94	584	97
Unmarried	19	3	12	2
Divorce	1	0	1	0
Widow	18	3	8	1
Total	605	100	605	100

Table 6: Occupation of Respondent

Occupation	Number	Percent
Housewife	193	32
Small Business	86	14
Daily Labor	77	13
Agriculture (Own Land)	76	13
Agriculture (Others Land)	56	9
Driver (Rickshwa, Van, Auto)	22	4
Unable to work	14	2
Skilled Labourer	12	2
Service (Non-Govt.)	11	2
Unemployed	11	2
Fisherman	9	1
Students	8	1
Service (Govt.)	6	1
Shop/Hotel Owner	5	1
Teacher	5	1
Driver (Bus, Track)	3	0
Retired (Pension)	3	0
Shop/Hotel Employee	2	0
Advocate/Engineer/Doctor	2	0
Factory labor	1	0
Beggar	1	0
Kabiraj	1	0
Politician	1	0
Total	605	100

Table 7: Occupation of Respondent by gender(Percent)

Occupation	Male	Female
Small Business	22	1
Agriculture (Own Land)	20	1
Daily Labor	18	4
Agriculture (Others Land)	13	3
Driver (Rickshwa, Van, Auto)	5	1
Unable to work	3	1
Unemployed	3	0
Fisherman	2	0
Service (Non-Govt.)	2	1
Skilled Labourer	2	1
Service (Govt.)	2	0
Shop/Hotel Owner	1	0
Teacher	1	0
Students	1	2
Driver (Bus, Track)	1	0
Retired (Pension)	1	0
Housewife	1	84
Shop/Hotel Employee	1	0
Advocate/Engineer/Doctor	1	0
Total	100	100

Table 8: Occupation of Household head

Occupation	Number	Percent
Small Business	125	21
Daily Labor	123	20
Agriculture (Own Land)	105	17
Agriculture (Others Land)	81	13
Skilled Labourer	29	5
Driver (Rickshwa, Van, Auto)	26	4
Service (Non-Govt.)	21	3
Fisherman	16	3
Unable to work	14	2
Shop/Hotel Owner	9	1
Service (Govt.)	9	1
Housewife	8	1
Teacher	7	1
Unemployed	7	1
Driver (Bus, Track)	6	1

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Retired (Pension)	5	1
Shop/Hotel Employee	4	1
Factory labor	2	0
NGO Official	2	0
Advocate/Engineer/Doctor	2	0
Beggar	2	0
Students	1	0
Servant	1	0
Total	605	100

Table 9: Occupation of others household members

Occupation of HH member	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Housewife	252	42.9	274	42.1	526	42.5
Students	208	35.4	232	35.6	440	35.5
Daily Labor	27	4.6	26	4.0	53	4.3
Agriculture (Own Land)	20	3.4	12	1.8	32	2.6
Unemployed	15	2.6	7	1.1	22	1.8
Small Business	14	2.4	18	2.8	32	2.6
Service (Non-Govt.)	11	1.9	9	1.4	20	1.6
Unable to work	7	1.2	14	2.2	21	1.7
Skilled Labourer	6	1.0	9	1.4	15	1.2
Service (Govt.)	5	0.9	4	0.6	9	0.7
Agriculture (Others Land)	4	0.7	21	3.2	25	1.9
Fisherman	4	0.7	3	0.5	7	0.6
Driver (Rickshwa, Van, Auto)	3	0.5	7	1.1	10	0.8
Factory labor	2	0.3	1	0.2	3	0.2
Shop/Hotel Employee	2	0.3	7	1.0	9	0.7
Teacher	2	0.3	1	0.2	3	0.3
Garrege labor	1	0.2	2	0.3	3	0.2
Shop/Hotel Owner	1	0.2	0	0.0	1	0.1
Driver (Bus, Track)	1	0.2	2	0.3	3	0.2
NGO Official	1	0.2	1	0.2	2	0.2
Advocate/Engineer/Doctor	1	0.2	0	0.0	1	0.1
Servant	0	0.0	1	0.2	1	0.1
Total	587	100.0	651	100.1	1238	100.1

Table 10: Age group of household member

Age group	Number	Percent
0-5 years HH member	292	10
6-17 years HH member	715	25
18+ years HH member	1896	65
Total Population	2903	100

Table 11: Well being status of House Hold according to WDMC

Well being status	Shyamnagar	Assasuni	Total
Rich	2	4	3
Middle Class	13	11	12
Lower middle class	23	18	21
Poor	44	33	39
Extreme poor	18	34	26
Total	100	100	100

Table 12: Main source of drinking water for the Household

Source of drinking water	Shyamnagar	Assasuni	Total
PSF	37	63	50
Deep tubewell	8	25	17
Shallow tubewell	44	2	23
Pond water	1	8	5
Rain water harvesting with cover	0	1	1
River/Khal water	0	1	1
Bottle Water	4	0	2
Supply Tank Water	5	0	3
Reverse osmosis	0	1	1

Table 13: Crisis month of drinking water

Crisis month	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Baishakh	14	33.3	23	33.3	37	33.3
Chaitra	13	31.0	19	27.5	32	29.3
Jaishtha	9	21.4	15	21.7	24	21.6
Falgun	5	11.9	4	5.8	9	8.9
Augrahayon	1	2.4	3	4.3	4	3.4
Vadro	0	0.0	3	4.3	3	2.2
Kartik	0	0.0	1	1.4	1	0.7
Poush	0	0.0	1	1.4	1	0.7
Total	42	100.0	69	99.7	111	99.9

Table 14: Causes of water crisis in certain month

<i>Causes of water crisis</i>	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Saline water	8	38.1	8	20.0	16	29.1
Due to draught	8	38.1	17	42.5	25	40.3
Due to lower ground water level	4	19.0	5	12.5	9	15.8
Damage of water source	1	4.8	8	20.0	9	12.4
Due to other disaster	0	0.0	2	5.0	2	2.5
Total	21	100.0	40	100.0	61	100.0

Table 15: Sources of drinking water in crisis month

<i>Source of drinking water</i>	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Deep tubewell	8	32.0	8	25.8	16	28.9
PSF	5	20.0	16	51.6	21	35.8
Shallow tubewell	5	20.0	0	0.0	5	10.0
Pond water	4	16.0	6	19.4	10	17.7
Rain water harvesting with cover	2	8.0	1	3.2	3	5.6
Rain water harvesting without cover	1	4.0	0	0.0	1	2.0
Total	25	100.0	31	100.0	56	100.0

Table 16: Sources of drinking water in disaster

<i>Source of drinking water</i>	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Shallow tubewell	120	32.1	16	4.5	136	18.3
PSF	93	24.9	186	52.0	279	38.5
Rain water harvesting with cover	84	22.5	16	4.5	100	13.5
Deep tubewell	30	8.0	88	24.6	118	16.3
Rain water harvesting without cover	21	5.6	3	0.8	24	3.2
Pond water	20	5.3	45	12.6	65	9.0
Bottle Water	5	1.3	1	0.3	6	0.8
Reverse osmosis	1	0.3	0	0.0	1	0.2
Supply Tank Water	0	0.0	3	0.8	3	0.4
Total	374	100.0	358	100.1	732	100.1

Table 17: Perception about quality of drinking water (percent)

Perception	Shyamnagar	Assasuni	Total
Pure	81	84	83
Contaminated by iron	4	0	2
Contaminated by arsenic	10	0	5
Saline	3	8	5
Odd smelled	1	4	3
Dirty/Clay mixed/Turbid	1	3	2
Don't know	0	1	1

Table 18: Meaning of safe water

Meaning of safe water	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Arsenic free water	211	29.6	85	13.7	296	21.7
Clean water	177	24.8	188	30.3	365	27.6
Water with no germ	105	14.7	154	24.8	259	19.8
Iron free water	91	12.8	6	1.0	97	6.9
Without odd smell	65	9.1	27	4.4	92	6.8
Sweet water	48	6.7	91	14.7	139	10.7
Bottle water	12	1.7	11	1.8	23	1.8
Don't know	4	0.6	58	9.4	62	5.0
Total	713	100.0	620	100.1	1333	100.1

Table 19: Ownership of drinking water source (percent)

Type of ownership	Shyamnagar	Assasuni	Total
Own	16	4	10
Combined	5	1	3
Neighbour	30	6	18
Relative	1	0	0
Landlord	0	4	2
Community	45	70	58
NGO	2	9	5
Government	1	5	3

Table 20: Availability of drinking water from the source all the year round (percent)

	Shyamnagar	Assasuni	Total
Yes	94	91	92
No	6	9	8

Table 21: Main Sources of water for dish washing and cooking (percent)

Source of water	Shyamnagar	Assasuni	Total
PSF	3	6	4
Deep tubewell	1	7	4
Shallow tubewell	14	3	9
Pond water	82	84	83
Deep-set tubewell	0	0	0

Table 22: Main sources of water for other daily HH work (percent)

Source of water	Shyamnagar	Assasuni	Total
PSF	2	1	1
Deep tubewell	2	3	2
Shallow tubewell	6	2	4
Pond water	89	94	92

Table 23: Arsenic test conducted for your main drinking water source (percent)

Answer	Shyamnagar	Assasuni	Total
Yes	80	60	70
No	17	12	14
Don't know	3	28	16

Table 24: Is there any sign/color on your main drinking water source?

Color	Shyamnagar	Assasuni	Total
Yes, Red Color	9	0	5
Yes, Green Color	51	24	38
No Color	36	67	52
Don't know	3	8	6

Table 25: Type of latrine use by household (percent)

Type of latrine	Shyamnagar	Assasuni	Total
Pit latrine with lid	25	52	39
Slab latrine with water seal	25	22	24
Slab latrine without water seal	23	19	21
Pit latrine without lid	14	2	8
Open Place	13	0	6
Hanging latrine	0	1	1
Pit latrine but connected with drain/canal	0	3	1

Table 26: Ownership of latrine (percent)

Ownership of latrine	Shyamnagar	Assasuni	Total
Self	95	92	94
Combined	5	6	5
Other's ownership	0	2	1

Table 27: Status of cleanliness of latrine (percent)

Question	Answer	Shyamnagar	Assasuni	Total
Is the latrine neat and clean?	Yes	39	58	49
	No	61	42	51
Does it spread bad smell?	Yes	64	32	48
	No	36	68	52

Table 28: Do you anything about risk factors due to climate change?

Answer	Shyamnagar	Assasuni	Total
Yes	64	15	39
No	36	85	61

Table 29: Risk factor due to climate change

<i>Risk factor</i>	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Increase the prevalence of diseases	129	27.4	17	17.9	146	22.7
Increase natural disaster	102	21.7	29	30.5	131	26.1
Increase temperature	99	21.1	19	20.0	118	20.5
Increase salinity	87	18.5	19	20.0	106	19.3
Sea-level rise	41	8.7	7	7.4	48	8.0
Increase the winter/cold	12	2.6	4	4.2	16	3.4
Total	470	100.0	95	100.0	565	100.0

Table 30: Initiative to take to cope with risk factors

<i>Initiative to take</i>	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Remain neat clean	114	24.1	6	7.0	120	15.5
Plant more green trees	72	15.2	29	33.7	101	24.5
Arrangement of first-aid	71	15.0	4	4.7	75	9.8
Maintained water source	67	14.1	25	29.1	92	21.6
Keep Torch/Candle	57	12.0	1	1.2	58	6.6
Arrange alternative sources of drinking water	49	10.3	14	16.3	63	13.3
Build Sanitary Latrine	43	9.1	5	5.8	48	7.4
Don't know	1	0.2	2	2.3	3	1.3
Total	474	100.0	86	100.0	560	100.0

Table 31: How did you know about this information?

<i>Source of knowledge</i>	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Training from Rupantor/Shushilon	149	34.4	32	39.5	181	37.0
Media	112	25.9	10	12.3	122	19.1
WDMC	75	17.3	9	11.1	84	14.2
Self learning	70	16.2	6	7.4	76	11.8
Through Other NGO	13	3.0	7	8.6	20	5.8
From Doctor/Teacher	9	2.1	10	12.3	19	7.2
Through CBO	2	0.5	0	0.0	2	0.2
Local government/UP	2	0.5	6	7.4	8	4.0
DPHE	1	0.2	1	1.2	2	0.7
Total	433	100.0	81	100.0	514	100.0

Table 32: Status of maintenance of water sources (PSF)

Question	Answer	Shyamnagar	Assasuni	Total
Is the pond keeping reserved?	Yes	35	54	45
	No	65	46	55
Is there any latrine or cow shade on the bank or within 30 feet of the pond?	Yes	19	26	23
	No	81	74	77
Is the bank broken through where rain water or other dirty water from outside can enter into the pond?	Yes	21	29	25
	No	79	71	75
Do man, cattle and poultry take bath in the pond?	Yes	21	30	26
	No	79	70	74
Does man washes cloth and wash dishes in the pond?	Yes	24	32	28
	No	76	68	72
Is the connection pipe of PSF broken?	Yes	2	2	2
	No	98	98	98
Is the sand filter remaining blocked or looking dry?	Yes	2	4	3
	No	98	96	97
Is the storage chamber of PSF covered?	Yes	96	92	94
	No	4	8	6
Is the Water collection tap damaged or lost?	Yes	12	43	27
	No	88	57	73
Is there any damage seen in the wall of PSF?	Yes	9	14	12
	No	91	86	88

Table 33: Status of maintenance of water source (Tubewell/deep tubewell)

Question	Answer	Shyamnagar	Assasuni	Total
Is there any latrine in higher place than tubewell?	Yes	15	18	17
	No	85	82	83
Is there any latrine around 30 feet of the tubewell?	Yes	28	29	28
	No	72	71	72
Is there any garbage or cow shade seen around 30 feet of the tubewell?	Yes	27	28	27
	No	73	72	73
Is there any garbage in the connected drain to tubewell?	Yes	42	36	39
	No	58	64	61
Is there any damage seen in the connected drain of tubewell?	Yes	26	18	22
	No	74	82	78
Is there water logging on the platform of tubewell?	Yes	20	22	21
	No	80	78	79
Is there any damage seen in the platform of tubewell?	Yes	24	14	19

Are the nut bolts are in the proper place?	No	76	86	81
	Yes	80	86	83
Is the bottom of tubewell loose?	No	20	14	17
	Yes	10	3	7
Is contaminated water is using for plucking water from the tubewell?	No	90	97	93
	Yes	29	18	24
	No	71	82	76

Table 34: Status of maintenance of water source (Rain Water Harvesting)(Number of case 4 at Asasuni)

Question	Answer	Number	Percent
Is there any dirt/garbage/dust in the roof/catchment?	Yes	2	50
	No	2	50
Is there any dirt/garbage/dust in the gutter?	Yes	2	50
	No	2	50
Is the first flashing pipe broken/damaged or dirty?	Yes	1	25
	No	3	75
Is the filter chamber dirty or jam?	Yes	1	25
	No	3	75
Is the filter chamber broken or damaged?	Yes	1	25
	No	3	75
Is there any garbage or latrine around 30 feet of the collected pipe or tank?	Yes	2	50
	No	2	50
Is the tank damaged or broken?	No	4	100
Is there any dirt inside the tank?	Yes	1	25
	No	3	75
Is the cover of the tank open or damaged?	No	4	100

Table 35: Was your drinking water source needed to be repair last one year?

Answer	Shyamnagar	Assasuni	Total
Yes	69	84	76
No	28	13	20
Don't know	3	3	3

Table 36: Who paid the repairing cost?

Who paid	Shyamnagar	Assasuni	Total
Source Owner	11	13	12
Caretaker	0	5	2
Elected body	0	1	0
Self	11	1	6
All users jointly	78	74	76
Government	0	5	3

Table 37: Frequency of water pot cleaning

Frequency	Shyamnagar	Assasuni	Total
Once in a day	57	55	56
Twice in a day	8	2	5
More than twice in a day	2	0	1
Once in every two days	7	5	6
2-3 times in a week	19	28	23
Twice in a month	6	10	8
Never clean	1	0	0

Table 38: Do you use any cover on water pot during bringing water?

Answer	Shyamnagar	Assasuni	Total
Yes	97	99	98
No	3	1	2

Table 39: Type of pot for water collection

Type of pot	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Pitcher	248	88.9	296	78.3	544	83.6
Dram/Jar	29	10.4	73	19.3	102	14.9
Bucket	2	0.7	4	1.1	6	0.9
Jug	0	0.0	5	1.3	5	0.7
Total	279	100.0	378	100.9	657	100.5

Table 40: Type of cover use for water pot when transport

Type of cover	Shyamnagar	Assasuni	Total
Steel	12	12	12
Cloth	0	5	3
Coconut skull	39	29	34
Plastic	33	22	27
Melamine	15	32	23

Table 41: Do you use same pot for preserving drinking water?

Answer	Shyamnagar	Assasuni	Total
Yes	88	71	79
No	12	29	21

Table 42: Type of pot for preserving water

Type of pot	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Pitcher	22	62.9	72	65.5	94	64.2
Dram/Jar	13	37.1	34	30.9	47	34.0
Bucket	0	0.0	4	3.6	4	1.8
Total	35	100.0	110	100.9	145	100.5

Table 43: Frequency of cleaning water pot in where preserve water

Frequency	Shyamnagar	Assasuni	Total
Once in a day	6	7	7
Twice in a day	0	5	3
More than twice in a day	0	1	1
Once in every two days	3	27	15
2-3 times in a week	67	40	53
Twice in a month	24	19	22

Table 44: Do you cover the water pot in where preserve?

Answer	Shyamnagar	Assasuni	Total
Yes	100	100	100

Table 45: Type of cover use for water pot in where preserve

Type of cover	Shyamnagar	Assasuni	Total
Plastic	33	36	35
Coconut skull	30	23	26
Melamine	15	15	15
Cover made of mud	9	2	6
Steel	6	6	6
Cloth	6	18	12

Table 46: Where keep the water pot at household

Where keep	Shyamnagar	Assasuni	Total
On the floor with cover	50	79	65
Higher places with cover	35	18	26
On the floor Occasionally with cover	12	1	6
Higher places Occasionally with cover	3	1	2
On the floor without cover	1	1	1

Table 47: Hygiene practices at household levels

Question	Answer	Shyamnagar	Assasuni	Total
Is there any place for washing hands beside the latrine?	Yes	16	43	30
	No	84	57	70
Is there any soap for washing hands beside the latrine?	Yes	18	30	24
	No	82	70	76
If there is no soap beside the latrine, does any soap at HH?	Yes	98	95	96
	No	2	5	4
Is the soap used?	Yes	100	95	97
	No	0	5	3
Is there water beside the latrine for washing hands?	Yes	20	30	25
	No	80	70	75
If there is no water beside the latrine, does any water at HH for washing hands?	Yes	100	99	99
	No	0	1	1
Is the HH and its around side are neat and clean?	Yes	32	45	39
	No	68	55	61

Table 48: Where do you put your garbage?

Where put garbage	Shyamnagar	Assasuni	Total
Anywhere	29	19	24
Specific pit	63	70	67
Pond/River/Khal	7	11	9

Table-49: Hand Washing Practice

Percentages and totals are based on respondents or case or HH	Shyamnagar		Assasuni		Total	
	Number of HH/case	Percent	Number of HH/case	Percent	HH/case	Percent
After having meal	162	58.91	48	14.55	210	36.72
Before having meal	175	63.64	222	67.27	397	65.45
After defecation	265	96.36	314	95.15	579	95.75
Whenever hands become dirty	155	56.36	99	30.00	254	43.18
Before preparing food	57	20.73	15	4.55	72	12.63
Before serving food	5	1.82	7	2.12	12	1.96
Before touching a baby	0	0.00	2	0.61	2	0.30
Don't know	0	0.00	3	0.91	3	0.45
Don't use soap ever	1	0.36	1	0.30	2	0.33
Total	275	298.18	330	215.45	605	256.77

Table 50: Level of hygiene maintain during drinking water serving

level of hygiene maintain	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Water pot had no cover	158	28.8	231	37.1	389	32.9
Glass was holding in its upper side	140	25.5	174	27.9	314	26.7
Glass was not clean	88	16.0	42	6.7	130	11.4
Water was provided properly	73	13.3	51	8.2	124	10.7
Glass was washed with clean water	42	7.7	75	12.0	117	9.8
Finger touched the glass water	38	6.9	11	1.8	49	4.3
Water pot was covered	6	1.1	6	1.0	12	1.0
Glass was holding in its middle/lower part	4	0.7	33	5.3	37	3.0
Total	549	100.0	623	100.0	1172	100.0

Table 51: Status of water borne disease and consequences

Question	Answer	Shyamnagar	Assasuni	Total
Do you know anything about water contaminated diseases?	Yes	93	79	86
	No	7	21	14
Do any HH member/s affected by water-borne disease in last 3 month?	Yes	11	46	28
	No	89	54	72
Was any working day of any member of this HH lost due to this illness?	Yes	35	53	44
	No	65	48	56

Table 52: Type of problem due to drink contaminated water

<i>Problem due to drink contaminated water</i>	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Diarrhoea	262	33.5	275	37.6	537	35.6
Dysentery	138	17.6	190	26.0	328	21.8
Eczema/Skin disease	128	16.4	64	8.8	192	12.6
Abdominal pain	127	16.2	33	4.5	160	10.4
Cholera	124	15.9	127	17.4	251	16.7
Don't know	3	0.4	42	5.7	45	3.1
Total	782	100.0	731	100.0	1513	100.0

Table 53: Mention name of water borne diseases

<i>Name of water borne disease</i>	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Diarrhoea	247	33.4	253	42.8	500	38.1
Dysentery	167	22.6	212	35.9	379	29.2
Skin disease	113	15.3	73	12.4	186	13.8
Jaundice	91	12.3	13	2.2	104	7.3
Fever	81	11.0	15	2.5	96	6.7
Cold	12	1.6	0	0.0	12	0.8
Typhoid	11	1.5	2	0.3	13	0.9
Dengue	9	1.2	1	0.2	10	0.7
Malaria	8	1.1	22	3.7	30	2.4
Total	739	100.0	591	100.0	1330	100.0

Table 54: How did you know about this information?

<i>Source of knowledge</i>	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Training from Rupantor/Shushilon	198	34.9	160	34.7	358	34.8
Media	144	25.4	29	6.3	173	15.9
Self learning	96	16.9	115	24.9	211	20.9
WDMC	73	12.9	29	6.3	102	9.6
From Doctor/Teacher	29	5.1	55	11.9	84	8.5
Through Other NGO	20	3.5	52	11.3	72	7.4
DPHE	3	0.5	1	0.2	4	0.4
Through CBO	2	0.4	1	0.2	3	0.3
Local government/UP	2	0.4	19	4.1	21	2.3
Total	567	100.0	461	99.9	1028	100.0

Table 55: Type of water-borne diseases that affected HH members?

<i>Type of water borne disease</i>	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Diarrhoea	13	41.9	52	33.3	65	37.6
Fever	8	25.8	47	30.1	55	28.0
Dysentery	6	19.4	49	31.4	55	25.4
Cold	3	9.7	0	0.0	3	4.8
Skin disease	1	3.2	6	3.8	7	3.5
Malaria	0	0.0	1	0.6	1	0.3
Dengue	0	0.0	1	0.6	1	0.3
Total	31	100.0	156	100.0	187	100.0

Table 56: Causes of water borne diseases

<i>Causes</i>	Shyamnagar		Assasuni		Total	
	Number	Percent	Number	Percent	Number	Percent
Contaminated water	240	41.3	212	64.6	452	53.0
Scruffy Environment	163	28.0	49	14.9	212	21.5
Water logging	86	14.8	8	2.4	94	8.6
Natural disaster	49	8.4	23	7.0	72	7.7
Weather change	33	5.7	8	2.4	41	4.1
Erratic rainfall	5	0.9	5	1.5	10	1.2
Don't know	5	0.9	23	7.0	28	3.9
Total	581	99.9	328	100.0	909	100.0

Table 57: Treatment Place of household for water borne diseases

Treatment Place	Shyamnagar	Assasuni	Total
Quack/Village doctor	74	68	71
Hospital/Medical College/Clinic	22	11	17
Medicine seller	4	15	9
MBBS Doctor	0	3	2
Homeopathic Doctor	0	1	0
Didn't take any treatment	0	2	1

Table 58: Knowledge about WDMC and participation

Question	Answer	Shyamnagar	Assasuni	Total
Is there any committee or group are there in your locality who engage with WaSH related activities?	Yes	90	34	62
	No	4	51	27
	Don't know	6	15	11
Are you or any member of your HH is a member of WDMC?	Yes	26	21	23
	No	72	76	74
	Don't know	2	3	3

Table 59: Water quality test TTC/Fecal coliform (Facilities and household level)

Assasuni		N(Source)	Acceptance level(source)	%	N(HH)	Acceptance level(HH)	%
	PSF	6	1	17	6	4	67
	STW	7	3	43	7	6	86
	RO	1	0	0	1	1	100
	RWH	2	0	0			
Shyamnagar	PSF	5	1	20	5	4	80
	STW	3	3	100	3	2	67
	RO	1	0	0	1	1	100
	RWH	3	2	67			
	DTW	4	2	50	4	4	100

Table 60: Water quality test Arsenic (Source level)

Assasuni		N(Source)	Acceptance level(source)	Percent
	PSF	6	6	100
	STW	7	5	71
	RO	1	1	100
Shyamnagar	PSF	5	5	100
	STW	3	3	100
	RO	1	1	100
	DTW	4	4	100

Table 61: Water quality test Iron (Source level)

Assasuni		N(Source)	Acceptance level(source)	Percent
	PSF	6	6	100
	STW	7	0	0
	RO	1	1	100
Shyamnagar	PSF	5	5	100
	STW	3	0	0
	RO	1	1	100
	DTW	4	2	50

Table 62: Time to collect Water

Time to collect water(in minutes)	Number of HH	Percent
less than or equal to 15 minutes	173	29
Greater than 15 minutes	432	71
Greater than 60 minutes	109	18

Table 63: Average Time to collect Water

Time in minute	(Mean)		If 5% HH is excluded from 605 who collect water from more than 1500 meter away	
	Shymnagar	Asasuni	Shymnagar	Asasuni
Travelling time during collecting water	17	20	15	18
Total time to collect water (waiting time)	15	16	14	15

Table 64: Distance of water facilities from household

Distance from HH to Water source(metre)	Number of HH	Percent
less than or equal 50 metre	152	25
Greater than 50 metre	453	75
Greater than 1000 metre	107	18

Table 65: Number of critical time when HH members washed their hands

Number of critical time	Number of Respondent/HH	Percent
1	605	100.00
2	534	88.30
3	314	51.90
4	67	11.10
5	11	1.80

Table-66: Age group of Respondent and Household Head

Age group	Respondent	Household head
15-29	17	7
30-59	72	79
60+	11	14

Annex 3: Household survey questionnaire

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Study conducted by: WaterAid and Disaster Management Watch

SL. [Official use only]

Consent of the respondents

(Clearly describe the following para to the respondent and start the interview after taking his/her consent)

Good (Morning/afternoon/evening. My name is..... WaterAid and dmwatch are going to conduct a research work in your locality. Our goal is to collect information regarding your awareness/knowledge, practice and attitude towards WaSH related activities. Also want to know the level of accessibility of the poor, disadvantaged and vulnerable population in intervention areas to sustainable water supply, sanitation and hygiene facilities. The study also focused to comprehend the role of local government in addressing WaSH needs of the poor and climate vulnerable population in the communities. We are expecting your valuable cooperation and want to conduct an interview according to our questionnaire. Hope you provide complete and correct answers. All the information provided by you will be treated as valid. All informations will be kept confidential and will be used only for research purpose and program planning. This interview will take -25 to 30 minutes.

If you agree to participate in this research work, please sign this consent form. You have every right to quit at anytime from giving the information for research work though you have given your consent. You will neither be benefited or looser by participating or not participating in this study.

[Start after having the consent of the respondents]

Interviewer's Name		Date		Starting Time	End Time
		/ / 2014			
Check		FS Name:		FC Name:	
	YES	No	Date	Time	Signature
Accompany/Back Check	1	2	/ / 2014		

SL	Question	Code	Code List	
Primary Information of Respondent and Household Head:				
01	Respondent's name:		Sex: 1=Male, 2=Female Education: 0=No education, 1=Primary, 2=Secondary, 3=Higher secondary+ 4=Only read and write Marital status: 1=Married, 2=Unmarried, 3=Divorce,4=Widow Occupation: 01 = Housewife, 02 = Garrege labor, 03 = Factory labor, 04 = Shop/Hotel Employee,05= Shop/Hotel Owner, 06 = Agriculter (Own Land), 07= Agriculter (Others Land), 08= Daily Labor, 09= Driver (Rickshwa, Van, Auto), 10= Driver (Bus, Track), 11= Nurse, 12=NGO Official, 13= Teacher, 14=Advocate/Engineer/Doctor, 15=Retaired (Pension), 16=Disable, 17= Fisherman, 18= Small Business, 19= Students, 20 = Service (Govt.), 21 = Service (Non-Govt.), 22=	
02	Respondent's Age	<input type="checkbox"/> <input type="checkbox"/>		
03	Respondent's Sex	<input type="checkbox"/>		
04	Respondent's Education	<input type="checkbox"/>		
05	Respondent's Marital status	<input type="checkbox"/>		
06	Occupation	<input type="checkbox"/>		
07	Household size	0-5 Year		<input type="checkbox"/>
		6-17 Year		<input type="checkbox"/>
		18 Year +		<input type="checkbox"/>
08	Sex of Household head	<input type="checkbox"/>		
09	Age of Household head	<input type="checkbox"/> <input type="checkbox"/>		
10	Education of Household head	<input type="checkbox"/>		
11	Marital status of Household head	<input type="checkbox"/>		
12	Occupation of Household head	<input type="checkbox"/>		
Information of geographic location				
13	Village:			

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14	Ward:	<input type="checkbox"/>		
15	Union:	<input type="checkbox"/> <input type="checkbox"/>	01=Assasuni Sadar, 02= Budhata, 03=Borodol, 04=Kulla, 05=Kadakati, 06=Shyamnagar Sadar, 07= Bhuruliya, 08=Kashimari, 09=Nurnagar,10=koikhali,	
16	Upazila:	<input type="checkbox"/>	1=Shyamnagar, 2=Assasuni	
SL	Question		Code Code List	
Well being				
17	What are the occupations of other household member of your family? <i>(Multiple answers)</i>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	01 = Housewife, 02 = Garrege labor, 03 = Factory labor, 04 = Shop/Hotel Employee,05= Shop/Hotel Owner, 06 = Agriculter (Own Land), 07= Agriculter (Others Land), 08= Daily Labor, 09= Driver (Rickshwa, Van, Auto), 10= Driver (Bus, Track), 11= Nurse, 12=NGO Official, 13= Teacher, 14=Advocate/Engineer/ Doctor, 15=Retaired (Pension), 16=Disable, 17= Fisherman, 18= Small Business, 19= Students, 20 = Service (Govt.), 21 = Service (Non-Govt.), 22= Servent, 23= Begger, 24= Unemplpoyee, 25=Skilled labourer, 26=Kabiraj, 27=UP Chairman	
18	If you consider income of all the members of your household, what will be the amount in a month in general?		<i>write in Taka</i>	
19	Monthly expenditure(on an average)	Food		
		Educatio n		
		Medicati on		
		Others		
20	In which level the Household belong according to the Socio-economic Status by WDMC/Ward Disaster Management Committee?	<input type="checkbox"/>	1= Rich, 2= Middle Class, 3= Lower Middle Class 4=Poor, 5= Extreme Poor	
Information on Water, Sanitation and Hygiene				
Water Sources				

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21	What is the main source of drinking water of your household? <u><i>if answer is 04/09/11/13/14 then go to q33</i></u>	<input type="checkbox"/>	01=PSF 02=Deep tubewell 03= Shallow tubewell 04=Pond water 05=Deep-set tubewell 06=Submersible pump 07= Rain water harvesting with cover 08= Rain water harvesting without cover 09=River/ <i>Khal</i> water 10= Water of well 11= Bottle Water 12= Ring Well 13= Supply Tank Water 14=Reverse Osmosis
22	What is the ownership of the water source from which you collect drinking water?	<input type="checkbox"/>	1=Own 2=Combined 3=Neighbour 4=Relative 5=Landlord 6=Community 7=NGO 8=Government 9=community
23	Whatever the source of water is available all the year round?	<input type="checkbox"/>	1 = Yes 2 = No
24	In which month/s there water scarcity exists? <u><i>(Multiple answers)</i></u>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	01=Baishakh 02=Jaishtha 03=Ashar 04=Shrabon 05=Vadro 06=Arshin 07=Kartik 08=Augrahayon 09=Poush 10=Magh 11=Falgun 12=Chaitra 99=All the year round
25	Why does there arise the scarcity of water? <u><i>(Multiple answers)</i></u>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1=Due to lower ground water level 2=Sea level high 3=Saline water 4=Damage of water source 5=Due to draught 6=Due to other disaster 8=Don't know
26	From Where do you collect drinking water in those month(s)? <u><i>(Multiple answers)</i></u>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	01=PSF 02=Deep hand tubewell 03= Shallow tubewell 04=Pond water 05=Deep-set tubewell 06=Submersible pump 07= Rain water harvesting with cover
27	In Which Sourse your househole collect water from natural disaster (Flood, Strom Surge, Cyclone etc)?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	08= Rain water harvesting without cover 09=River/ <i>Khal</i> water 10= Ring well 11= Bottle Water 12= Ring Well
28	What is the main source of water for cooking and dishwashing?	<input type="checkbox"/>	

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29	What is the main source of water for other using except for drinking, cooking and dishwashing?	<input type="checkbox"/>	13= Supply Tank Water 14=Reverse Osmosis
30	Is the main source of your drinking water has entered Arcanic Test?	<input type="checkbox"/>	1 = Yes 2 = No 8 = Don't know
31	Is the main source of your drinking water has any Mark/Color?	<input type="checkbox"/>	1 = Yes, Red Color 2 = Yes, Green Color 2 = No Color 8 = Don't know
Operation and Maintanace of Water Source			
32	What is the present conditation of water source where the household collect water?		
32.1	Is the pond kept preserved?	<input type="checkbox"/>	1 = Yes 2 = No
32.2	Is there any toilet/hanging toilet within 30 feet of the pond?	<input type="checkbox"/>	1 = Yes 2 = No
32.3	Is there any broken part through which rainwater or other dirty substance can intire into the pond?	<input type="checkbox"/>	1 = Yes 2 = No
32.4	Are the man, cattle, duck brought to the pond for having a bath?	<input type="checkbox"/>	1 = Yes 2 = No
32.5	Are the Pond uses for wash the clothes and dishes?	<input type="checkbox"/>	1 = Yes 2 = No
32.6	Is the PSF connected pipe broken?	<input type="checkbox"/>	1 = Yes 2 = No
32.7	Is the PSF sand filter closed or dry?	<input type="checkbox"/>	1 = Yes 2 = No
32.8	Is the PSF storage chamber has covered?	<input type="checkbox"/>	1 = Yes 2 = No
32.9	Is the water collection tap has damage or stolen?	<input type="checkbox"/>	1 = Yes 2 = No
32.10	Is there any crack on the PSF wall?	<input type="checkbox"/>	1 = Yes 2 = No
Tubewell			
32.11	Is there any latrine around the higher place from the tubewell?	<input type="checkbox"/>	1 = Yes 2 = No
32.12	Is there any dustbin/latrine within 30 feet from the tubewell?	<input type="checkbox"/>	1 = Yes 2 = No
32.13	Is there any Cowshed/ Slag heap within 30 feet from the tubewell?	<input type="checkbox"/>	1 = Yes 2 = No
32.14	Is Water being Slag heap/logging in the drain of tubewell?	<input type="checkbox"/>	1 = Yes 2 = No
32.15	Is the linkage drain of the tubewell has any broken or crack?	<input type="checkbox"/>	1 = Yes 2 = No
32.16	Is Water being logging in the platform?	<input type="checkbox"/>	1 = Yes 2 = No
32.17	Is the Platform of the tubewell broken or crack?	<input type="checkbox"/>	1 = Yes 2 = No
32.18	Are the Nut bolts of the tubewell having the right place?	<input type="checkbox"/>	1 = Yes 2 = No
32.19	Is the Bottom of the tubewell loose?	<input type="checkbox"/>	1 = Yes 2 = No
32.20	Is there polluted water being used to pluck water?	<input type="checkbox"/>	1 = Yes 2 = No
Rainwater Harvesting System			
32.21	Are there any Dirty substance / garbage / dust on the roof or catchment?	<input type="checkbox"/>	1 = Yes 2 = No
32.22	Are there any Dirty substance / garbage / dust in the gutter?	<input type="checkbox"/>	1 = Yes 2 = No
32.23	Is there any droken, damage or dirty subastance in the first flashing pipe?	<input type="checkbox"/>	1 = Yes 2 = No

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32.24	Is there any dirty substance or logging in the water filter?	<input type="checkbox"/>	1 = Yes 2 = No
32.25	Is the filter chamber has broken or damage?	<input type="checkbox"/>	1 = Yes 2 = No
32.26	Is there any dustbin/latrline within 30 feet from the tank or water collector?	<input type="checkbox"/>	1 = Yes 2 = No
32.27	Is the water tank has broken or damage?	<input type="checkbox"/>	1 = Yes 2 = No
32.28	Is there any dirty substance in the tank?	<input type="checkbox"/>	1 = Yes 2 = No
32.29	Is the head cover of the tank has broken or damage?	<input type="checkbox"/>	1 = Yes 2 = No
33	Is there any repair work done in the last one year where you collect drinking water?	<input type="checkbox"/>	1 = Yes 2 = No 8=Don't know
34	Who bear the cost of maintenance?	<input type="checkbox"/>	1=Source Owner 2= Elite Person 3=Caretaker 4= Elected body 5= People living close to water source 6=WDMC 7=Self 8=All users combinely
Water Transport, Storage and Cleanliness			
35	What is the distance in meters from the source of drinking water in the household?	<input type="text"/> <input type="text"/>	meter
36	How much time does it take to fetch water (only communication time)?	<input type="text"/> <input type="text"/>	(minutes)
37	How much time does it take to collect water? (waiting & collection time)	<input type="text"/> <input type="text"/>	(minutes)
38	How much liters of water require your household per day?	<input type="text"/>	liters
39	The water that you drink, What is the Quality of collected water?	<input type="checkbox"/>	1=Pure 2=Contaminated by iron 3=Contaminated by arsenic 4=Saline 5= Odd smelled 6= Dirty/Claymixed/Turbid 7= Bacteria/ Pathogens 8= Don't know
40	What type of pot do you use for collecting water? <i>(Multiple answers)</i>	<input type="checkbox"/> <input type="checkbox"/>	1=Pitcher 2=Bucket 3= Dram/Jar 4=Jug
41	How frequently you clean the pot?	<input type="checkbox"/>	1=Once in a day 2=Twice in a day 3=More than twice in a day 4=Once in every two days 5=2-3 times in a week 6=Twice in a month 7=Never clean 8=Don't know
42	Do you WaSH the pot with clean water before collecting water?	<input type="checkbox"/>	1 = Yes 2 = No 8 = Don't know
43	Do you use any cover on water pot during bringing water?	<input type="checkbox"/>	1 = Yes 2 = No 8 = Don't know

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44	What type of cover?	<input type="checkbox"/>	1=Cover made of mud 2=Steel 3=Glass 4=Cloth 5=Coconut skull 6=Plastic 7=Leaf of trees 8= Melamine
45	Do you use the same pot to preserve drinking water?	<input type="checkbox"/>	1 = Yes 2 = No
46	What type of pot do you use for preserve drinking water? <i>(Multiple answers)</i>	<input type="checkbox"/> <input type="checkbox"/>	1=Pitcher 2=Bucket 3= Dram/Jar 4=Jug
47	How frequently do you clean the pot where you preserve drinking water?	<input type="checkbox"/>	1=Once in a day 2=Twice in a day 3=More than twice in a day 4=Once in every two days 5=2-3 times in a week 6=Twice in a month 7=Never clean 8=Don't know
48	Do you cover the water pot?	<input type="checkbox"/>	1 = Yes 2 = No 8 = Don't know
49	What type of cover you used?	<input type="checkbox"/>	1=Cover made of mud 2=Steel 3=Glass 4=Cloth 5=Coconut skull 6=Plastic 7=Leaf of trees 8= Melamine
50	Where do you keep the water pot?	<input type="checkbox"/>	1= On the floor with cover 2= On the floor Occasionally with cover 3= On the floor without cover 4= Higher places with cover 5= Higher places Occasionally with cover 6= Higher places without cover
51	What do you mean by Safe drinking water? <i>(Multiple answers)</i>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1=Water with no germ 2=Clean water 3=Sweet water 4=Arsenic free water 5=Iron free water 6=Bottle water 7= without odd smell 8= Don't know
52	What is the result of drinking contaminated water? <i>(Multiple answers)</i>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1=Diarrhoea 2=Cholera 3=Dysentery 4=Abdominal pain 5=Eczema/Skin diseages 8= Don't know
53	How do you learn this? <i>(Multiple answers)</i>	<input type="checkbox"/> <input type="checkbox"/>	1=Training from Rupantor/Shushila 2=Through CBO 3=Through Other NGOs 4=Local government

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		<input type="checkbox"/>	5=DPHE 6=WDMC 7=Media 8=From Doctor/Teacher 9=Self learning
Sanitation			
54	What type of latrine do you use at household level?	<input type="checkbox"/>	1= Slab latrine without water seal 2= Slab latrine with water seal 3= Pit latrine with lid 4= Pit latrine without lid 5=Hanging latrine 6=Pit latrine but connented with drain/canal 9= Open Place
55	Who was the Owner of latrine?	<input type="checkbox"/>	1=Self 2=Combined 3=Other's ownership
56	Is the latrine your household uses, hygienic and clean?	<input type="checkbox"/>	1 = Yes 2 = No
57	Does it spread bad smell?	<input type="checkbox"/>	1 = Yes 2 = No
WaSH awareness			
58	Usually when do you wash hands with soap? <i>(Multiple answers)</i>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1=After having meal 2=Before having meal 3=After defecation 4=Whenever hands become dirty 5=Before preparing food 6=Before serving food 7=Before touching a baby 8=Don't know 9=Doesn't use soap ever
59	What is the condition of hand washing?		
59.1	Is there any place for handwashing?	<input type="checkbox"/>	1 = Yes 2 = No
59.2	Is there any soap for washing hand beside latrine? <i>If the answer is 'Yes' then goto Q-59.3</i>	<input type="checkbox"/>	1 = Yes 2 = No
59.3	If there is no soap beside latrine, is there any soap for washing hand in your household? <i>If the answer is 'No' then goto Q-59.5</i>	<input type="checkbox"/>	1 = Yes 2 = No
59.4	Is the soap used?	<input type="checkbox"/>	1 = Yes 2 = No
59.5	Is there any water for washing hand beside latrine? <i>If the answer is 'Yes' then goto Q-59.7</i>	<input type="checkbox"/>	1 = Yes 2 = No
59.6	If there is no water beside the latrine, is there any water for washing hand in your househld?	<input type="checkbox"/>	1 = Yes 2 = No
59.7	Is the HH and its around side are neat and clean?	<input type="checkbox"/>	1 = Yes 2 = No

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59.8	Would you please give me a glass of drinking water? <i>(Researcher will ask the respondent to give him a glass of water to drink and will observe whether he/she maintains hygiene)</i> <i>(Multiple answers)</i>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1=Water pot had no cover 2=Glass was not clean 3=Glass was washed with clean water 4= Finger touched the glass water 5= Glass was holding in its upper side 6=Glass was holding in its middle/lower part 7=Water pot was covered 9=Water was provided properly
60	Where the garbage of the household is removed?	<input type="checkbox"/>	1=Anywhere 2=Specific pit 3=Dustbin 4=Pond/River/Khal
Diseases			
61	Do you know anything about water borne diseases? <i>If the answer is 'no' then goto Q-71</i>	<input type="checkbox"/>	1 = Yes 2 = No
62	Mention at least three water borne diseases. <i>(Multiple answers)</i>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1=Diarrhoea 2=Dysentery 3=Malaria 4=Dengue 5=Skin disease 6=Typhoid 7=Jaundice 8=Fever 9=Cold
63	In the last three months, has any member(s) of your household been suffered with waterborne diseases?	<input type="checkbox"/>	1 = Yes 2 = No
64	If yes	how many persons <input type="checkbox"/> how many times <input type="checkbox"/>	(Please put Number)
65	Please mention at least 3 diseases your household member(s) suffered in the last 3 months. <i>(Multiple answers)</i>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1=Diarrhoea 2=Dysentery 3=Malaria 4=Dengue 5=Skin disease 6=Typhoid 7=Jaundice 8=Fever 9=Cold
66	Where was the treatment?	<input type="checkbox"/>	1= MBBS Doctor 2=Hospital/Medical College/Clinic 3=Quack/Village doctor 4=Medicine seller 5=Homeopathic Doctor 6=Kabiraj/Awairbadi 7=Faith healer 8= Self 9= Didn't take any treatment
67	What is the total treatment cost? (Transport, Doctor Fee, Examine, Medicine etc)		Taka
68	Was any working day of any member of this HH lost due to this illness?		1 = Yes 2 = No
69	How many days were lost?		Days

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70	What are the causes for being affected by water-borne diseases? <i>(Multiple answers)</i>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1=Weather change 2=Erratic rainfall 3=Contaminated water 4=Water logging 5=Natural disaster 6= Scruffy Environment 8=Don't know
Ward Disaster Management Committee(WDMC)			
71	Is there any committee or group are there in your locality who engage with WaSH related activities?	<input type="checkbox"/>	1 = Yes 2 = No 8 = Don't know
72	Are you or any member of your household a member of WDMC?	<input type="checkbox"/>	1 = Yes 2 = No 8 = Don't know
Knowledge on risk factors due to climate change			
73	Do you know anything about risk factors due to climate change? <i>If the answer is 'no' then close the interview</i>	<input type="checkbox"/>	1 = Yes 2 = No
74	What are the risk factors of climate change? <i>(Multiple answers)</i>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1= Sea-level rise 2=Increase natural disaster 3=Increase salinity 4=Increase temperature 5=Increase the winter/cold 6= increase the prevalence of diseases
75	What initiatives can be taken to cope with/face the risk factors? <i>(Multiple answers)</i>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1= Arrange alternative sources of drinking water 2= Maintained water source 3=Arrangement of first-aid 4= Plant more green trees 5=Keep Torch/Candel 6=Build Sanitary Latrine 7= Remain neat clean 8= Don't know
76	How did you know about these matter? <i>(Multiple answers)</i>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1=Training from Rupantor/Shushilon 2=Through CBO 3=Other NGO 4=Local government/UP 5=DPHE 6=WDMC 7=Media 8=From Doctor/Teacher 9=Self learning

Check the whole questionnaire to see whether any question is being left or not. If it is found that all the questions were asked, then close the interview thanking the respondent

References

- Banglapedia (2012a) *Assasuni Upazila*, National Encyclopedia of Bangladesh.
- Banglapedia (2012b) *Shyamnagar Upazila*, National Encyclopedia of Bangladesh.
- Bates, B.C., Kundzewicz, Z.W., Wu, S. and Palutikof, J.P. (2008) 'Climate change and water'. IPCC Technical Paper VI. Geneva, CH: Intergovernmental Panel on Climate Change (IPCC).
- BCAS/RA/Approtech (1994) *Vulnerability of Bangladesh to Climate Change and Sea Level Rise: Concepts and Tools for Calculating Risk in Integrated Coastal Zone Management*, Dhaka, Bangladesh: Bangladesh Centre for Advanced Studies (BCAS).
- Calow, R., Bonsor, H., Jones, L., O'Meally, S., MacDonald, A., & Kaur, N. (2011). Climate change, water resources and WASH: a scoping study.
- Cruz, R.V., H. Harasawa, M. Lal, S. Wu, Y. Anokhin, B. Punsalmaa, Y. Honda, M. Jafari, C. Li and N. Huu Ninh, 2007: Asia. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 469-506.
- DoE (2007) *Climate Change and Bangladesh*, Dhaka: Climate Change Cell, Department of Environment, Government of the Peoples Republic of Bangladesh.
- GoB (2005) *The National Adaptation Programme of Action (NAPA)*, Dhaka: Ministry of Environment and Forests, Government of the Peoples Republic of Bangladesh.
- GoB (2008) *Bangladesh Climate Change Strategy and Action Plan 2008*, Dhaka: Ministry of Environment and Forests, Government of the Peoples Republic of Bangladesh.
- GoB (2009) *Bangladesh Climate Change Strategy and Action Plan 2008*, Dhaka: Ministry of Environment and Forests, Government of the Peoples Republic of Bangladesh.
- Godfrey, S., Timo, F. and Smith, M. (2005) Relationship between rainfall and microbiological contamination of shallow groundwater in Northern Mozambique, *Water SA*, 31; 4; 609
- Habiba, U., Abedin, M. A., Shaw, R., & Hassan, A. W. R. (2013). Salinity-Induced Livelihood Stress in Coastal Region of Bangladesh. *Community, Environment and Disaster Risk Management*, 13, 139-165.
- Hunter, P.E., MacDonald, A.M and Carter, R.C. (2010). Water supply and health. *PLOS Medicine* 7 (11) e1000367. doi:10.1371/journal.pmed.1000367.
- IPCC (2007), *Climate Change 2007: The Physical Science Basis, Summary for Policy Makers*, Intergovernmental Panel on Climate Change, Working Group 1, p. 13.
- JMP (2008), Global water supply and sanitation 2008 report. Joint Monitoring Programme WHO/UNICEF. World Health Organization: Geneva.
- Johannessen A, Rosemarin A, Thomalla F, Swartling AG, Stenström TA, Vulturius G,(2014). Strategies for building resilience to hazards in water, sanitation and hygiene (WASH) systems: The role of public private partnerships; *International Journal of Disaster Risk Reduction*, 10(A), 102-115
- Kalyan Banda et al. (2007) Water handling, sanitation and defecation practices in rural southern India: a knowledge, attitudes and practices study, *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 101 (11), 1124-1130
- Kundzewicz, Z.W., L.J. Mata, N.W. Arnell, P. Döll, P. Kabat, B. Jiménez, K.A. Miller, T. Oki, Z. Sen and I.A. Shiklomanov, (2007): Freshwater resources and their management. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 173-210.
- Mara D.D., 2003. Water, sanitation and hygiene for the health of developing nations, *Public Health* (2003) 117, 452–456

End Line Study of Climate Resilience WASH Programming in Coastal Areas of Bangladesh

- Rahman, M. M., & Islam, A. (2013). Adaptation Technologies in Practice and Future Potentials in Bangladesh. In *Climate Change Adaptation Actions in Bangladesh* (pp. 305-330). Springer Japan.
- Roger Calow, Helen Bonsor, Lindsey Jones, Simon O'Meally, Alan MacDonald, Nanki Kaur, (2011). Climate change, water resources and WASH: A scoping study, ODI Working Paper 337, Overseas Development Institute, UK. 2011
- Sarraf, Maria. 2012. *Project Information Document (Concept Stage) - Coastal Embankment Improvement Project - Phase 1(CEIP-1) - P128276*. Washington, DC: World Bank.
<http://documents.worldbank.org/curated/en/2012/05/16249945/project-information-document-concept-stage-coastal-embankment-improvement-project-phase-1ceip-1-p128276>
- Shimi, A. C., Parvin, G. A., Biswas, C., & Shaw, R. (2010). Impact and adaptation to flood: A focus on water supply, sanitation and health problems of rural community in Bangladesh. *Disaster prevention and management*, 19(3), 298-313.
- Stern, N. (2006) Stern review: the economics of climate change. London, UK: HM Treasury.
- Taylor, R., Callist Tindimugaya, C., Barker, J., Macdonald, D. and Kulabako, R. (2009), Convergent Radial Tracing of Viral and Solute Transport in Gneiss Saprolite, Ground Water, doi: 10.1111/j.1745-6584.2008.00547
- United Nations Environment Programme (2007), Trends in natural disasters, UNEP.
- Water Aid (2011), Bangladesh Country strategy plan 2011-2016.
- World Bank (2000) Bangladesh: *Climate Change and Sustainable Development*, Report no. 21104- BD, Dhaka: Rural Development Unit, South Asia Region, The World Bank (Wb).
- World Bank, United Nations Development Programme and United Nations Environment Programme (2005), Ecosystems and Human Well-Being, Synthesis Report, WB, UNDP & UNEP.
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