PROJECT COMPLETION REPORT:WHO_WSP

Development and Implementation of Climate Resilient Water Safety Plan in Vulnerable Rural Communities: WHO-WSP Project

Practical Action Bangladesh

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ACRONYMS

AIRP	Arsenic Iron Removal Plant
DPHE	Department of Public Health and Engineering
DTW	Deep Tube well
FGD	Focus Group Discussion
HH	House Hold
KII	Key Informant Interview
LGIs	Local Government Institutions
PSF	Pond Sand Filter
RWHS	Rain Water Harvesting System
SI	Sanitary Inspection
STW	Shallow Tube Well
UP	Union Parishad
WSP	Water Safety Plan

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STAKEHOLDERS

Government	DPHE, DAE, Weather and meteoroidal department, Health Department, Union Parishad, Upazilla Parishad and District Administration
Community	Community dwellers, Religious leaders

1. EXECUTIVE SUMMARY

The climate resilient WSP project was started from October 2016 to June 2017 by Practical Action, in 6 unions of 4 upazillas under 4 districts in 3 different geographical locations like flood, drought and saline prone areas with the technical and financial support from WHO in Bangladesh with a view to develop and implement a Climate Resilient WSP in the selected rural communities of flood, coastal and drought prone area. This report will provide key information, insights, evidences, learning and findings that captured and documented throughout the project period by applying different methods, approaches, tools and techniques i.e. literature review, KAP baseline, end line survey, observations, consultations etc. The key information and findings are based on the climatic and environmental effects, people's perception, drinking water value chain (Source to use), hygiene behavior, sanitary inspection, safe water and health and water quality. There are some remarkable changes found as compare to the baseline information.

Climatic and Environmental effects and diseases: As per literature review, the climatic effect is gradually increasing on environment and extreme weather events especially seasonal variations, increasing temperature, the distribution pattern of rainfall is changed considering the geography and seasons and unusual nature of rainfall that deteriorate the water quality, accessibility, availability, and functionality. 89% respondents observed changes in temperature, humidity, rainfall and seasonal variations like drought, salinity, flood and heavy cold of which flood responded 69%, drought 65%, heavy cold 54% and salinity 37%. As a result during disaster, 66% respondents faced problem for collection of drinking water of which distant source is dominating 98%, then cost 36%, less contaminated water 19% and use less water 13%.

People's perception:
Source: During end line, 30% people are facing deficiency of water that are addressing in different ways including purchase of water 10%, use rain water 48%, consume contaminated water 9%, less consume 2% etc. 58% respondent commented that their sources are become non-functional especially January to May but April is the highest (52%). Main reasons behind natural phenomena around 95% people and then operation and maintenance 46%. Around 36% people spent money approximately Tk. 284 during last 6 months against operation and maintenance of their water sources.

Whereas during baseline, around 50% respondents replied that their water is not available round the year and 49% water sources were nonfunctional due to lack of repair and maintenance and seasonal variations.

More than 50% people responded that their water sources were tested majority by NGO (68%), then Govt. especially DPHE (18%), own 13%. Mostly tested parameters are arsenic, E.coli, Iron, Turbidity and salinity / chloride which was 30% **during baseline** and most of the parameters include arsenic, iron and bacteria.

Collection: More than 90% respondents answered positively that they clean their pot properly during water collection which was 32% during baseline.

Transportation: More than 82% respondents answered that they use cover with pot during transportation of water which was only 35% during baseline.

Storage: More than 90% respondents answered that they keep their water pot in a suitable height by using cover which was only 41% during baseline.

Use: Around 98% respondents answered that they clean their glass during water use which was only 77% during baseline.

Safe water: Most of the respondents mentioned that safe water are SHTW, DHTW, then rain water harvesting system, pond sand filter, ring well/dug well of which 60% for SHTW which was 50% during baseline. 81% respondents know about the arsenicosis diseases which occur due to the drinking of arsenic contaminated water (96%), unsafe water (19%), pond and river water 6%, from arsenicosis patients 4%.

WSP: More than 76% respondents know about the WSP of which 83% replied for good health, 78% replied on safe water and 1.47% replied don't know. 5 steps of WSP answered properly by the majority of the respondents 82% of which source is the highest around 92%.

HH hygiene situation and Health: Hygienic practice more than 74% people and diseases associated to inadequate hygienic practice commented 96% people and don't know 4% people.

86% respondents answered that they use soap for hand washing after defecation and 65% use soap for hand washing before eating and preparing food. Majority respondents answered that the prevalent water borne diseases in the area are diarrhea, cholera, dysentery, then typhoid, jaundice, skin diseases. Most dominating one is diarrhea around 89% which was 56.9% during baseline. 87% respondents answered that the trend of incidences of the water borne diseases over time is increasing which was 22% during baseline.

Sanitary inspection: Option wise and union wise risk scores of the water facilities are gradually decreasing due to the practice change of the users through raising awareness and knowledge on the importance of WSP as compare to baseline. Highest average risk score of PSF was 6.5 that reduced to 2.29, then RWHS 6.3 reduced to 3.14 and SHTW 4.5 reduced to 2.25 as compare to baseline survey. Most of the water options are within the low risk score whereas during baseline it was only 41%.

Water quality: Microbial parameters (E.coli) were tested in 80 water sources and same amount in household storage level. The E.coli count in source water is less in low, high and very high risk level except medium as compare to baseline data which indicates the behavioral change of the people. Particularly SHTW, DHTW and protected pond resulted low risk level high compare to others with baseline.

At household storage water, the low risk level of E.coli count is gradually increasing and medium to very high risk level is decreasing as compare to baseline data. Particularly SHTW, DHTW, PSF, Ring well and protected pond resulted low risk level high compare to others with baseline

Regarding arsenic, 82% options within the acceptable limit as compare to baseline 73% which indicates seasonal variation and somewhere users switched to safe water sources like AIRP, nearest green STW, household arsenic removal filter, rain water collection during monsoon.

Use of arsenic contaminated water for drinking and cooking purposes is still done by the users especially in Aliabad Union, where arsenic problem is high and lack of alternative sources but less compare to baseline. Other parameters like acceptable limit of Iron, Manganese, Residual chlorine and turbidity are increasing whereas the limit of Nitrate and chloride is same as baseline.

2. BACKGROUND & CONTEXT OF THE PROJECT

a. Introduction

Bangladesh is vulnerable to climate variability and extreme weather events to a great extent considering its geography and topography. The impact of climate variability has been deteriorating the drinking water quality and availability. Some examples of impact of climate change are: the climate variability and extreme weather events influence the pathogenic activity which increases the cholera/diarrhoeal incidences; the malaria and dengue; parasitic propagation. Extreme events include flood, drought, saline intrusion; storm and sea level rise have also negative impacts on environmental determinants such as solid waste and fecal sludge management, salinity, chemical, industrial pollutants, etc. to reduce the quality, accessibility, availability and functionality of water. In addition, different socio-economic factors like poverty, lack of education and density of population has been making the water quality become worse. Therefore, vulnerability to diseases has been increasing with higher morbidity and mortality rate.

As per the MICS report 2012-2013, the survey result indicated that 98% of the households nationally have access to improved water sources of which most of the people in rural areas are using tube well for drinking and cooking purposes. In addition, ring/ dug wells, PSF, rain water harvesting systems, purification filters and other alternative and mitigation technologies are used depending on the geographical and geo-hydrological context. In some cases, small scale community based piped water supply is also found in rural areas.

However an estimated 12.5%[1] of households or approximately 19.7 million people use source water in excess of the national drinking water health based guideline value of 0.05 mg/l for arsenic, 41.7% of the households exceed the fecal coliform standard of 0 CFU/100 ml. 55% of the sources in urban areas and 38.2% sources in rural areas exceed the microbiological drinking water quality standard. The reasons behind are natural and manmade including lack of awareness on behavioral practice which create ultimate impacts on human health. So, there is need to be put in place short and long term mechanisms for safeguarding drinking water from source to consumption.

WHO-WSP project has been launched from October 16 to June 17 in 6 unions of 4 upazillas under Barguna, Pirojpur, Faridpur and Nawgaon district to develop and implement climate resilient water safety plan in vulnerable rural communities in Flood, Drought and saline prone areas to improve the above situation by motivating, capacity building, demonstration, monitoring and follow up and introducing user's friendly communication materials.

During this reporting period through this project, some visible and tangible changes are achieved like 76% people can tell about water safety plan, 82% people know about 5 steps of WSP from source to use, 66% people know how to minimize hazards and their responsibility how to protect safe water source from climatic effect, disaster and extreme weather events. Different types of events including awareness raising, capacity building, demonstration, pre and post interventions survey, proper monitoring and follow up, networking and linkage by engaging relevant stakeholders were undertake. Their progress, result, impacts, challenges and lesson learned are explained in the below sections.

[1] Source: MICS 2012-2013

b. Objective of the project

The overall objective of the project is to develop and implement a Climate Resilient Water Safety Plan in the selected rural communities of flood, coastal and drought prone area.

Specific objectives:

1. To know impacts of climate variability and extreme weather events on water point sources.
2. To know the measures that communities have been taking to adapt with the impact of climate change.
3. To know quality of water through conduction of water quality testing (10% of total surveyed households) both at source (Arsenic, Iron, NO3, Manganese, Chloride, Turbidity, Residual Chlorine and commonly used pesticides) and at HH storage (E.coli and NO3).
4. To contribute through data generation on climatic and environmental hazards matrix for each type of technology in each geographic location.
5. To contribute through data generation on climatic and environmental hazards pathways to entry into water supply system/pint sources.
6. To identify and analyze present control measure and suggest new control measures

Operational areas

The place of performance of the work under the contract has been done in the following unions where the climate variability and extreme weather events like flood, saline intrusion and drought are very much critical.

Sl	Union	Upazilla	District	House holds	Population
1	Pattashi	Zianagar	Pirojpur	8,156	40,779
2	Balipara			7,562	37,810
3	Charduani	Patharghata	Barguna	6,131	30,654
4	Patharghata			7,502	37,512
5	Sapahar	Sapahar Sadar	Naogaon	5,440	27,200
6	Aliabad	Faridpur Sadar	Faridpur	7,906	39,530
			Total	**42,697**	**213,485**

c. Steps towards solutions

In close coordination with DPHE district, sub district offices, local staff, health department and Union Parishads, education department and weather department, the project has been undertaken the following solutions:

- Examining all types of existing point water sources (physical condition, functionality, water quality, availability, accessibility etc.)
- Understanding the health related features including incidences of water-related illness
- Understanding the salient features of operation, maintenance and management related cost structure - investment, operational cost includes repair, maintenance and replacement cost etc.
- Exploring possibilities of local or individual resource mobilization like encouraging poor household to save money in different forms (মুষ্টিচাল, Coin in bank) etc. for using the same when water sources requires repairing
- Developing a hazard matrix (climate variability and environmental parameter)
- Preparing climate resilient WSP documents with the control measures for each type of technology in each union
- Capacity building for water supply staff, and on the job training
- Local level campaigns for users awareness and hygiene practice

d. Expected output, outcome and deliverables

Objective	Expected Output	Expected Outcome
Develop and implement a Climate Resilient Water Safety Plan in the selected rural communities of flood, coastal and drought prone area	1. Increase Knowledge of 213,485 population on WSP through awareness raising events 2. Build capacity of 72 caretakers, masons and plumbers on operation and maintenance of water supply options including WSP 3. Developed and disseminated 3 types of communication materials related with climate resilient WSP 4. Strengthening coordination and cooperation with local actors	• Increased knowledge on climate resilient WSP • Increased capacity of the service providers like caretakers, masons, plumbers on operation and maintenance of the water supply facilities • Local actors became more motivated about WSP and its future implications and importance

Deliverables

Sl	Items	Due Date
1	Inception report	20 Oct'16 / proposed 20 Nov'16
2	KAP baseline report	07 Dec'16 / proposed 30 Dec'16
3	WSP document with Hazard Analysis Report	30 Apr'17
4	Completion report	30 Jun'17
5	Financial statement	30 Jun'17

2. APPROACH & METHODOLOGY

Household survey, FGD, KII and consultation workshop has been conducted with the project stakeholders to collect information regarding climate variability and extreme weather events that create impacts on water quality, availability, accessibility and functionality of the safe water sources. Community mobilization, effective communication tools development and use of materials, mobile based online monitoring, local capacity building, networking and linkage with the stakeholders has been established for the replication of climate resilient WSP.

The project has conducted water quality testing in 10% of the surveyed household's water sources around 80 like TW-83%, Filters-6, RWHS-4%, PSF-4%, DW-3%, in project locations and same Household's storage water (Total HH for test- 80 Approx.) to see the situation of water status, probable sources of contamination and variations of contaminants considering climatic and environmental impacts in different geographical context. The testing has been done by using two modalities includes laboratory testing only for pesticides and field test kits for all other parameters both in baseline and end line survey. The test result will be made available for the community through uploading into the web portal of the union parishad.

3. LITERATURE REVIEW (Salinity, flood and drought)

Literature review has been done and the findings from the study were given in the KAP baseline survey report (Annex -2). Last 30 years[2] (1981 to 2010) weather data has been analyzed and area wise summery views are given below;

Coastal area (Barisal Division) - Annual maximum temperature increased is 0.5ºC and highest increment of minimum temperature is 0.3ºC. Significant negative deviations of rainfall were found which consequences reduced freshwater flows combined with increased sea levels that lead to increased salinization of surface and ground waters, increased inundation of coastal freshwater wetlands and lowlands, and reduced quality of water.

Flood prone area (Faridpur region)- Annual maximum temperature increased is 0.5ºC and highest increment of minimum temperature is 0.3ºC. Issues associated with flooding is become more significant with the anticipated result including increased inflows to and pressure on water storage infrastructure, more intense storms, increased sediment and nutrient concentrations, disrupting drinking water supplies and sanitation systems and cutting off towns.

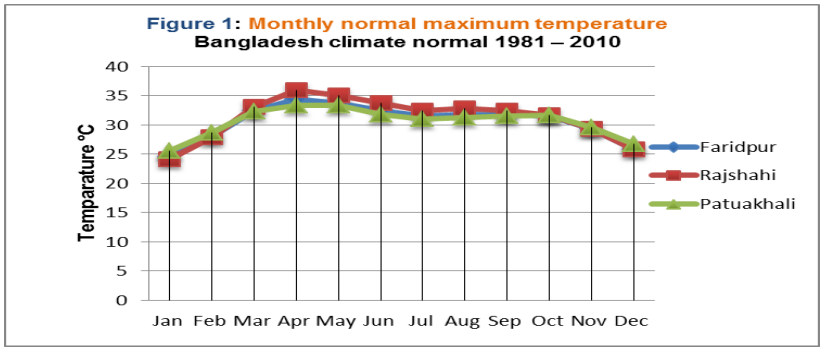
Drought prone area (Rajshahi Division)- The amounts of rainfall decreased and highest increment of minimum temperature is 0.3ºC.These changes in temperature and rainfall are predicted to continue and will result in the increased occurrence of drought with the anticipated results including reduced inflows to water storage, reduced recharge of ground water, increased risk of algal blooms, increased flooding during more intense precipitation events, reduced stream flows in major catchments.

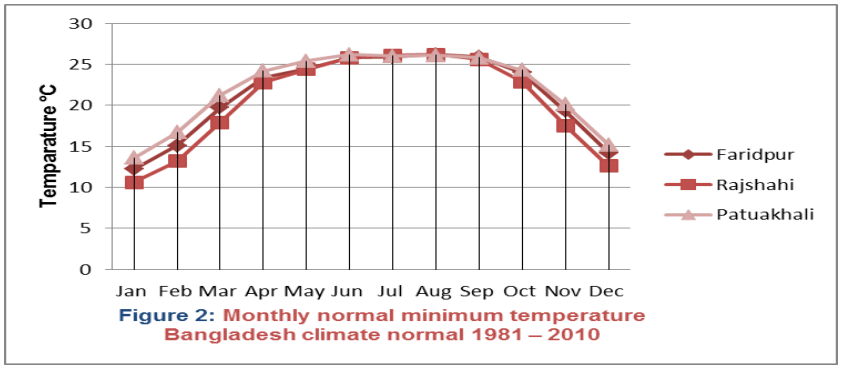
Humidity -The annual average humidity of 30 meteorological stations of Bangladesh has been studied over the period (1981-2008). Trends, periodicities and frequency distribution of the annual average humidity are found by the standard statistical techniques. Both very low and high relative humidity may cause some physical discomfort mainly indoor diseases as the relative humidity of the air directly affects temperature. Therefore, there is a great

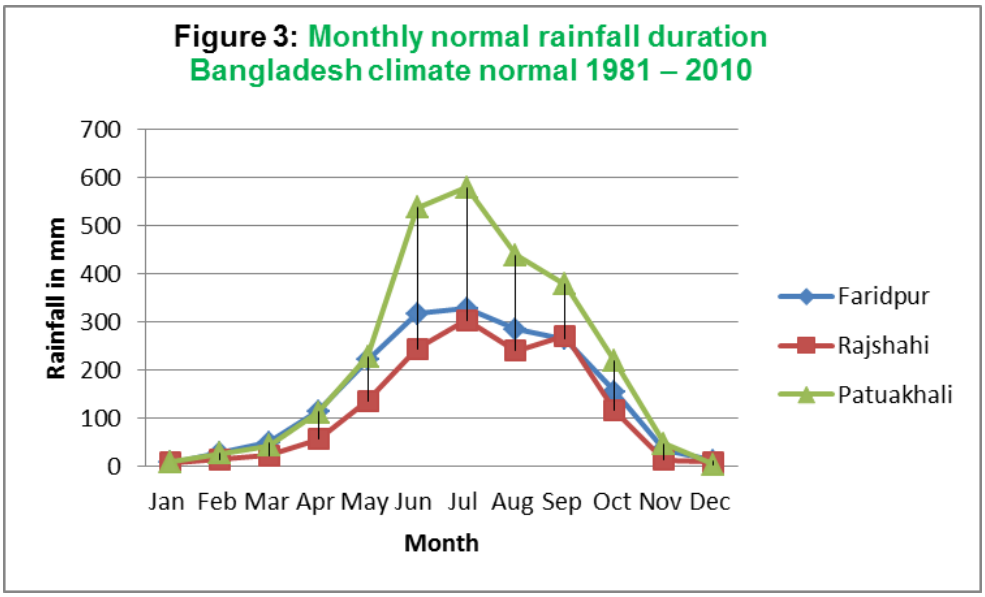
[2] **Source: MET report 2016 (Climate of Bangladesh)**

relation among humidity, temperature and rainfall that have great influence in the environment.

Wind -During summer season (March to May) heating belt shifts northward due to apparent northward movement of the sun. The summer months experience high temperature and falling of air pressure over the country. Circulation of air begins to set in around these low pressure area results strong gusty, hot, dry winds blowing the day. These are locally known as the 'Kalbaishakhi' are the common weather phenomena.







4. Description of all software activities

a. Partnership Development

A partnership agreement was signed with 2 local NGOs named CDS and Jago Nari to effective delivery of the project at field level through community mobilization, local facilitation, consultation, coordination and cooperation with both govt. and non govt. stakeholders. They have long track record and relevant working experience to implement such type of projects and programmes. Also aiming to do post project monitoring, follow up, future continuation and scale up of the best cases.

b. Project Inception

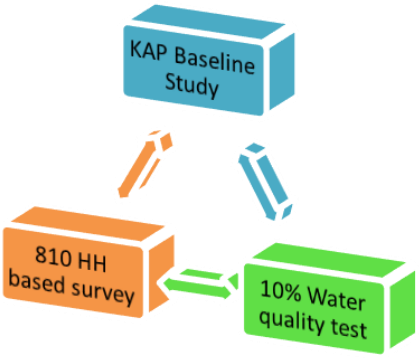
A kick off meeting was held with the presence of WHO representative, implementing partners, project staff and senior management of Practical Action. Afterwards, the upazilla level inception workshops was held in 4 upazillas of 4 districts in middle of November 2016 in presence of a wide range of multi stakeholders (225 participants) including Upazila Parishad, Union Parishad, DPHE, Civil Surgeon, Education Departments, NGO, Media and partners.

Kick Off meeting in presence of WHO representative and CD of Practical Action

In the workshop, project overview, the roles and responsibilities of the stakeholders, coordination mechanism, possible challenges and mitigation measures, joint action plan and monitoring, evaluation, and documentation system were shared. Before inception, field staff has visited the unions and communities, consulted with the LGIs, Govt. relevant departments and sectors and other relevant stakeholders for rapport building and related information collection (Annex -1).

The representative of local government institutions (LGIs) was found very enthusiastic about the new opportunity to work. The government officials have shown their keen interest to support the project as and when required. The participants from the implementing organizations and other stakeholders expressed their satisfaction due to get new ideas and understand about the project. They have also clarified about their roles and responsibilities, project targets and results get in time.

c. KAP Baseline study



A KAP baseline study along with a comprehensive report has been done (Annex -2), but some key findings are mentioned here like below

Regarding water quality test 30% respondent replied that they have tested water. 43% people are facing problem for collecting safe water and majority of them from distant place.

About more than 50% people (Multiple answers) have the knowledge on safe water mean boiled water.

People's perception regarding contamination of water source is that around 63% respondents answered that surrounding wastes of the water sources and more than 77% respondents replied that the use of insecticides in the surrounding paddy field of water sources are the reason of contamination.

Regarding collection, around 32% respondents replied that they do not clean pot, 40% people not clean their hand and 41% people not clean the spout of the tube well while collection.

Water transportation, 65% respondents replied that they do not use cover and 20% people use their cloth during water transportation.

Water storage, 41% respondents replied that they store water without cover and 32% people put their water pot in the place which is not clean.

Water Use, 23% respondents do not clean pot during consumption, 37% people do not wash hand and 27% people use mug, glass or other small size pot inside the vessel of stored water lifting for consumption.

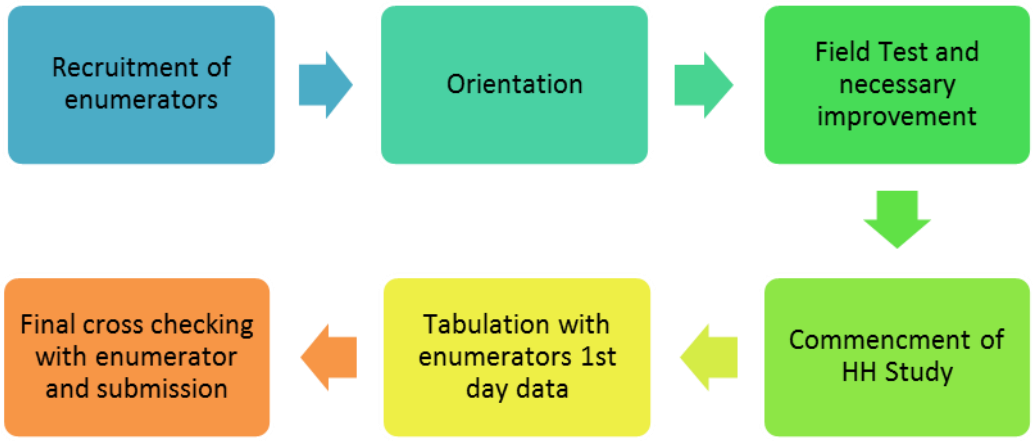


Figure: Process Flow

d. Training

Project staff: 10 project staff have received 2 days training on the project and water safety plan to improve their knowledge to develop and implement climate resilient WSP in flood, drought and saline prone areas of Bangladesh.

Community: Directly 15,930 (M=3,186, F= 12,744) community people have received updated information, knowledge and skill through orientation, demonstration and social mobilization events like folk song, courtyard meeting, community meeting, consultation, day observation on climate resilient WSP and indirectly covered 172,172 (M= 81,632 , F= 90,540) populations. Around 88% of the total population of the working unions has been covered both directly and indirectly through this project. They are practicing accordingly and replicating into their neighbors that has been observed during online monitoring, follow up and end line survey.

Caretakers, masons, plumbers, tube well mechanics, health staff: In the project locations (Union level), It has been found that some safe water options were non-functional installed by different NGOs and DPHE due to lack of operation and maintenance and local capacity in most of the cases. So, to improve this, a day long caretaker training (72 caretakers, masons, users, plumbers, Tube well mechanics) on operation and maintenance of different water option including AIRP, PSF, RWHS, D/SHTW, Dug well and household water filters was given with the technical support from DPHE.

Distribution of arsenic removal filter to the users by the ExEn, DPHE, Faridpur

e. Demonstration

The project didn't have any provision for support to install or renovate water options for the people especially who are more vulnerable. But as part of local capacity building and raising awareness among mass people, so, through this project some demonstration has been done into some priority spots in terms of vulnerability to influence wider community. For example, in Faridpur, the platform of a tube-well has been installed at a selected site where bacteriological contamination was found.

Renovation of Tube well Platform

Two arsenic removal filters also provided to two affected households where there is a crisis for safe water due to excessive iron and arsenic concentration in source water. In Barguna,

renovation was done to some PSF specially clogging of filter materials, repairing of covers, cleaning of pond, etc.

On the basis of findings of our study and with the coordination of DPHE and union parishad, Ms. Rokeya Begum of Billmamudpur village of Aliabad union was selected for renovation support. The platform of her tube well was installed with a view to more than 25 households will be benefited through the collection of safe drinking water from the site and well off people can follow the design as future scale up.

Before intervention: Aliabad

After intervention: Aliabad Union

"I am very happy to know about the support to protect my family from contamination of water. I am poor cannot afford to repair my platform so never even dreamt of having a safe platform to make my water source protected. You have saved not only my family but also my neighbor and next generation as I will disseminate these messages to my grandchildren and others"

f. Hazards Analysis

Hazard analysis report has been prepared on the basis of the findings captured from the sanitary inspection, KAP baseline study and water quality test in the context of saline, flood and drought prone areas (Annex-3). Emphasis has been given to hazards, hazardous events or source of hazards, risk rating with its severity (Low, medium, high and very high) and its consequences, control measures, suggested new control measures and improvement plan. Context specific control measures, operational plan and improvement plan have been developed against each type of hazardous event that has been clearly identified and explained into the report.

g. Awareness campaign for social mobilization

The project organized awareness campaign for WSP to mobilize community people to take necessary measures against hazardous condition from point water sources to water consumption at hh level during disaster and normal period. A significant number of people around 187,942 (88%, Table 1) of the total population in the working area attended in these activities including day observance, courtyard meetings, folk songs, bill board, cable TV network, consultation, group discussion and drama which covered gender, age, occupation, institution, location, and economic class. The campaign programmes have been facilitated by trained field mobilizer with coaching and mentoring support of zonal staff of the project. They delivered the sessions addressing water quality issues, steps of water safety plan (source to consumption), effects of climate/disaster and mitigation measures, responsibilities of community people and the different institutions.

Table 1: Beneficiaries were reached by awareness campaign

Sl	Activities	Quantitative Progress			Beneficiaries		
		Target	Achievements	Remaining Target	Total Beneficiaries	Male	Female
1	Observe World water day (Rally, miking)	6	6	0	105000	47244	57756
2	Courtyard meeting	241	288	0	4320	1020	3300
3	School session	102	102	0	5498	2472	3026
4	Religious institution based discussion	58	58	0	3024	2275	749
5	Cable TV network for WSP message dissemination	17	17	0	68000	30597	37403
6	Pot and folk song, Jaari Gaan	6	6	0	2100	1155	945
7	Health camp by the department of health	0	3	0	160	55	105
				Total	188,102	84,818	103,284

World water day

The community people observed world water day on 22 March, 2017 in the 6 unions with participation of Union Parishad Chairman, Member, Female Members, DPHE representative, Health Assistant, Family Planning Assistant, and Family Welfare Worker working at Union level, Students, and community people. The communities organized rally, miking, and discussions on the issue of waste water and water safety plan. More than 105,000 people attended these sessions where 57,756 were female.

Courtyard Meeting

Community people with different age group of female attended the courtyard meetings. Union facilitators conducted the sessions and discussed on the issues of water safety plan including safety of water source, collection, transportation, preservation, and use. They also discussed on climate resilient WSP issues, and the responsibilities of household members. During reporting period more than 4,320 people attended in 288 courtyard sessions (15 people /session) to improve knowledge and practice on WSP, hygiene behavior and impact of climate change on environment.

Courtyard meeting on WSP with the female group at community level

School Session

More than 5,498 school students including attended in 102 sessions (50 students per session) on Water Safety Plan including handwashing practices, contamination of water from source to consumption, health effects, and critical moments of hand washing, impacts of climate change and their solutions.


Meeting on WSP with the school students for the promotion of hygiene practice

Religious institution based discussion

Union facilitators conducted 58 sessions on WSP where 3024 students of Madrasha attended to improve understanding and knowledge. They have a plan to replicate this among their mates, neighbors and families.

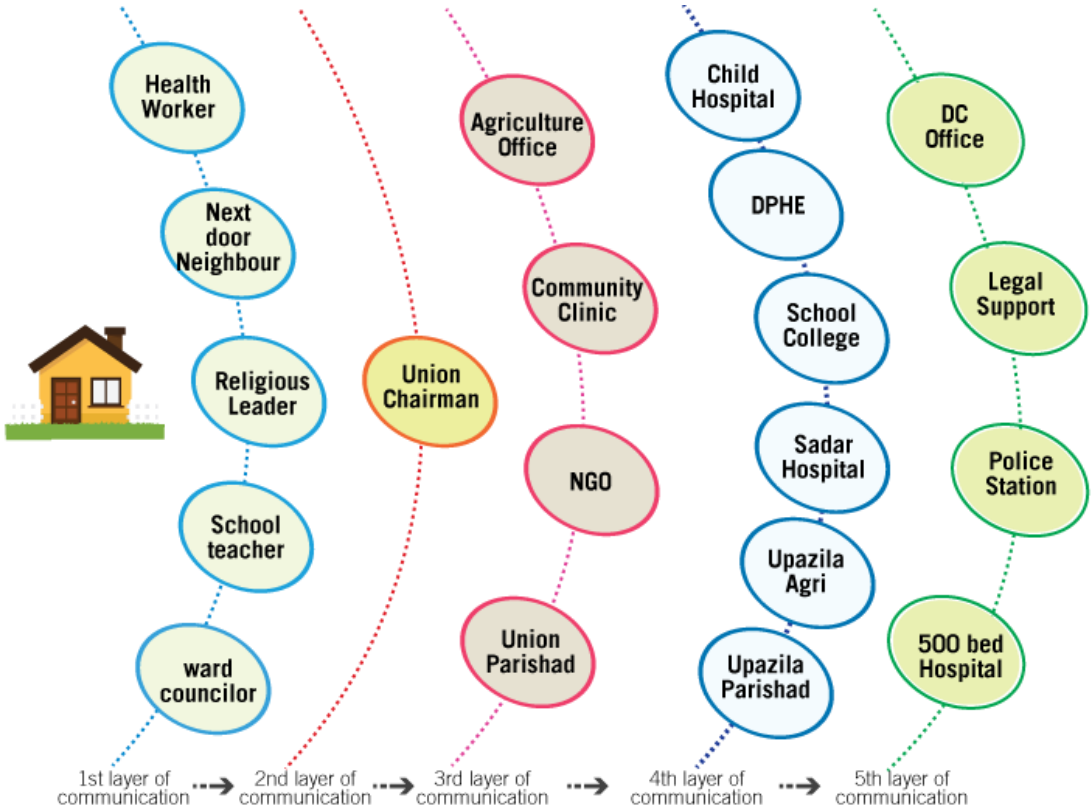

Meeting with Madrasha students on WSP to improve their behavioral practice

A local cultural event like Pot, folk song and drama on the WSP issues was organized in the community where around 2,100 people both male, female and children were attended and gathered information and messages that increased their responsibility and commitment. Out of that 450 students, 15 teachers, 8 UP Councilors, Official from DPHE and Health Department enjoyed drama specially its messages on climate resilient WSP.


Folk song with the community people to disseminate WSP related messages

Mobility Map

A mobility map/diagram has been developed by the community about multidimensional path of getting services (from where, whom, cost etc.) for mitigating their problems (i.e. individual, HHs, Community, Village, Union, Upazila & District level as well).



Mobility diagram of Alipur Union

Health camp by the department of health

160 people through 3 health camps especially the patients with skin diseases who are drinking arsenic contaminated water were diagnosed and identified by the medical doctor and enlisted for getting treatment facilities by the health department. During camps, union facilitator conducted session on WSP, hygiene behavior and their practice.

Households visit or observation

The project developed local leaders who have social acceptability, influence and voluntary mentality through orientation on WSP, hygiene behavior, networking as change agent to visit neighbors and campaign the importance of water safety and making their water points safe and resilient. They have done this successfully.

Development of communication materials

The project Has been reviewed existing materials developed jointly by Water Aid, WHO and DPHE, then contextualized with the project geographical locations on the basis of the information collected from KAP baseline survey, sanitary inspection, literature review and water quality test. 4 types of materials were designed and developed like leaflet -15,000 copies, reflective sticker -2,000 copies, Sticker for microbial information -500 copies and

context specific general sticker – 2,000 copies. Most of the materials were distributed among the people through different events like rally, courtyard meeting, day observation, folk song, school session etc. to disseminate WSP related information and messages.

Mass gathering

In addition to this, Practical Action was organized six mass gatherings sessions at respective Unions for awareness resining. These events were very effective in communicating hygiene messages and changing their attitudes.

The above social mobilization, capacity building and networking activities on climate resilient WSP from water source to the HH storage have created some visible and tangible changes of behavioral practice, ownership and planning of the community and other stakeholders. Few examples of changes are given below through some pictorial presentation.

At Water Source

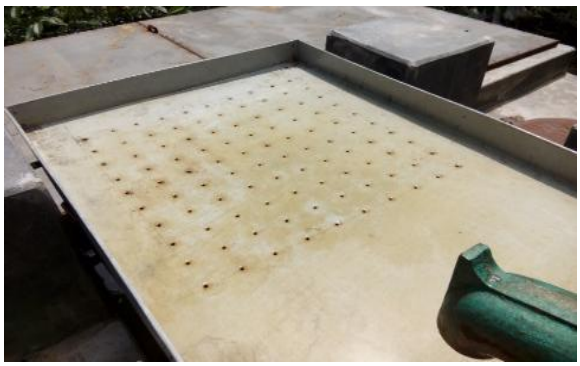
The user of the SHTW renovates the platform after getting information and motivation on WSP from the project.

Before: without platform

After: With platform

The users of the below Arsenic Iron Removal Plant (AIRP) became aware about the importance of WSP and they are improving their practice of operation and maintenance and hygienic practice of its use.

Before: Lack of maintenance



After: Improved

The below users of the Ring well became aware about the hygienic use of their water options i.e. surrounding cleanliness, waste, waste water

Before: Lack of maintenance of RW **After: Improved maintenance of RW**

At HH storage

At HH storage no cover was used by the user

Now users are gradually improving their hygiene practice

Before: Water Pitcher without cover **After: Water Pitcher with cover**

Water Transportation

The water user became motivated about the importance of WSP through orientation, courtyard session and folk song, now she is practicing hygienic issue from collection to consumption.

Before: Water Pitcher without cover **After: Water Pitcher with cover**

h. Mobile based monitoring

In course of development trend of mobile phone technology, it has become more easily accessible, affordable, available, and efficient and effective to people to communicate in terms of time, need and cost. In social research study, the use of mobile phone has introduced a smart solution to collect data more efficiently and accurately.

Under WHO-WSP project, 6 trainings have been initiated on mobile based online monitoring system for 60 participants in 6 working unions with a view to assess the WSP situation of that particular community by the community people for better awareness on its implications and impact as well.

The questionnaire was developed for focusing some major areas like water source contamination, water carrying and preservation methods, sanitation and hygiene to assess the further need for development of a climate resilient water safety planning and preparation by the community and other stakeholders.

Orientation to the project staff and community people on mobile based monitoring

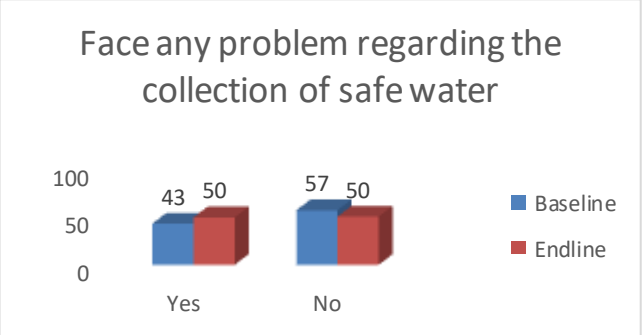
i. End line survey findings in comparison to baseline

Like KAP baseline survey, same sample size, tools and techniques were used for conducting KAP end line survey. Apps were used to collect household data. Same sample size and parameters for water sources and household storage were tested. All parameters were tested by using field kits except E.coli test which was tested in DPHE Lab, Barisal due to the lack of testing membrane, only E.coli at Faridpur was tested by using field kit.
A comprehensive report has been done (Annex-4), but some key findings are mentioned here like below:

Orientation on end line survey for the project staff and enumerators

Sanitation Situation

95 % have personal latrine, 4% have shared latrine and 1% have open defecation where as in Baseline 90 % had personal latrine, 7% had shared latrine and 3% have open defecation

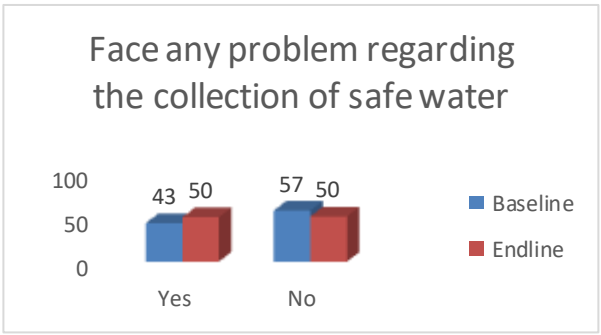


Water Situation

55% HH have personal water source, 19%HH have shared water source, 13%HH depends on neighbors water sources and 13% depends on other sources

- **Accessibility of water**

49.56% people are facing problem regarding collection of safe water of which mostly commented distance is the major problem (87%), then accessibility (60%), unavailability of water (30%, inefficient source 26% and others (Obstruction 4% and expensive 5%).



- **Availability of water**

Amount of water getting by the users commented 41.83 and 32.46 of which 70% people responded positively and 30% are facing deficiency of water that are addressing in different ways including purchase of water 10%, use rain water 48%, consume contaminated water 9%, less consume 2% and others 31%.

- **Functionality of water source**

58 respondent commented that their sources are become non-functional during a specific period of the year especially January to May are the most mentionable period but April is the highest (52% responded). Moderately faced in June, November and December (Avg. 28% responded). Main reasons were found behind the non-functionality are natural phenomena responded by around 95% people and then operation and maintenance responded by 46% people. Around 36% people spent money against operation and maintenance of the water sources which is about Tk. 284 during last 6 months. During this scarce period most of the people collect water from distant sources (Around 57%), some purchase (9%), and some use purified pond and river water.

- **Water quality**

More than 50% people responded that their water sources were tested majority by NGO (68%), then Govt. especially DPHE (18%), own 13%. Mostly tested parameters are arsenic, E.coli, Iron, Turbidity and salinity / chloride.

- **Drinking water collection to use**

Collection: More than 90% respondents answered positively that they clean their pot properly during water collection.

Transportation: More than 82% respondents answered that they use cover with pot during transportation of water. 93 % respondent commented that they entered their hands into pot during transportation.

Storage: More than 90% respondents answered that they keep their water pot in a suitable height by using cover.

Use: Around 98% respondents answered that they clean their glass during water use.

HH hygiene situation

Major factors contributing to the hygienic practice including hygienic practice more than 74%, safe water use 75%, hand washing 37%, sanitation 36% and don't know 3%. Health risk associated to inadequate hygienic practice commented disease by 96% people and don't know by 4% people.

Type of container use for carrying drinking water from source of which silver pot is the highest 92%, then plastic bucket 3%, earthen pitcher 2% and others 3% and for storage at home, type of container use of which silver pot is the highest 86%, then earthen pitcher 8%, plastic bucket 3%, and others 3%.

9% respondents don't know and 14% respondents answered that there are strong habits or beliefs in the village that prevent good hygiene behavior and difficult to change.

6% respondents don't know and 12% respondents answered that some of their family members showing resistance to good hygiene practice.

86% respondents answered positively that they use soap during hand washing after defecation and 65% respondents responded positively that they use soap for hand washing before eating and preparing food.

Awareness on safe water and health

Majority respondents answered that the prevalent water borne diseases in the area are diarrhea, cholera, dysentery, then typhoid, jaundice, skin diseases. Most dominating one is diarrhea around 89%. 87% respondents answered that the trend of incidences of the water borne diseases over time is increasing.

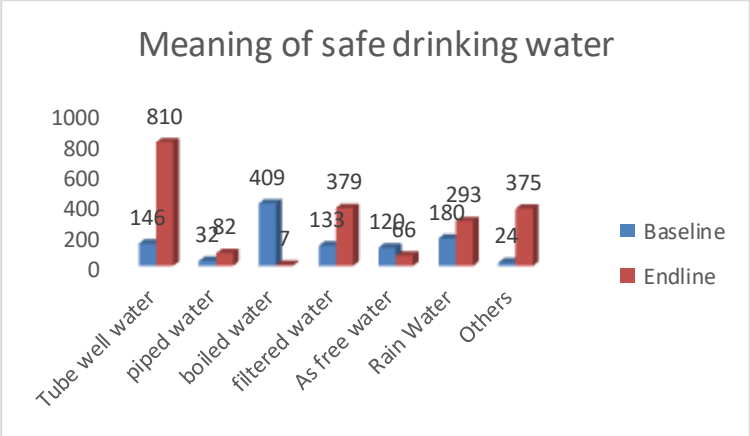
90% people answered that the number of incidences of diarrhea is zero in their family during last one week and 8% people answered 1 people affected in their family, 2 people affected in 2% family. Around Tk. 987 spent in last one year for treating water borne diseases by the affected HHs

Safe water: Most of the respondents answered that the meaning of safe water are SHTW, DHTW, then rain water harvesting system, pond sand filter, ring well/dug well. Most of the responded answered for SHTW which is 60%.

Respondents answered that diarrhea (88% respondents), cholera (53%), dysentery (69%), typhoid (36%), and jaundice (33%), skin diseases (45%) occurs from unsafe water.
81% respondents know about the arsenicosis diseasses which occurs due to the drinking of arsenic contaminated water (96%), unsafe water (19%), pond and river water 6%, from arsenicosis patients 4%.

WSP: More than 76% respondents know about the WSP. Importance of WSP 83% replied for good health, 78% replied on safe water and 1.47% replied don't know.

5 steps of WSP answered properly by the majority of the respondents around 82% of which source is the highest around 92%.



They got information highest from NGO (85%), then Govt. 29%, 25% from private sector through meeting, training, workshop, media and courtyard meeting of which majority 76% from courtyard meeting.

Climate Change and diseases related information

- 62% people know about climate change through meeting, workshop, media, Govt. courtyard session of which majority from courtyard session around 69%, then media 49%, neighbor 24%, Govt. 25%.
- 89% respondents observed changes in temperature, humidity, rainfall and seasonal variations those are drought, salinity, flood and heavy cold of which flood is the highest 69%, drought 65%, heavy cold 545, salinity 37%.
- Around 81% respondents answered in favor of natural disaster that occurred in last 5 years. 33% respondents replied their water sources were safe and 67% respondents replied their water sources were unsafe during last disaster.
- They understood that their sources inundated more saline intrusion and water declination during dry season of mostly responded inundated 80%, then water declination 56%, saline intrusion 24%.
- During disaster, 57% respondents collected water from neighbors, 15% purchased, 11% union parishad and 40% answered others.
- During disaster, 66% respondents faced problem for collection of drinking water those were distance source, cost needed, drink less water and use less contaminated water of which distant source is dominating 98%, then cost 36%, less contaminated water 19% and use less water 13%.
- 63% respondents faced health related diseases in their family/community during disaster those are diarrhea (88% respondents), cholera (59%), dysentery (73%), typhoid (46%), jaundice (41%), skin diseases (46%).
- 65% respondent observed that the color, odor and taste in their water point were changed in a typical year.
- 49% respondent replied that their water point was inundated during flood and 55% respondent replied that the iron smell increased in ground water in their area.

- More than 48% respondent replied that their water point became non- functional during pre- monsoon time.
- 59% respondent replied that the intensity of salinity increased both in ground and surface water in their area.
- 90% respondent replied that the level of ground water depleted more (Run down) in their area during dry period.

Sanitary Inspection (SI) Situation

During baseline and End line survey, sanitary inspection was done by using SI format for all water options that are used by the sampled households. The comparative analysis of their risk scores baseline vs end line is given in the following figures 5-8. The summary findings reflect that the option wise and union wise risk scores of the water facilities are gradually decreasing due to the practice change of the users through raising awareness and increasing knowledge on the importance of WSP.

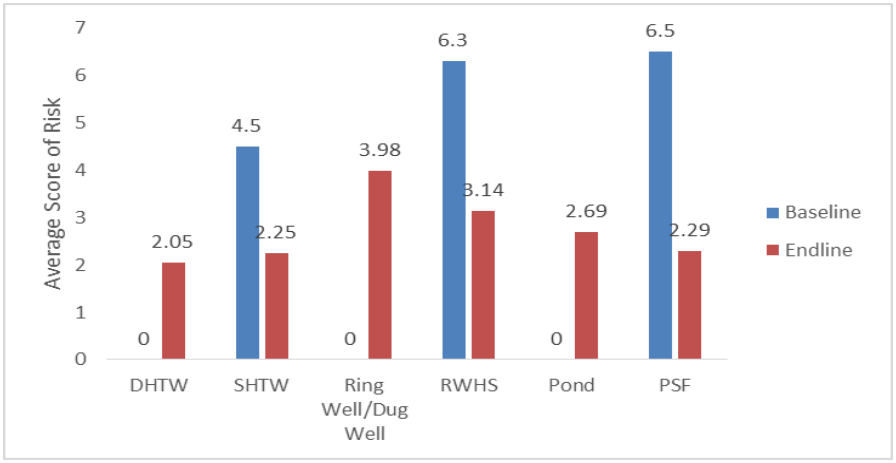


Figure 5: Option wise baseline vs end line analysis

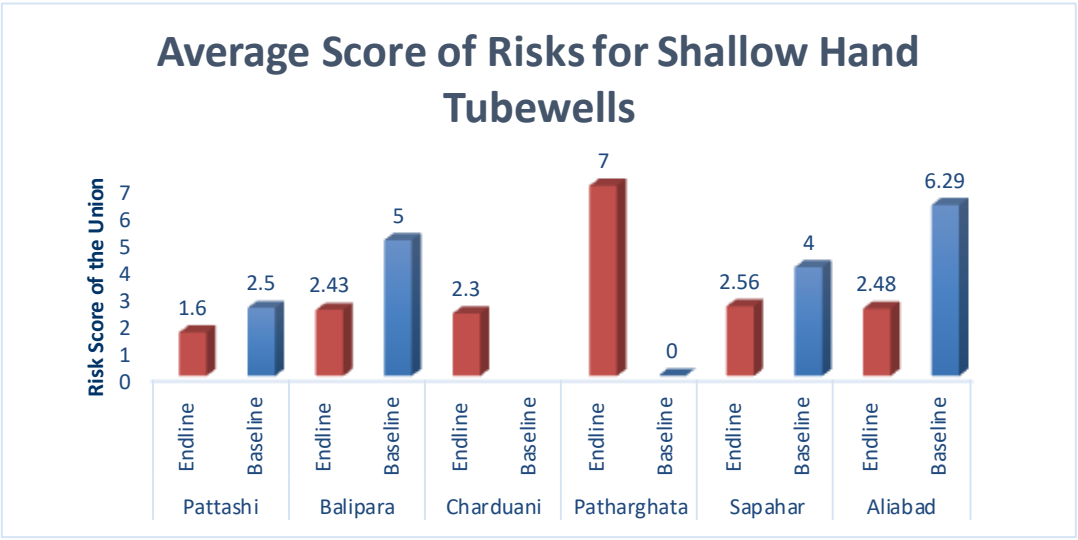


Figure 6: Union wise baseline vs end line analysis of SHTW

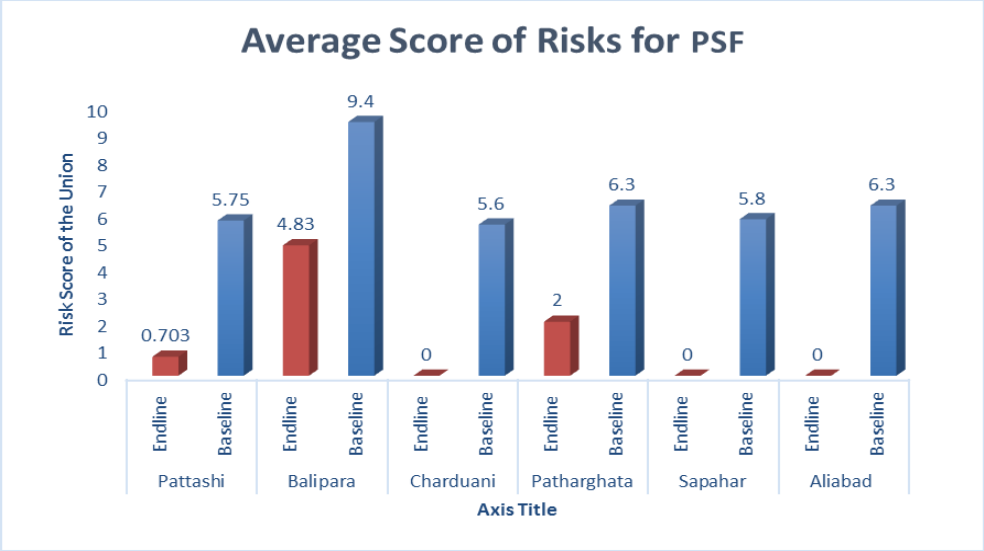


Figure 7: Union wise baseline vs end line analysis of PSF

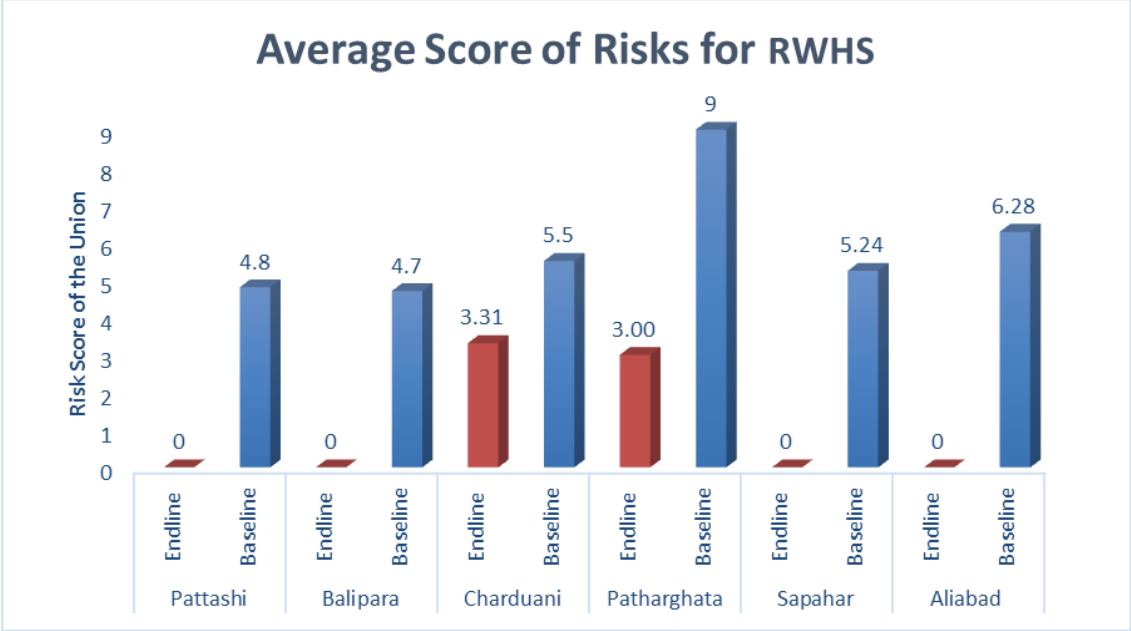


Figure 8: Union wise baseline vs end line analysis of RWHS

j. Coordination, Collaboration and Networking with stakeholders

The project was maintained close coordination, collaboration and networking with DPHE, local administration like UP, Upazila Parishad, district administration, health department, department of education, department of agriculture and weather and metrological department with a view to undertake their support and cooperation, leveraging resources and build linkage with the community. Networking and linkage was also built up with the local entrepreneur and other development partners to explore opportunity, support and area of collaboration.

So, as a result, the project has already received water purification tablets from Aquasure, a French NGO for water victims in Pathorghata Sadar union under Barguna district.

District administration of Faridpur has initiated a drive to promote rain water harvesting in both rural and urban areas and invited existing working NGOs like Practical Action, NGO Forum, BRAC to come up with ideas of implementation. The ideas were already shared with the administration during the following monthly coordination meeting.

The Civil Surgeon office initiated a health camp at Aliabad Union to identify and document arsenicosis patients for providing necessary treatment support align with other related government department. More than 80 people were dragonized through the health camp and documented 10 new arsenicosis patients along with providing necessary advices to the victims.

DPHE, Faridpur has allocated one AIRP for the most affected community of Pal-Para of Aliabad Union where around 50 households are getting safe water supply along with a dug well.

Health Camp for arsenicosis patient

Enlistment of arsenicosis patient

5. WATER QUALITY TEST RESULT (comparison between Baseline & End line study)

10% of the surveyed HH's water sources were tested both in baseline and end line survey for arsenic, E.coli, iron, salinity, Manganese, Nitrate, Turbidity, pH, pesticides. The storage water from the same HH were tested for, E.coli and Nitrate (Where applicable). All parameters were tested by field kit at field except E.coli test was done in DPHE lab at Barisal during end line survey due to the lack of test membrane. The parameter wise test results are given below:

Microbial

Microbial parameters (E.coli) were tested in 80 water sources and same amount in household storage level. The E.coli count in source water is less in low, high and very high risk level except medium as compare to baseline data which indicates the behavioral change of the people. Particularly SHTW, DHTW and protected pond resulted low risk level high compare to others with baseline.

At household storage water, the low risk level of E.coli count is gradually increasing and medium to very high risk level is decreasing as compare to baseline data. Particularly SHTW, DHTW, PSF, Ring well and protected pond resulted low risk level high compare to others with baseline.

Table 9: Description of E.coli Risk Categories

E.coli (cfu /100ml)	Risk Level	Priority for Action
∠1	Low	None
1 - 10	Medium	Low
10 - 100	High	Higher
> 100	Very High	Urgent

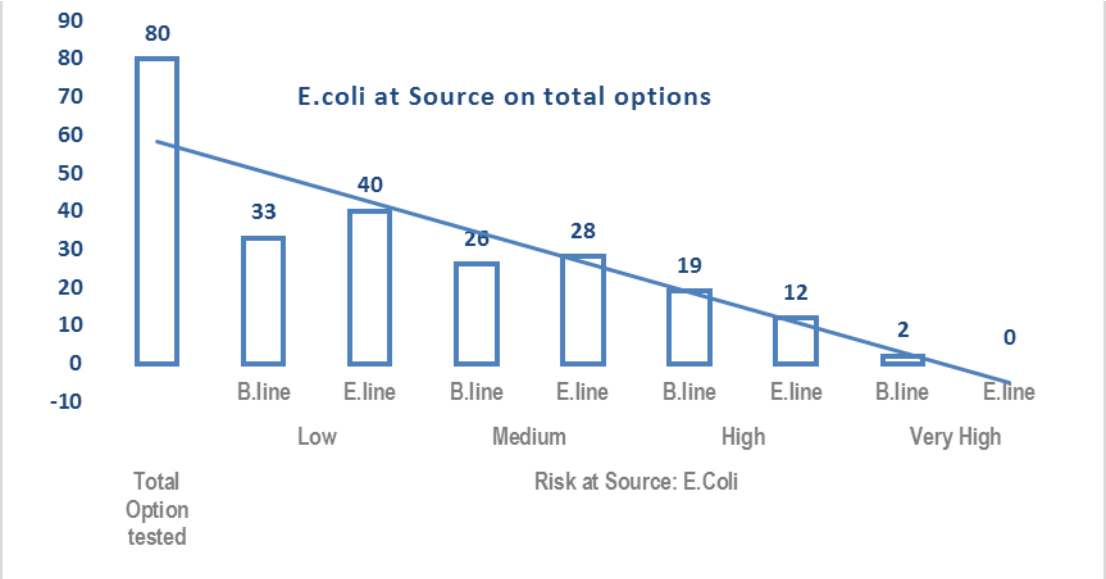


Figure 9 : E.coli count at source water

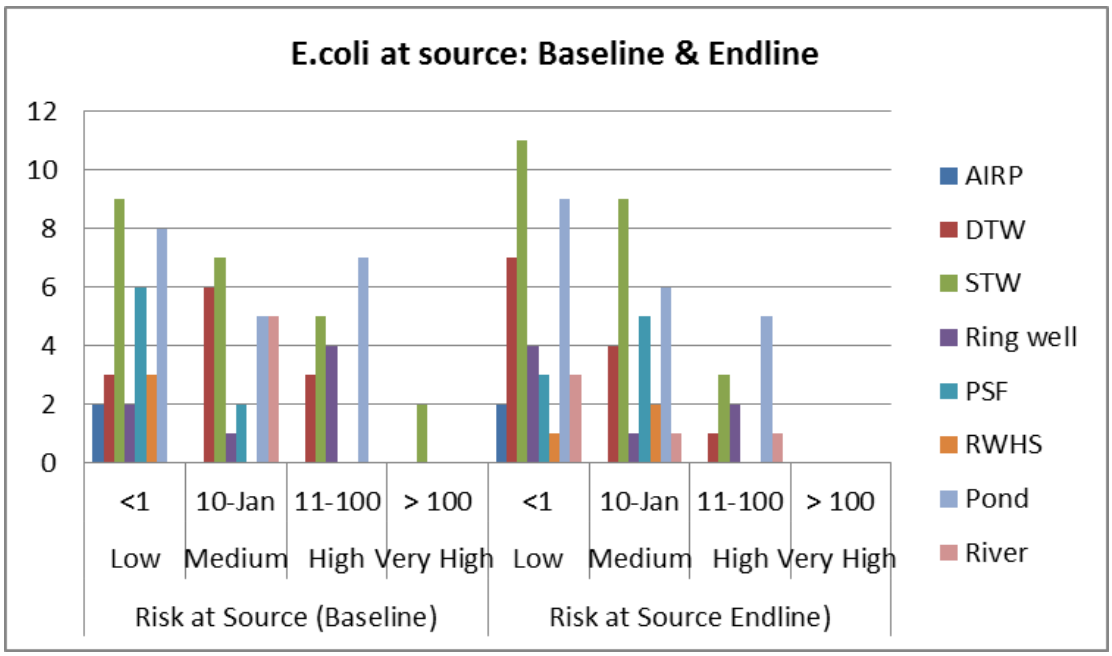


Figure 10 : Option wise E.coli count at source water

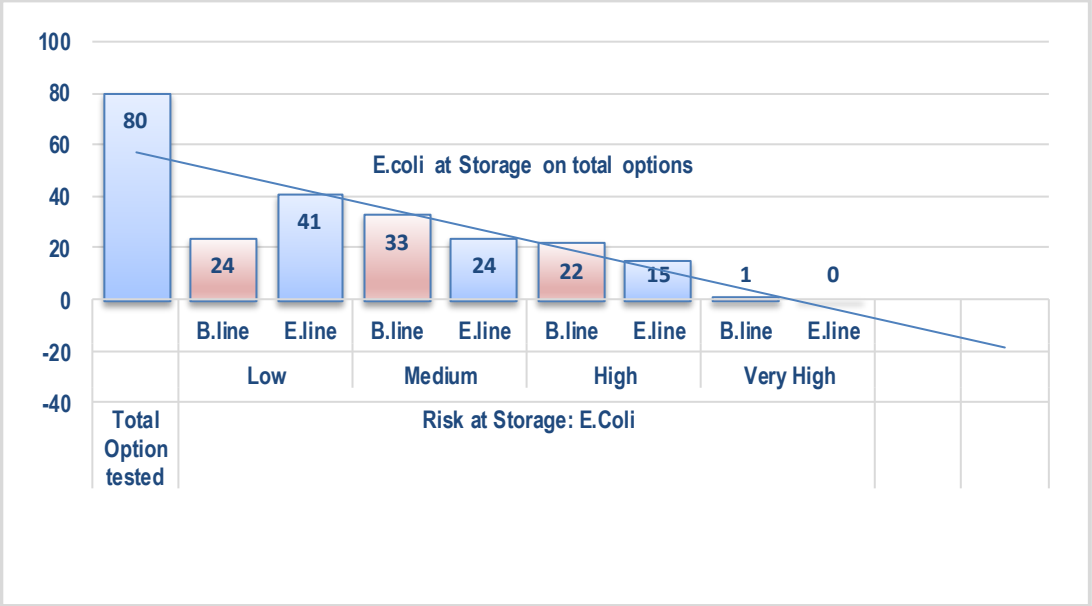


Figure 11 : E.coli count at HH storage water

The reference Table WQ.E below gives the critical water quality definitions and references to E.coli MICS risk categories as cfu/100 ml.

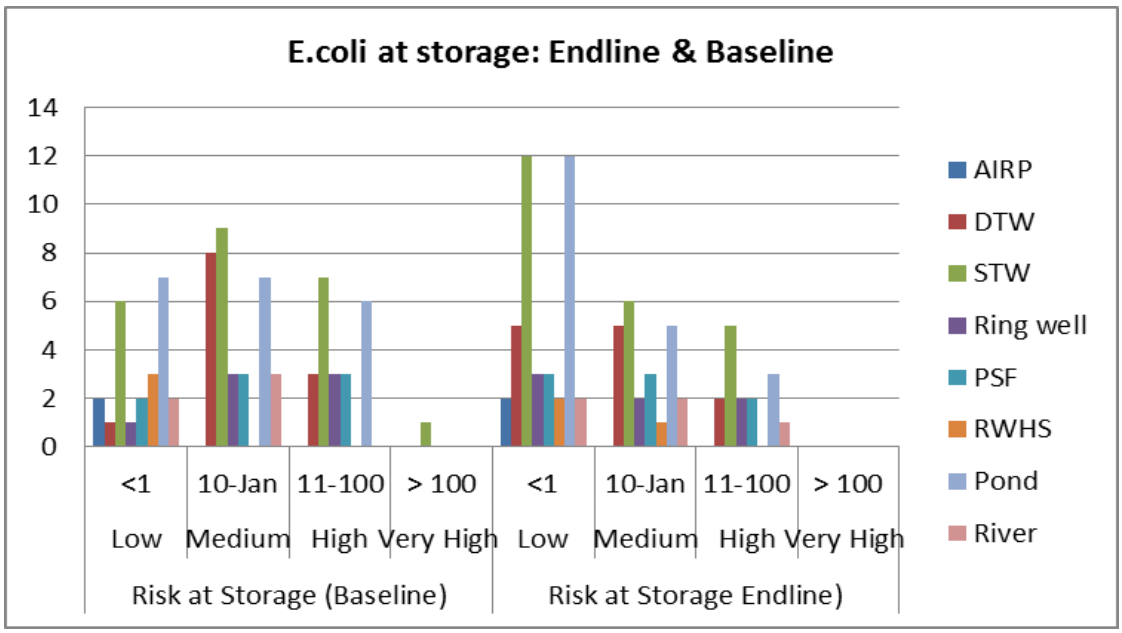


Figure 12 : Option wise E.coli count at HH storage water

Arsenic (As+)

45 water options were tested where **82% option within the acceptable** limit of Bangladesh standard (0-0.05 mg/l) **as compare to baseline 73%**. Out of 3 geographical locations, highest arsenic contamination was found in Aliabad union of Faridpur district. The table indicates seasonal variation of arsenic concentration in ground water and somewhere affected people have switched to safe water sources like AIRP, nearest green STW, household arsenic removal filter, rain water collection during monsoon. So, the arsenic concentration was found less in comparison with the baseline data.

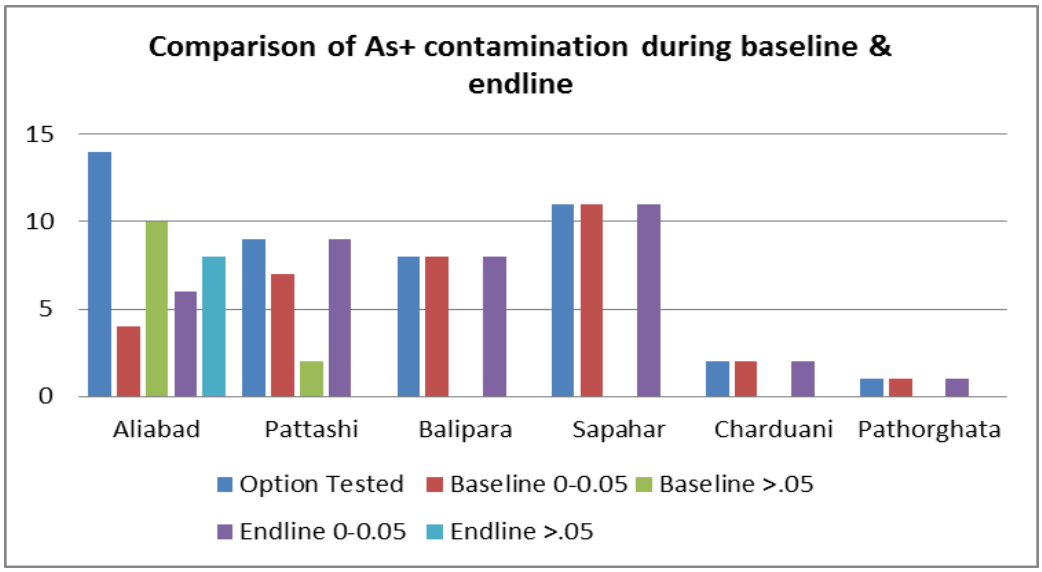


Figure 13: Union wise As comparison

Iron (Fe)

44 water sources were tested where ***45% options were found beyond the acceptable*** limit (0-1.0 mg/l) which is less than the ***baseline (68%)***. Out of 3 geographical locations, highest Iron contamination was found in Pattashi union where 100% water options were iron contaminated. In Aliabad union, the contamination was decreased to 45% from 79% in baseline and in Balipara union decreased to 62% from 87% in baseline.

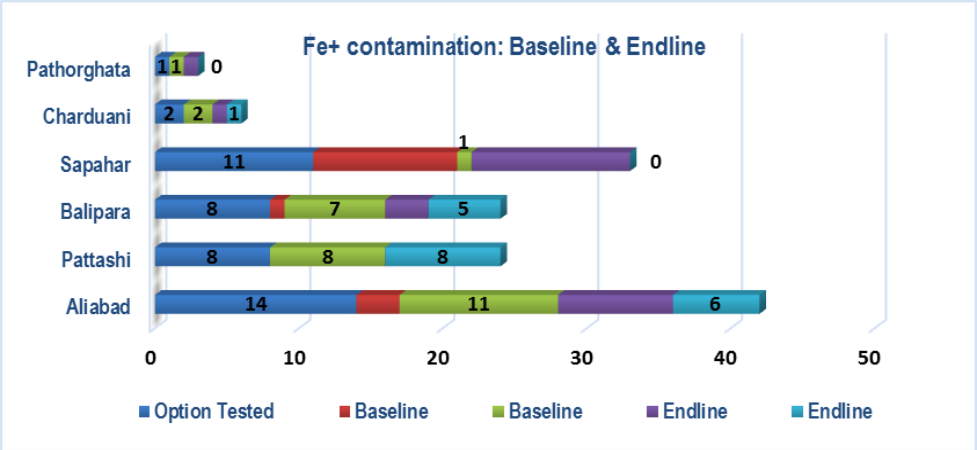


Figure 14: Union wise Iron Comparison

Manganese (Mn)

44 water options were tested where 100% options were found within the acceptable limit of Bangladesh standard (0-1.0 mg/l) as compare to baseline 98%.

Chlorine (residual)

79 water options are tested where 100% options were found within the acceptable limit of Bangladesh standard (0-0.2 mg/l) as compare to 98% in baseline.

Chloride (NaCl)

54 water options were tested where 93% options were found within the acceptable limit of Bangladesh standard (150-600 mg/l). Out of 6 unions, Chloride contamination was found in Charduani and Pathorghata sadar union of Brguna district and Balipara union of Pirojpur district where highest contamination was found in Charduani union around 17% options which is same as the baseline survey report.

Turbidity

79 water options were tested where 66% water options were found within the acceptable limit of Bangladesh standard (0-5 NTU). Out of 3 geographical locations, at source, highest contamination found in Pathorghata Sadar union, then Charduani union of Barguna district and at storage, highest contamination was found in Pattashi union of Pirojpur district. The very common container for water storage is pitcher (kalash) either of silver or earthen.

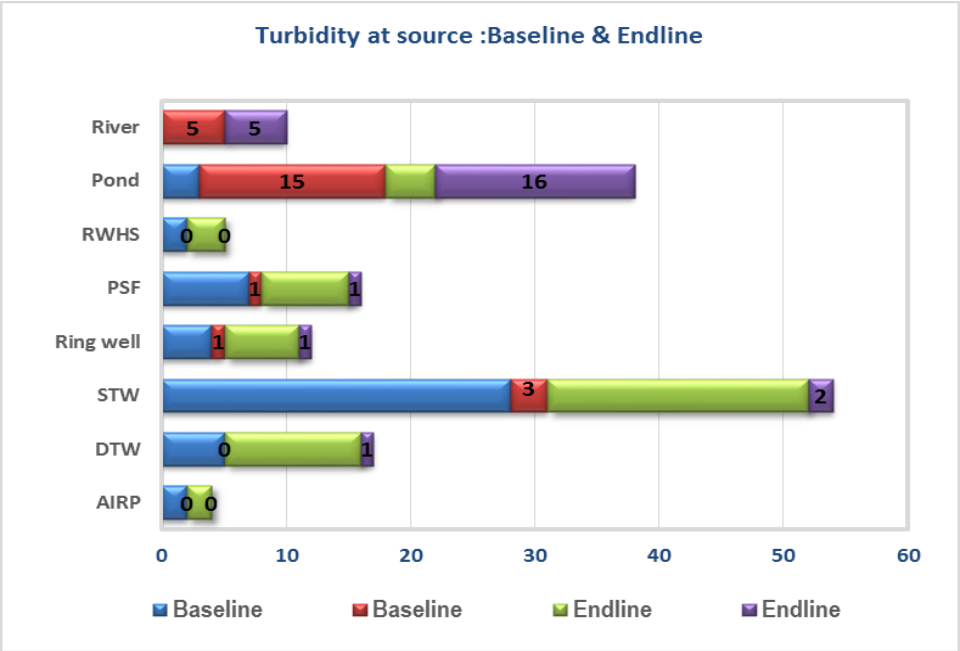


Figure 15: Union wise Turbidity Comparison at source

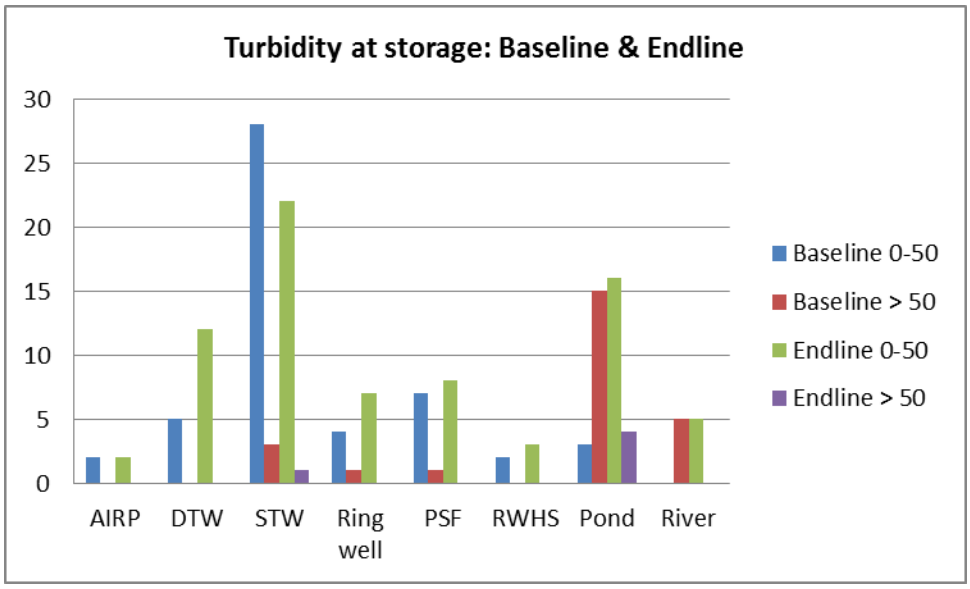


Figure 16: Union wise Turbidity Comparison at storage

Nitrate (NO_3)

42 water options were tested where 98% options were found within the limit 0-10 of Bangladesh standard. Only 7% NO_3 concentration was found above the limit at source and storage level in Aliabad union of Faridpur Sadar upazilla under Faridpur district. The result is same as the baseline survey report.

6. KEY FINDINGS AND LEARNINGS

The project findings were captured from KAP baseline survey, end line survey, field observations, literature review and executed different interventions in coordination and collaboration with other stakeholders (DPHE, LGIs, Health, weather department, NGOs, community). The findings were explained based on different indicators including climate change and extreme weather events like flood, drought and salinity, people's perception on water safety, related diseases, emergency situation and water crisis, hygienic practice of water value chain (Source to use), water accessibility, availability, functionality, water quality and sanitary risks of the water facilities. A number of key findings are given below.

The climatic effect is gradually increasing on environment and extreme weather events especially seasonal variations, increasing temperature and changing distribution pattern of rainfall that deteriorate the water quality, accessibility, availability, and functionality. Context specific reflections include;

In coastal areas, salinity is gradually increased both in ground and surface water.
In flood prone areas, rainfall pattern and its distribution are gradually changing that inundated water points during flood and iron smell increased in ground water.
In drought prone areas, water point became non- functional during dry period due to depletion of water table each year.
As a result during disaster or water scarce period, vulnerable people face manifold problems including distant source, cost, use less contaminated water and less water that causes diseases like diarrhea, dysentery, typhoid etc.

People's perception, beliefs and behavioral practice is very much important to consider in every steps from source to use for ensuring water safety.

The microbial water quality varied with type of water options and context, low risk level is gradually increasing as compare to baseline data both at source and HH storage, particularly for SHTW, DHTW and protected pond resulted high low risk level compare to others as baseline.

As per sanitary inspection, option wise and union wise risk scores of the water facilities are gradually decreasing due to the practice change of the users through raising awareness and increasing knowledge on the importance of WSP.

Regarding arsenic, *82% options within the acceptable limit as compare to baseline 73% which indicates* seasonal variation and somewhere users switched to safe water sources like AIRP, nearest green STW, household arsenic removal filter, rain water collection during monsoon.

Use of arsenic contaminated water for drinking and cooking purposes is still done by the users especially in Aliabad Union where arsenic problem is high and lack of alternative sources but less compare to baseline.

Other parameters like acceptable limit of Iron, Manganese, Residual chlorine and turbidity are increasing whereas the limit of Nitrate and chloride is same as baseline.

The responses from the community and other stakeholders were found very positive and encouraging towards the practice of WSP.

Identification and documentation of arsenicosis patient through health camp is important.

Climate resilient WSP was found very effective to improve the situation through transferring information and knowledge among the community, caretakers, masons and other stakeholders in a participatory way.

The existing community groups, health workers, religious leaders, DPHE tube well mechanics and CBOs can play important roles in the implementation of WSP through their capacity building, coaching, mentoring and teaching.

The sanitation and hygiene campaigns along with demonstration were made the implementation of WSP easier.

7. KEY CHALLENGES

- According to survey, it was revealed that for changing behavioral practice of vulnerable people of the community, it is prime need to improve their water accessibility and use which has been addressed partially through demonstration though there was no provision of budget in the project.
- Space is always constraint for those who have less land to maintain safe separation distance between latrines and tube well which has been overcome through orientation to the people on optimum use of land.
- The project has achieved significant improvement and changes regarding climate resilient WSP within the limited budget and time which was possible only through proper planning, guidance, monitoring, follow up and team work.

8. WAY FORWARD

- Scaling up of the learnings and findings of the project in future projects and programmes.
- Demonstration of RO as a control measures for the hazardous events through future projects and programmes.
- Develop and demonstrate effective participatory online monitoring mechanism for the promotion of WSP.
- Leveraging resources to promote and mainstream WSP through establishing linkage, networking and relationship with decision makers, policy makers, private sectors and Govt. line departments.
- Fund allocation for renovation and demonstration of context specific water supply option to improve accessibility, use and hygiene behavior for vulnerable poor people.

9. REFERENCES

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10. ANNEXURES

- **Annexure -5: Water quality test data of end line survey**

Parameter wise water quality test result:

Total Option tested	Risk at Source: E.Coli							
	Low		Medium		High		Very High	
	B.line	E.line	B.line	E.line	B.line	E.line	B.line	E.line
80	33	40	26	28	19	12	2	0

Parameters: E-Coli	Option Name	Risk at Source (Baseline)				Risk at Source End line)			
Option Tested		Low	Medium	High	Very High	Low	Medium	High	Very High
		<1	1-10	11-100	> 100	<1	1-10	11-100	> 100
2	AIRP	2	0	0	0	2	0	0	0
12	DTW	3	6	3	0	7	4	1	0
23	STW	9	7	5	2	11	9	3	0
7	Ring well	2	1	4	0	4	1	2	0
8	PSF	6	2	0	0	3	5	0	0
3	RWHS	3	0	0	0	1	2	0	0
20	Pond	8	5	7	0	9	6	5	0
5	River	0	5	0	0	3	1	1	0
80		**33**	**26**	**19**	**2**	**40**	**28**	**12**	**0**

Parameters: E-Coli	Water Source	Risk at Storage (Baseline)				Risk at Storage Endline)			
Storing pot		Low	Medium	High	Very High	Low	Medium	High	Very High
		<1	1-10	11-100	> 100	<1	1-10	11-100	> 100
Kalash	AIRP	2	0	0	0	2	0	0	0
Kalash	DTW	1	8	3	0	5	5	2	0
Kalash	STW	6	9	7	1	12	6	5	0
Kalash	Ring well	1	3	3	0	3	2	2	0
Kalash	PSF	2	3	3	0	3	3	2	0
Kalash	RWHS	3	0	0	0	2	1	0	0
Kalash	Pond	7	7	6	0	12	5	3	0
Kalash	River	2	3	0	0	2	2	1	0
		24	**33**	**22**	**1**	**41**	**24**	**15**	**0**

Total Option tested	Risk at Storage: E.Coli							
	Low		Medium		High		Very High	
	B.line	E.line	B.line	E.line	B.line	E.line	B.line	E.line
80	24	41	33	24	22	15	1	0

Parameters: Turbidity					
Union	Option Tested	Baseline		Endline	
		0 -50	>50	0 -50	>50
Aliabad	14	14	0	14	0
Pattashi	14	10	4	10	4
Balipara	14	9	5	9	5
Sapahar	11	9	2	9	2
Charduani	12	5	7	5	7
Pathorghata	14	5	9	5	9
Total	**79**	**52**	**27**	**52**	**27**

Parameters: As+ At Source					
Union	Option Tested	Baseline		Endline	
		0-0.05	>.05	0-0.05	>.05
Aliabad	14	4	10	6	8
Pattashi	9	7	2	9	0
Balipara	8	8	0	8	0
Sapahar	11	11	0	11	0
Charduani	2	2	0	2	0
Pathorghata	1	1	0	1	0
Total	**45**	**33**	**12**	**37**	**8**

Parameters: Fe at Source					
Union	Option Tested	Baseline		Endline	
		0 -1	>1	0 -1	>1
Aliabad	14	3	11	8	6
Pattashi	8	0	8	0	8
Balipara	8	1	7	3	5
Sapahar	11	10	1	11	0
Charduani	2	0	2	1	1
Pathorghata	1	0	1	1	0
Total	**44**	**14**	**30**	**24**	**20**

Parameter: pH					
Union	Option Tested	Baseline		Endline	
		6.5 - 7	> 7	6.5 - 7	> 7
Aliabad	14	0	14	0	14
Pattashi	14	1	13	0	14
Balipara	14	0	14	0	14
Sapahar	11	0	11	0	11
Charduani	12	2	10	0	12
Pathorghata	14	0	14	0	14
Total	**79**	**3**	**76**	**0**	**79**

Parameters: NO3					
Union	Option Tested	Baseline		Endline	
		0 - 10	> 10	0 - 10	> 10
Aliabad	14	13	1	13	1
Pattashi	8	8	0	8	0
Balipara	6	6	0	6	0
Sapahar	11	11	0	11	0
Charduani	2	2	0	2	0
Pathorghata	1	1	0	1	0
Total	**42**	**41**	**1**	**41**	**1**

Parameters: CL					
Union	Option Tested	Baseline		Endline	
		0 -0.2	>0.2	0 -0.2	>0.2
Aliabad	14	14	0	14	0
Pattashi	14	14	0	14	0
Balipara	14	14	0	14	0
Sapahar	11	11	0	11	0
Charduani	12	12	0	12	0
Pathorghata	14	13	1	14	0
Total	**79**	**78**	**1**	**79**	**0**

Parameters: Mn					
Union	Option Tested	Baseline		Endline	
		0-0.1	>.1	0-0.1	>.1
Aliabad	14	13	1	14	0
Pattashi	8	8	0	8	0
Balipara	8	8	0	8	0
Sapahar	11	11	0	11	0
Charduani	2	2	0	2	0
Pathorghata	1	1	0	1	0
Total	**44**	**43**	**1**	**44**	**0**

Parameters: Chloride					
Union	Option Tested	Baseline		Endline	
		150-600	>600	150-600	>600
Aliabad	0				
Pattashi	3	3	0	3	0
Balipara	14	13	1	13	1
Sapahar	11	11	0	11	0
Charduani	12	10	2	10	2
Pathorghata	14	13	1	13	1
Total	**54**	**50**	**4**	**50**	**4**