Assessing Availability and Accessibility of Safe Drinking Water and Exploring the Health Impacts: A Study in the Barind Area of Bangladesh

12 March, 2025

InternshipDuration:10 December 2024 -10 March, 2025

Organization: Palli Karma-Sahayak Foundation

Project: Extended Community Climate Change Project- Drought

SUBMITTED BY

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12 March, 2025

Declaration

I, Kabya Koninika Rahman, declare that this report titled **"*Assessing Availability and Accessibility of Safe Drinking Water and Exploring the Health Impacts: A Study in the Barind Area of Bangladesh*"** is an original work undertaken by me under the guidance and direct supervision of . My internship was conducted at ECCP-Drought project of PKSF as a requirement for the completion of my BSS (Hons), in Health Economics at University of Dhaka.

I confirm that:

1. The report presented is original and has been conducted by me in accordance with the ethical standards.
2. Any assistance received during the process has been acknowledged, and the work of others is cited and referenced.
3. I acknowledge that in accordance with PKSF regulations, any violation of academic integrity, such as plagiarism, may potentially lead to significant repercussions.

.....

(Kabya Koninika Rahman)

Author and Intern, ECCP-Drought Project, PKSF

Acknowledgement from the ECCP-Drought project, Palli Karma-Sahayak Foundation (PKSF):

.....	**.....**
Dr. AKM Nuruzzaman	**Dr. Fazle Rabbi Sadeque Ahmed**
General Manager,	**Deputy managing Director,**
PKSF	**PKSF**

Acknowledgement

I extend my gratitude to the Institute of Health Economics for mandating a three-month internship for recent graduates in health economics. This experience has highlighted the invaluable nature of practical exposure in this field. I am profoundly thankful to Prof. Dr. Syed Abdul Hamid for facilitating my internship at PKSF, an esteemed organization in Bangladesh. This internship has been instrumental in bridging the gap between theoretical concepts and their real-world applications within health economics, contributing significantly to my academic journey.

My sincere appreciation goes to my academic mentors, Ashraful Kibria and Nasrin Sultana at the Institute of Health Economics, whose guidance profoundly influenced my research projects and steered the trajectory of my academic pursuits. Their mentorship enhanced my understanding of health economics and its practical implications.

I express my gratitude to Dr. AKM Nuruzzaman, General Manager at PKSF. His steadfast support and guidance were instrumental in creating a comprehensive and growth-oriented learning experience during my internship. He served as my intern supervisor, extending valuable support. His engaging and informative session on relevant topics significantly enhanced our knowledge.

The assistance and guidance provided by K.M. Marufuzzaman (Manager, PKSF) were pivotal in shaping my study's direction and resulting report.
A special thanks Dr. Md. Ferozur Rahaman for guiding us throughout the process with his valuable insights.
I extend my gratitude to Dr. Md. Jashim Uddin (AMD, PKSF) for their warm welcome on the commencement of my internship.

I would like to sincerely thank Mr. Hasib Hossain, CEO of Proyas Manobik Unnoyon Society, and Mr. Bokul Kumar Ghosh, Project Coordinator, ECCP-Drought, for their kind cooperation and warm hospitality. I am also grateful to all the dedicated staff members of the organization who extended their support throughout my work.

Lastly, I am grateful to all who contributed to making this unique internship possible. My time at the PKSF was filled with positivity and enthusiasm. As an intern at PKSF, this experience has significantly contributed to my professional growth and prospects. The insights gained will undoubtedly be applied to my forthcoming endeavours.

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Executive Summary

Access to safe drinking water is a fundamental human right and a crucial determinant of public health, economic stability, and overall well-being. However, in many developing regions, including the Barind area of Bangladesh, water scarcity and contamination remain pressing concerns. This study investigates the availability and accessibility of safe drinking water in the Barind region, focusing on three villages in Chapai Nawabganj Sadar upazila, while also exploring the associated health impacts on the local population.

The Barind region faces unique challenges due to its semi-arid climate, low annual rainfall, and declining groundwater reserves. The study utilized a mixed-methods approach, combining household surveys, key informant interviews, and focus group discussions (FGDs) to assess the water crisis comprehensively. The findings reveal that 100% of surveyed households rely on groundwater as their primary drinking water source, yet its availability fluctuates due to seasonal depletion. More than one-third of respondents reported that their primary water source becomes non-functional during certain months, particularly between April and June. In such cases, households resort to alternative sources such as deep tube wells, harvested rainwater, or even surface water, despite potential contamination risks.

Although the majority of respondents perceived their drinking water as safe, only 5.17% treated their water before consumption, with boiling being the most common method. The study highlights critical issues in water accessibility, as 15.52% of households must travel between 500 meters to 1 km to fetch water, and over 80% make more than four trips per day to meet their household needs. Additionally, frequent power outages disrupt the operation of electric water pumps, causing significant distress to residents. Financial constraints further exacerbate accessibility issues, with all surveyed households reporting that they incur costs for drinking water, primarily through electricity bills for pumping systems.

The health implications of inadequate water access are evident, with 24.14% of households reporting cases of waterborne diseases, primarily diarrhea, in the past six months. Furthermore, nutritional assessments of children under five indicate that while most have a normal body mass index (BMI) for their age, a small percentage exhibit moderate undernutrition, raising concerns about the long-term effects of water insecurity on child health.

Key informant interviews with experts from government agencies and non-governmental organizations (NGOs) emphasized the urgent need for sustainable water management strategies. Recommendations include expanding the installation of deep tube wells, implementing Managed Aquifer Recharge (MAR) systems, promoting rainwater harvesting, and improving institutional coordination. Additionally, community discussions underscored the necessity of raising awareness about safe water consumption practices, addressing governance inefficiencies, and mitigating the social conflicts that arise due to water scarcity.

To address these challenges, the study proposes a multi-faceted approach:

- **Infrastructure Development**: Expansion of deep tube wells with financial support from the government and NGOs, investment in rainwater harvesting systems, and rehabilitation of existing water storage facilities.
- **Water Resource Management**: Implementation of MAR systems to replenish groundwater levels, excavation of ponds and canals to enhance surface water storage, and adoption of double-lifting techniques to distribute river water efficiently.
- **Electricity and Pumping Solutions**: Introduction of solar-powered water pumps to mitigate the impact of frequent power outages, along with improved community-based management systems for electric pumps.
- **Water Safety and Hygiene Promotion**: Awareness campaigns to encourage water treatment practices such as boiling, filtering, and chlorination, as well as regular water quality monitoring to detect contaminants like arsenic and bacteria.
- **Policy and Institutional Strengthening**: Enhanced collaboration between local government bodies, NGOs, and community organizations to ensure the effective implementation of water security initiatives and policies such as the Bangladesh Water Act 2013.

This study underscores the urgent need for a coordinated effort to ensure equitable access to safe drinking water in the Barind region. Without timely interventions, the increasing pressures of climate change, groundwater depletion, and socio-economic disparities will continue to threaten water security and public health. By integrating technological solutions, policy support, and community engagement, sustainable access to safe drinking water can be achieved, improving the overall quality of life for the people of Barind.

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1. Introduction

Access to safe drinking water is a fundamental human right. It is a critical determinant of public health as well as economic development and overall well-being of a country's population. Even though there have been some significant advancements in water supply infrastructure throughout the globe, many developing countries still face challenges related to the availability and accessibility of safely managed drinking water. Bangladesh is particularly vulnerable to water scarcity and contamination because of its unique geographical and climatic conditions. The Barind area of Bangladesh is known to be one of the most water-stressed zones in the country. About 88% of water sources in Bangladesh are categorized as 'improved' (An **improved water source** is a drinking water source that is designed to protect against contamination, particularly from faecal matter) and comply with national standards for arsenic (<=50 ppb). However, significant disparities remain. For example, in 17 districts, more than 1 in 5 people consume water that has arsenic concentrations above 50 ppb which poses a great public health threat. In Bangladesh, 95% of the population has access to improved water sources within a 30-minute round trip but only 34.6% of households consume water that complies with both arsenic and E. coli standards at the point of consumption. Many households resort to consuming contaminated water, increasing their vulnerability to diarrheal diseases, arsenic poisoning, malnutrition and other health risks.

The northwestern part of Bangladesh is known as the Barind area. In the Barind area, the lacks of safely drinking water and ability to access it have severe impacts on the health and livelihoods of the local population. The characteristics of the region include semi-arid climate, low annual precipitation, and depleting groundwater reserves. The people of the region relied on deep tube wells and rainwater harvesting as primary sources drinking water in the past. In recent days, phenomenona like excessive extraction of ground water, climate change, and inconvenient soil composition etc. have led to declining water tables and increased risks of contamination of drinking water. This poses significant threats to water security and availability in the region.

Multiple factors like geographical constraints, socio-economic conditions and governance policies influence the water availability and accessibility in the Barind area. The rural population, especially the marginalized communities face significant challenges in obtaining safe drinking water due to economic hardships and inadequate infrastructure (affordability constraints). Besides that, institutional inefficiencies also hinder the accessibility of safe drinking water (policy constraints). With all the constraints in hand, households resort to consuming contaminated water. This increases their vulnerability to many waterborne diseases and health risks. Understanding the interplay of these factors is essential for formulating effective policies and interventions to ensure equitable access to safe drinking water.

The objective of this study is to assess the availability and accessibility of safe drinking water in the Barind area and explore the associated health impacts on the local population. By examining the current water sources, distribution patterns, and quality parameters, this study

aims to provide an in-depth analysis of the existing challenges. Additionally, it seeks to evaluate the health implications of water scarcity and contamination, with a focus on identifying vulnerable groups and prevalent diseases linked to poor water quality. Between 2009 and 2013, about 1.6 million people in Bangladesh gained access to arsenic-safe water, yet the risk remains widespread, with 73.3 million people using improved water sources that do not meet government standards for arsenic and E. coli. Through a combination of qualitative and quantitative research methodologies, including field surveys, water quality testing, and health impact assessments, this study will contribute to the existing body of knowledge and inform policy recommendations for sustainable water resource management.

Ensuring access to safe drinking water requires a multi-faceted approach involving community participation, government initiatives, and technological innovations. This study will also explore potential solutions, such as improved water management practices, infrastructure development, and alternative water supply mechanisms, to address the challenges faced by the Barind region. Given that faecal contamination increases from 41.7% at the source to 61.7% at the point of consumption, it is crucial to integrate water safety plans and behavior change communication to improve drinking water quality. By highlighting the critical issues and proposing viable strategies, this research aims to support stakeholders in designing and implementing effective interventions that enhance water security and safeguard public health in the Barind area of Bangladesh.

1.1 Extended Community Climate Change Project- Drought (ECCCP-Drought):

Bangladesh faces an unpredictable drought hazard due to inadequate and uneven rainfall that affects the timing of onset and end of the monsoon season. The northwestern *Barind* region/districts of Bangladesh suffer the most from droughts (BBS, 2015). Climate change is changing the nature of droughts in *Barind* by increasing temperature and variations in precipitation. The historical data show that the number of consecutive dry days and temperature have increased steadily over the past 30 years (MoEF, 2009). On the contrary, long-term projections of precipitation using different models show decreasing trend. Thus, drought episodes have become more erratic through climate change, a trend that has a high probability of worsening for the next decades.

Drought causes several challenges for vulnerable communities of the *Barind* region. During droughts, almost all natural surface water sources evaporate, leaving none for drinking, sanitation or agriculture. The human cost is measured in a greater incidence of disease, especially among children and lack of nutrition due to crop failure, increased poverty and reduced development potential.

Objectives of the Project

The project intends to address the above-mentioned drought-related problems by promoting good water management, adaptive technological practices, infrastructure maintenance, and planning for irrigation, drinking and household usage. Also, the project intends to reduce water needs by promoting the cultivation of crops with low water requirements in the dry season, thus reducing irrigation needs up to 70% during the winter season. In addition, the

project will provide more water access points for drinking purposes too, thereby reducing the burden on women.

Project components

The Project consists of the following three components under which the following activities (each, an "Activity") will be implemented, each as further described in the Funding Proposal.

Component 1: Improved institutional and technical capacities to address climate change-induced drought.

This first Component intends to build capacities among government institutions and NGOs to address climate change impacts, particularly related to droughts. This will be achieved by improving capacities among different interrelated scales of institutional and community organisations: at the ministry, subnational, and at community levels.

Output 1.1 Enhanced capacities of government institutions to implement and monitor water resources management and climate change adaptation projects

Activity 1.1.1 Establishment of climate change unit at the *Barind* Multipurpose Development Authority (BMDA)

Activity 1.1.2 Establishment of a Managed Aquifer Recharge (MAR) center

Output 1.2 Knowledge and technical capacities of climate change adaptation interventions improved

- Real Time Evaluation (RTE) study
- Analyse results and develop database of intervention impacts
- Training to NGOs on climate change
- Trainings on climate change issues and project management
- Organize knowledge sharing workshops and seminars

Output 1.3 Communities are organized and aware of climate change issues and potential responses

- Beneficiary selection, group formation and mobilization
- Develop beneficiary's socio-economic profiles
- Arrange monthly group meetings on climate change issues of Climate Change Adaptation Groups (CCAG)
- Trainings of beneficiary groups
- Organize exchange visits for CCAG members and implementing entities' staffs

Component 2: Increased availability of surface and ground water for irrigation and drinking.

In the proposed districts, the average annual rainfall (1,400 mm) is far below that of the national average (i.e., 2,300 mm). Rains do not percolate into aquifers easily because of the presence of clay soils, which have low porosity. Therefore, a large amount of rain-water evaporates before percolating into the soil. In addition, there are no large and deep surface water sources, such as lakes or rivers, and hence groundwater recharge is very slow. During

times of drought, when surface water dries up, communities traditionally use hand-pumped tube-wells for drinking purposes. These extract water from shallow aquifers that depend on seasonal rainfall and the availability of surface water. However, under current drought regimes, shallow aquifers are dry and hand-pumped tube-wells are of no use.

Under this Component, water access will be provided for CCAGs through different mechanisms. Canals and ponds will be used as per site specifications and substrate adequacy. The Project will also demonstrate the effectiveness of managed aquifer recharge systems by harvesting rainwater and injecting it into the aquifer. Piezometres will be used to check changes in the water table level. Communities will have increased access to water for household drinking and irrigation. In order to improve access to water, multiple interventions will be implemented, including the use of 140 km of renovated canals, 300 renovated ponds for surface water storage, 40 ponds with recharge well and 2,500 rooftop MAR systems. It is estimated that by the end of the Project, about 215,000 people will have improved access to water use.

Output 2.1 Improved storage of surface water

- Ponds re-excavation
- Canals re-excavation

Output 2.2 Improved recharge of aquifers

- Installation of rooftop managed aquifer recharge systems
- Installation of recharge well for ground water recharge in ponds

Component 3: Drought resilient livelihoods created through a sustainable agricultural production.

This Component will promote drought-adaptive cropping patterns. A cropping pattern will include at least three crops in a year on a single piece of land. It will include different types of crops. The crops will be chosen based on moisture-stress tolerant capacity, duration of the production cycle, and water requirement. Considered crops include rice, wheat, and mung bean. For example, a suggested cropping pattern is BRRI Dhan-56 (rice variety)-BARI Gom-24 (a wheat variety)-BARI Mung-6 (a pulse variety). Fruit trees will also be promoted since they require a minimal amount of water. Besides, cotton will also be promoted since it is a crop with high agronomic and economic potentials in the Barind region and is drought-tolerant. The Project will link CCAG members to the local office of the Department of Agricultural Extension (DAE) and/or Bangladesh Agricultural Development Corporation (BADC) to get seeds.

Through this Component, it is expected that farmers will increase productivity and incomes from agriculture. It is also expected that water requirement for agricultural production will be reduced by 70%.

Output 3.1 Drought-resilient crops are adopted by farmers

- Promotion of drought-adaptive cropping patterns, crop varieties

- Promotion of drought adaptive fruit cultivation

Expected outcomes:
The project will bring 3,500 hectares of land under irrigation by rehabilitating 140 kms of canal in the three selected districts. In order to promote a sustainable use of groundwater resources, the project will implement a Managed Aquifer Recharge technique (rainwater directed through tubes to the aquifer) to replenish the ground water. It is expected that 2,500 rooftop-based MAR will replenish about 560,000 m3 of water into the aquifer annually which will increase access to drinking water of the selected communities in proposed districts. 40 inject wells in ponds will replenish 400,000 m3 of water into the aquifer annually. In addition, these ponds will also preserve about 150,000 m3 of water as surface storage. Also, 15,000 farmers will apply drought-adaptive cropping patterns.

Project Area:
14 most drought vulnerable and poverty stricken upazilas of Naogaon (all 9 upazilas, Rajshahi (two upazilas) and Chapainawabganj (three upazilas) districts.

Target Beneficiaries:
Number of direct beneficiaries is 215,000 and Indirect beneficiaries are all the people of the selected upazilas.

Project Duration: 48 months (4 years)

2. Literature Review

The availability of safe drinking water is a pressing issue in many parts of the world. Despite covering two-thirds of the Earth's surface, only a small fraction of water is freshwater, and even less is readily accessible for human consumption. The growing demand for freshwater, coupled with unsustainable water management practices and has exacerbated water shortages in many regions. The lack of adequate access to potable water is particularly concerning in developing countries, where infrastructure and governance challenges hinder effective water distribution.

In Bangladesh, water scarcity is a severe problem, especially in regions like the Barind area, where groundwater depletion and seasonal droughts limit access to safe drinking water. The reliance on deep tube wells has increased over time, but the sustainability of this approach is questionable given the declining water table. Moreover, contamination from arsenic and other pollutants further compromises the safety of available water sources.

Contaminated drinking water is a major cause of disease and mortality worldwide. The World Health Organization (WHO) estimates that 88% of diarrheal diseases globally are caused by

unsafe water, poor sanitation, and inadequate hygiene. In Cameroon, for example, a study found that contaminated drinking water significantly contributed to the prevalence of diarrheal diseases, particularly among children under five. The study highlighted that waterborne diseases, such as cholera, dysentery, and typhoid, are directly linked to poor water quality and sanitation conditions.

In Bangladesh, the health risks associated with unsafe drinking water are similarly concerning. Contaminated water sources expose communities to severe gastrointestinal infections, skin diseases, and malnutrition. Furthermore, the economic burden of waterborne illnesses is substantial, affecting productivity and increasing healthcare costs. The persistence of these health risks underscores the urgent need for effective water management strategies and improved access to potable water.

Addressing water scarcity and contamination requires a combination of policy interventions, infrastructure development, and community-based initiatives. Internationally, the recognition of water as a fundamental human right has driven efforts to improve water governance and promote sustainable water use. The United Nations has emphasized the need for universal access to safe drinking water, urging governments to implement policies that prioritize water security and equity.

In Bangladesh, several initiatives have been introduced to enhance water accessibility and quality. Rainwater harvesting, deep tube well installation, and water purification technologies have been promoted as potential solutions. However, challenges remain in ensuring that these interventions are effectively implemented and maintained. Additionally, public awareness campaigns play a crucial role in promoting safe water consumption practices and encouraging community participation in water conservation efforts.

The literature highlights the critical importance of safe drinking water for public health and socioeconomic development. In regions like the Barind area of Bangladesh, water scarcity and contamination pose serious challenges, necessitating urgent and coordinated action. While policy interventions and technological solutions have shown promise, sustained efforts are needed to ensure universal access to potable water. Addressing research gaps related to long-term water security and the effectiveness of existing policies will be essential for improving water management strategies and reducing the health burden of unsafe water.

3. Methodology

3.1 Study Area

Three villages in the Chapai Nawabganj Sadar upazilla were the sites of the study. Amarok, Delbari, and Jolahar were the villages. Jolahar is a part of the Jhilim union. In contrast, Amarok and Delbari are part of Chapai Nawabganj Sadar's Gobratola union. The indigenous Santal community makes up the inhabitants of Jolahar and Delbari. Residents of Amarok were members of the Sanatan religious sect. Nonetheless, the localities named had some Muslim households.

The residents from the villages belonged from economically underserved communities. They are known to face issues with affordability concerns regarding access to safe drinking water.

3.2 Questionnaire

The questionnaire consists of four sections. The first section collects the demographic information of the households. The second section explores the availability and quality of drinking water. The third section explores variables and indicators that assess the accessibility. We also incorporate the affordability concerns in the third section where we ask questions regarding water accessing facilities and ability of the households to purchase water when needed. The fourth section explores the health effects where we see the incidence of water borne diseases among the population and also assess the nutritional status of the under five children of the households. The questionnaire was developed with compliance to WHO and JMP guidelines for questions for household surveys on drinking water.

3.4 Methodology of the Assignment

The study is conducted using Qualitative and Quantitative methods that include primary and secondary data collection considering study objectives, location and community dimensions. The qualitative technique includes Key Informants Interview and Focus Group Discussion using a semi-structured interview guidelines and the data was collected through face-to-face interview administered questionnaires from the selected stakeholders.

3.5 Data Collection and Analysis

Before collecting data in the field, a dynamic data entry form was developed using KoboToolbox. After data collection, necessary measures such as data coding, cleaning and minor editing were accomplished. Data analysis was done by using Stata/SE 14.

To assess the nutritional status of the under five children, their BMIs were calculated. The calculated BMIs were compared with the chart of Z score range of WHO to assess their nutritional status.

3.6 Qualitative Method

In this study, the most appropriate methods to be used are suggested as follows:

i. Key Informant Interviews (KII)
ii. Focused Group Discussions (FGD)
iii. Observation/Field Visit

3.7 Ethical Considerations

Clear and informed consent will be obtained from all study participants, ensuring that they are fully informed about their involvement. Strict measures will be taken to ensure the privacy and confidentiality of all participants are protected during both data collection and analysis. Pictures or videos will only be taken with the clear and informed consent of beneficiaries, respecting their choices. Data will be handled with care to maintain accuracy and integrity during both the sorting and analysis phases.

3.8 Methodology Matrix

Objective	**Specific Objective**	**Indicators**	**Data**
Assessing the availability and accessibility of safe drinking water and exploring health impacts	Assessing availability of safe drinking water	• **Ground Water Sources** (Level of ground water) • **Surface Water Sources** (Availability and condition of rivers, ponds and reservoirs)	Secondary data Primary Data Literature
	Assessing the accessibility of the safe drinking water	• **Distance of Water Sources** • **Time Spent Fetching Water** (Time taken per trip, Frequency of trips) • **Affordability** (Cost of accessing drinking water if sold, presence of facilities like pipeline, pump etc.)	Primary Data
	Exploring the health impacts due to the availability and accessibility of safe drinking water	• **Incidence of Water Borne Diseases** (Diarrhoea, Typhoid, Cholera, Jaundice etc.) • **Malnutrition Indicators** (BMI) • **Mental Health** (Stress and anxiety due to long distances or water scarcity)	Primary data Secondary data

Table 1: Methodology Matrix

4. Findings and Discussion

The questionnaire for the survey was divided into 4 sections. The important findings are presented in below:

4.1 Section 1: Demographic Information

Question	Category	Percentage (n=58)
Religion of the household	Islam	5.17 (3)
	Sanatan Hindu	48.28 (28)
	Christian	46.55 (27)
Educational years of the household head	0	27.59 (16)
	3	3.45 (2)
	4	5.17 (3)
	5	15.52 (9)
	6	5.17 (3)
	7	5.17 (3)
	8	13.79 (8)
	9	5.17 (3)
	10	15.52 (9)
	12	3.45 (2)
Main occupation of the household	Farmer	94.83 (55)
	Small and Medium Enterprise (SME)	3.45 (2)
	Day Laborer	1.72 (1)
Total members in the household	2	10.34 (6)
	3	17.24 (10)
	4	41.38 (24)
	5	17.24 (10)
	6	12.07 (7)
	7	1.72 (1)

Table 2: Findings Regarding Demographic Information

From the table we see that almost half of the household surveyed belonged from Santal Christian community (46.55%) and the other half consisted of Sanatan Hindu community (48.28%). 5.17% of the households were Muslim households. A big portion of the households (94.83%) relies on farming for income generating.

Quantitative Variables:

Educational Years of the Head of the Household

Observations	Mean	Standard Deviation	Minimum	Maximum
58	5.293103	.5112223	0	12

We see that the head of the household had 5.29 years of education on average. The most educated head of the household was higher secondary certificate holder. The lower limit was no education.

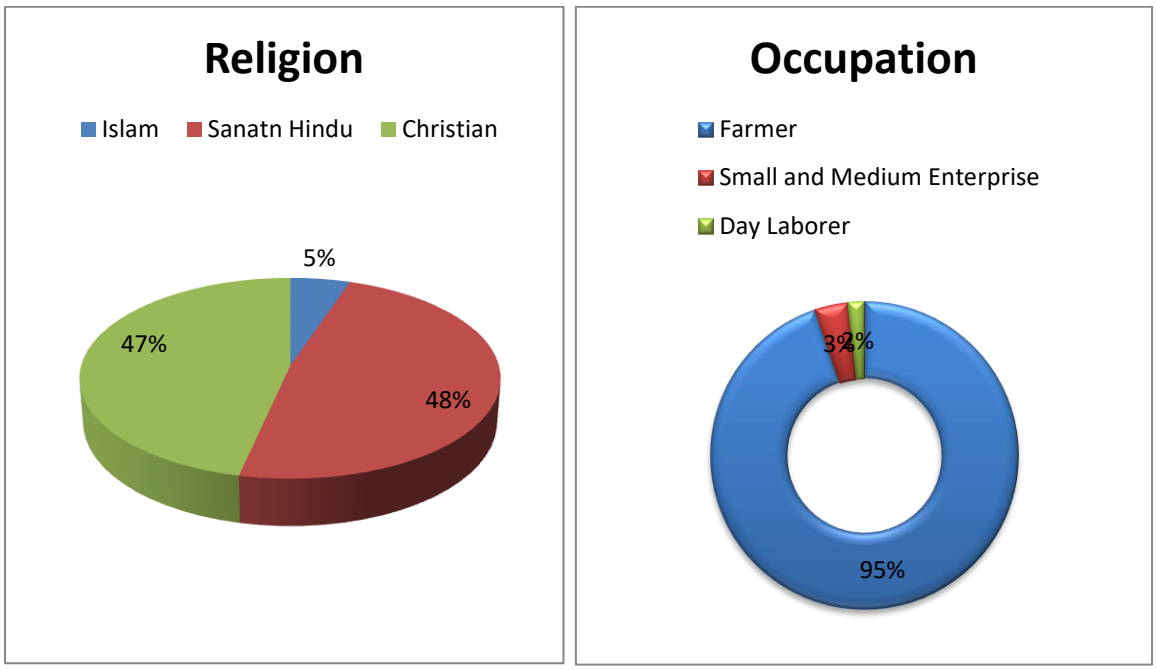

Chart 1: Religion and Occupation Distribution

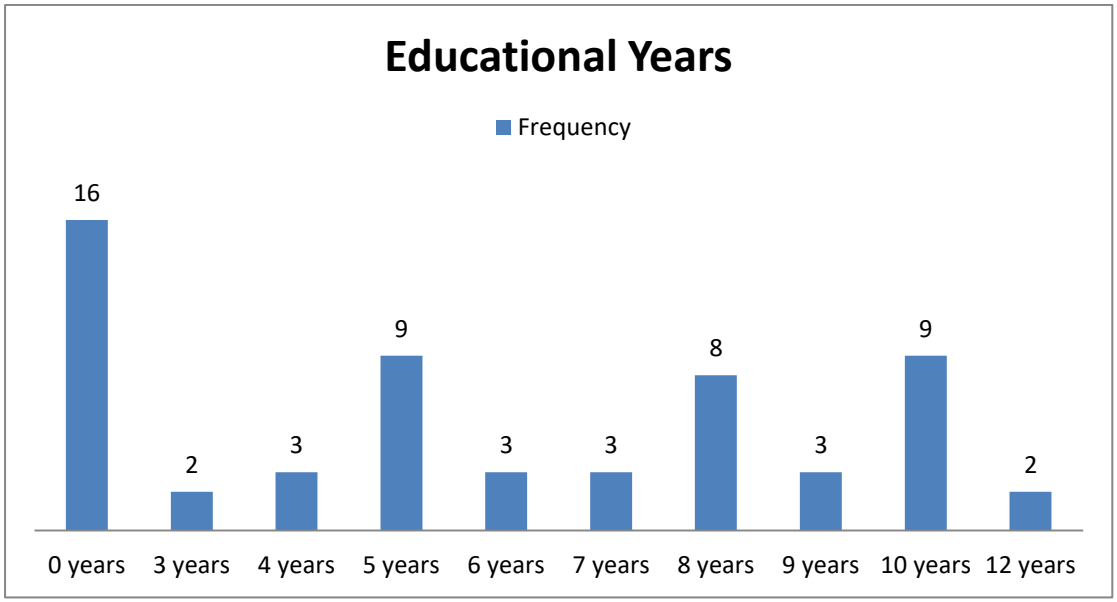

Chart 2: Frequency of Educational years

Monthly Household Income

Observations	Mean	Standard Deviation	Minimum	Maximum
58	15534.48	598.0486	6000	25000

The mean household income is 15,534.48. The range has a minimum of 6000 BDT to 25000 BDT.

Monthly Household Expenditure

Observations	Mean	Standard Deviations	Minimum	Maximum
58	15275.86	566.665	5000	25000

We see a similar contrast between household income and expenditure which shows that what they earn, they usually spend it for monthly needs. They rarely can save their income for future expenditures.

4.2 Section 2: Drinking Water Availability and Quality

Questions	**Category**	**Percentage (n=58)**
What is the main source of drinking water of your family?	Ground Water (Well, Tubewell)	100 (58)
	Surface Water (River, Pond, Canal)	0 (0)
	Harvested Rainwater	0 (0)
Does the main source of drinking water of your family remains functional throughout the year?	Yes	63.79 (37)
	No	36.21 (21)
When the main source isn't functional, which sources of your drinking water do you use?	Ground Water (Well, Tubewell)	47.61 (10)
	Surface Water (River, Pond, Canal)	57.14 (12)
	Harvested Rainwater	57.14 (12)
How often do you face drinking water crisis?	Sometimes (Few times yearly)	100 (21)
	Frequently (Every month)	0 (0)
	All time	0 (0)
Is your water supply	Yes	94.83 (55)

sufficient to meet your household's daily needs?	No	5.17 (3)
Do you think your drinking water is safe for consumption?	Yes	100 (58)
	No	0 (0)
Have you noticed any problems with your drinking water?	Yes	0 (0)
	No	100 (58)
Do you treat your water in any way before drinking?	Yes	5.17 (3)
	No	94.83 (55)
What kind of treatment do you do to make the drinking water safe?	Add bleach/chlorine	0 (0)
	Use a water filter	0 (0)
	Solar disinfection	0 (0)
	Boil	66.67 (2)
	Strain it through a cloth	33.33 (1)
	Let it stand and settle	0 (0)

Table 3: Findings Regarding Drinking Water Availability and Quality

It can be noted that 100% of the surveyed households depend on ground water as their main source of drinking water. The problem here is that the ground water source doesn't stay functional throughout the year. In the months of April, May and June due to less rainfall and characteristics of the Barind lands, the water level goes down.

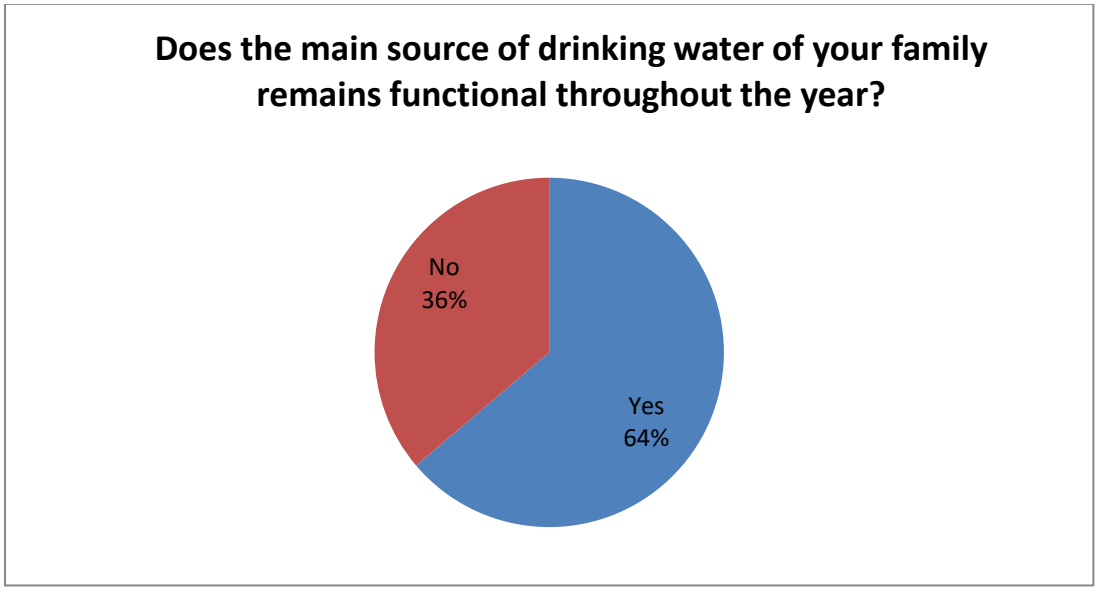

Chart 3: Answer Distribution Regarding Functionality of Main Drinking Water Source

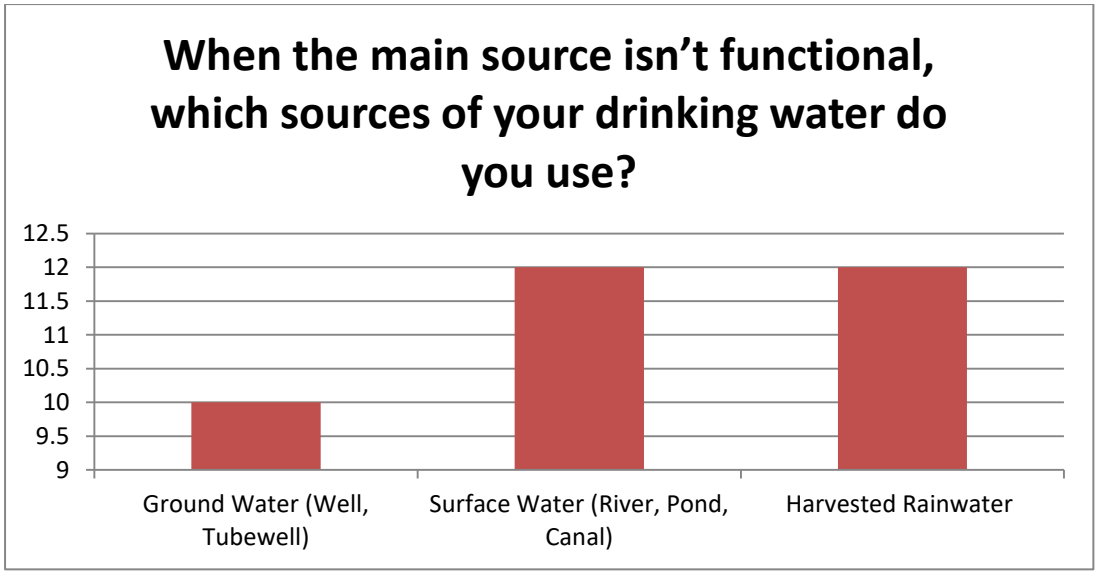

Chart 4: Alternate Sources during Water Crisis

We find that, 36.21% of the households face this problem. At those times, use of deep tube well can abstract ground water. However, the installation of deep tube well is very costly which cannot be afforded by most of the households. In times of crisis, households sought to deep tube wells, harvested rainwater and surface water. The share is respectively 47.61%, 57.14% and 57.14%.

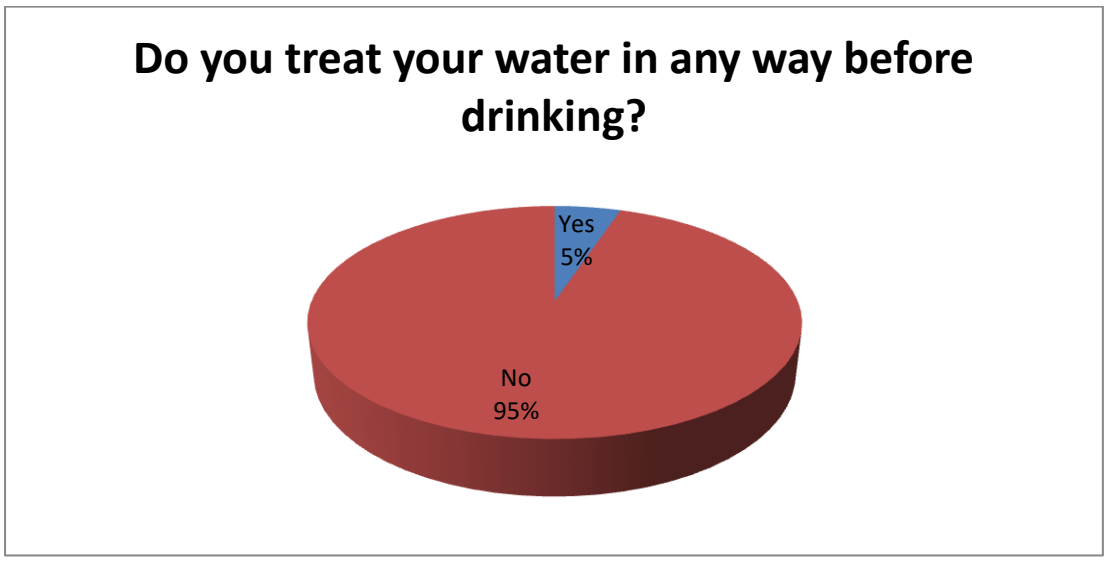

Chart 5: Answer Distribution Regarding Treatment of Water before Drinking

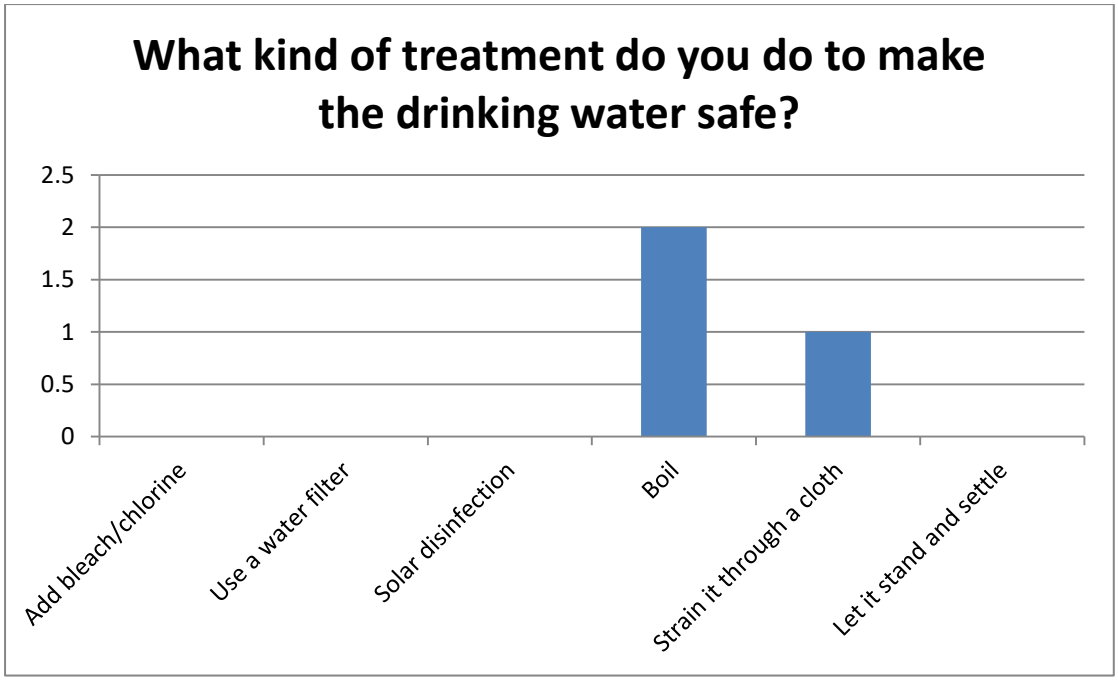

Chart 6: Types of Treatment Used by the Respondents

Most of the respondents agreed that the supply of water is enough for their daily household needs (94.83%). All of the respondents perceived their drinking water as safe. Only 5.17% of the sample treats their water before drinking. The practice of boiling and straining it through a cloth is seen.

4.3 Section 3: Drinking Water Accessibility

Questions	Category	Percentage (n=58)
How far is the main source of drinking water from your household?	Less than 500 metres	84.48 (49)
	500 meters to 1 km	15.52 (9)
	More than 1 km	0 (0)
How much time do household members spend fetching water per trip?	Less than 15 minutes	86.21 (50)
	15–30 minutes	10.34 (6)
	More than 30 minutes	3.45 (2)
How many trips per day are needed to meet household water needs?	1–2 trips	1.72 (1)
	3–4 trips	17.24 (47)
	More than 4 trips	81.03 (10)
Does your household have any of the following water facilities?	Hand pump	15.51 (9)
	Well	0 (0)
	Pipeline connection	34.48 (20)
	None of the above	65.52 (38)
Do you spend money for safe drinking water?	Yes	100 (58)
	No	0 (0)
What is the source of finance	Household current income	100 (58)

behind safe drinking water?	From savings	0 (0)
	By taking a loan	0 (0)
	By borrowing	0 (0)

Table 4: Findings Regarding Drinking Water Accessibility

It is a relief that most of the respondents (84.48%) of household have their main source of water within 500 metres from their household. The rest (15.52%) have it within 500m to 1km distance. 86.21% can fetch drinking water within less than 15 minutes.

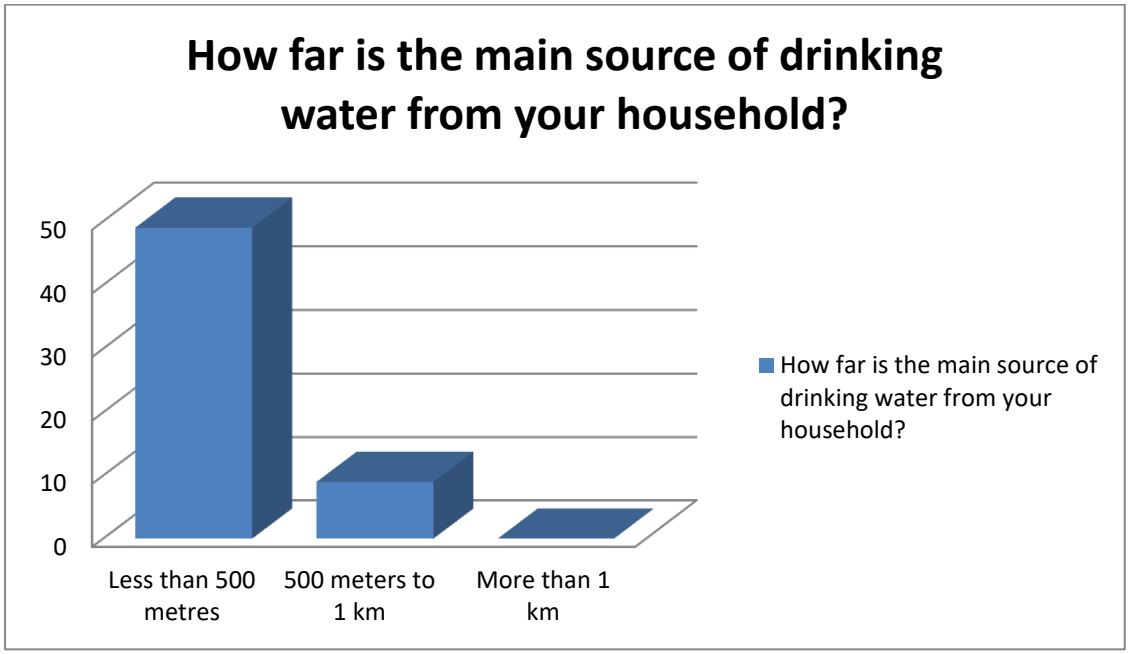

Chart 7: Distance of Main Source of Drinking Water from Households

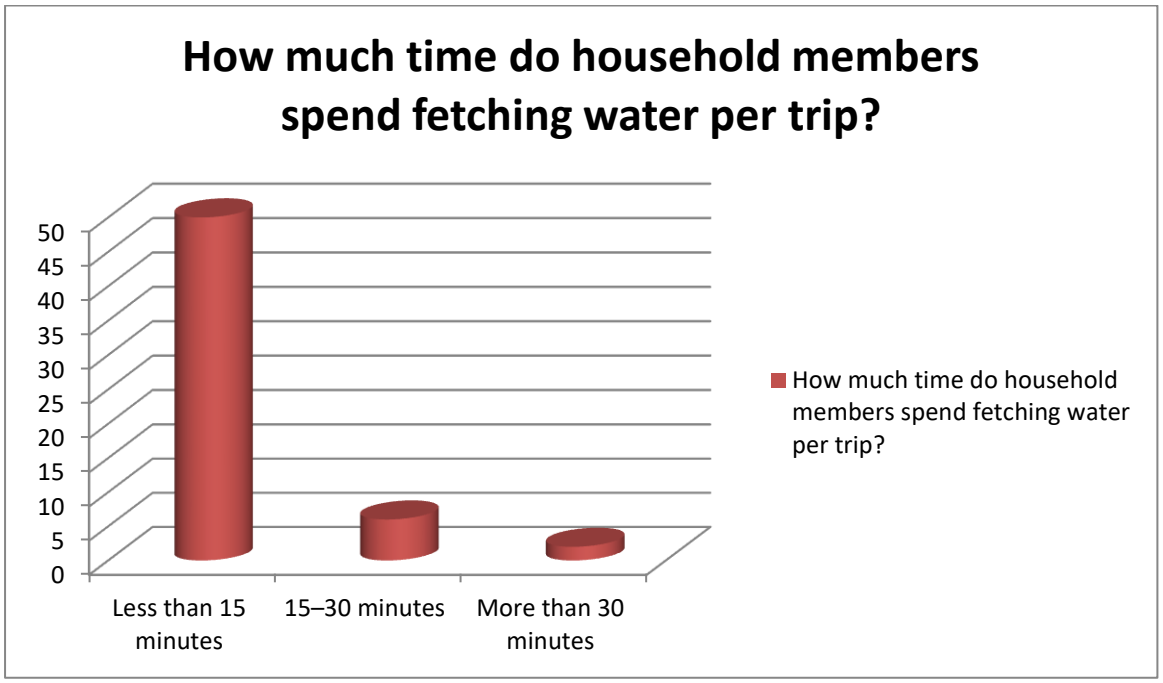

Chart 8: Time Spent Fetching Water

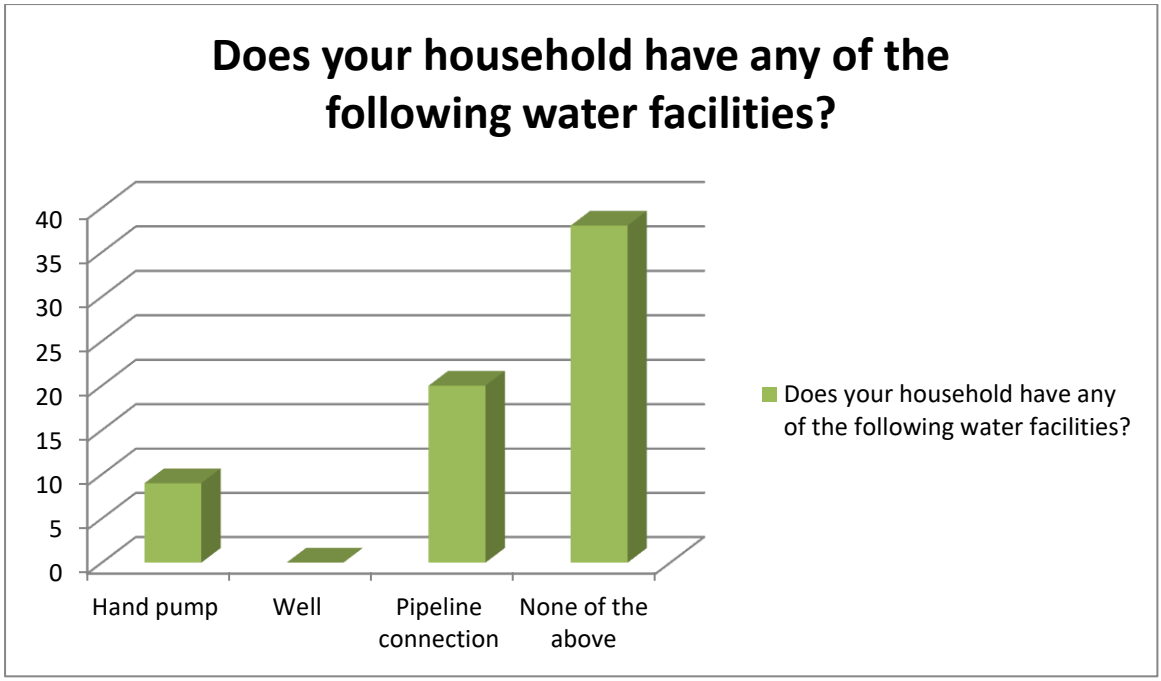

Chart 9: Available Facilities in Households

In terms of affordability, 34.48% of the households have pipeline connections. All of the households spend money for drinking water. The money they pay is the electricity bill of the electric pump installed in their village which defers from household to household depending on member number. The source of finance in terms of electricity bill for pump is household current income for every household.

Quantitative Variables:

Money Spent Behind Electricity Bill of the Pump

Observations	Mean	Standard Deviation	Minimum	Maximum
58	**49.8276**	**3.969**	**20**	**100**

Every household spends about 50 Tk on average. The range has a minimum of 20 Tk and maximum of 100 Tk.

4.4 Section 4: Health Impact

Questions	Category	Percentage (n=58)
Have any household members suffered from waterborne diseases in the	Yes	24.14 (14)
	No	75.86 (44)

past 6 months?		
If yes, then what disease did you suffer from in the past 6 months?	Typhoid	3.44 (2)
	Cholera	0 (0)
	Jaundice	0 (0)
	Diarrhea	20.68 (12)
	Others	0 (0)
Does the lack of water cause stress or anxiety in your household?	Yes	20.68 (12)
	No	79.31 (46)

Table 5: Findings Regarding Health Impacts

The table shows that 75.86% of the surveyed households were free from any kind of water borne diseases over the last 6 months. 20.68% of the affected suffered from Diarrhea. About 21% of the household said they battle anxiety due to lack of drinking water facilities.

Nutritional Assessment of Under-5 Children

Standards of Z-score Range:

Z-Score Range	Nutritional Status
Z > +3	Obesity
Z > +2 to +3	Overweight
Z between -2 and +2	Normal BMI for age
Z < -2 to -3	Underweight (Moderate thinness)
Z < -3	Severe underweight (Severe thinness)

Table 5: Nutritional Status According Z-Score

Nutritional Assessment of Boys:

Age of the Child	BMI of the Child	Z Score Range	Nutritional Assessment
2 years	14	Z between -2 and +2	**Normal BMI for age**
3 years 6 months	17.34	Z between -2 and +2	**Normal BMI for age**
6 months	19.84	Z between -2 and +2	**Normal BMI for age**
5 years	22.69	Z > +2 to +3	**Overweight**
2 years 6 months	14.11	Z between -2 and +2	**Normal BMI for age**
2 years 6 months	16.65	Z between -2 and +2	**Normal BMI for age**
4 years	15.73	Z between -2 and +2	**Normal BMI for age**
7 months	10.32	Z < -2 to -3	**Underweight (Moderate thinness)**
5 years	13.4	Z < -2 to -3	**Underweight (Moderate thinness)**

5 years	14.24	Z between -2 and +2	**Normal BMI for age**
2 years	13.21	Z < -2 to -3	**Underweight (Moderate thinness)**
5 months	15.22	Z between -2 and +2	**Normal BMI for age**
5 years	17.35	Z between -2 and +2	**Normal BMI for age**

Table 6: Findings Regarding Nutritional Status of Under five Children (Boys)

Nutritional Assessment of Girls:

Age of the Child	BMI of the Child	Z score Range	Nutritional Assessment
5 years	16.56	Z between -2 and +2	**Normal BMI for age**
4 years 5 months	17.28	Z between -2 and +2	**Normal BMI for age**
4 years	15.63	Z between -2 and +2	**Normal BMI for age**
5 years	13.91	Z between -2 and +2	**Normal BMI for age**
3 years	15.68	Z < -2 to -3	**Underweight (Moderate thinness)**
1 years 4 months	12.75	Z between -2 and +2	**Normal BMI for age**
4 years 4 months	13.75	Z between -2 and +2	**Normal BMI for age**
11 months	15.48	Z between -2 and +2	**Normal BMI for age**
1 years 6 months	16.12	Z between -2 and +2	**Normal BMI for age**
2 years 6 months	14.74	Z between -2 and +2	**Normal BMI for age**

Table 6: Findings Regarding Nutritional Status of Under five Children (Girls)

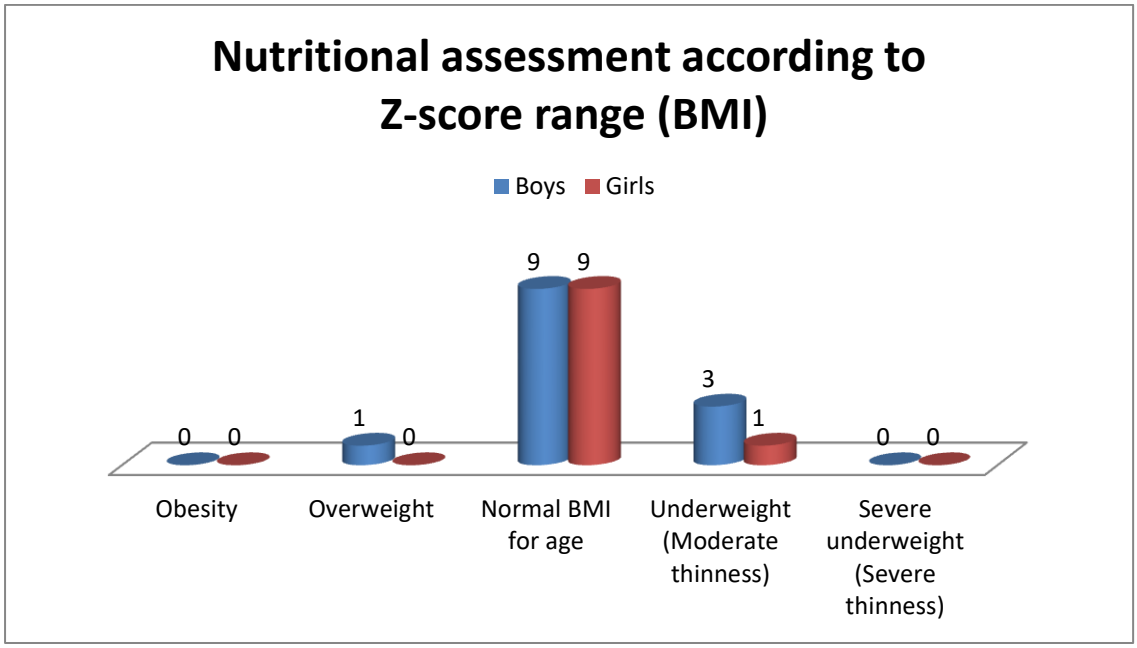

Chart 10: Findings Regarding Nutritional Status of Under five Children

We see that, most of the children proved to have normal BMI according to their age. A small portion was underweight and one single case we see was overweight.

4.5 FGD Findings

To gain deeper insights into the availability and accessibility of safe drinking water, three FGDs were conducted across the selected villages in Chapai Nawabganj. Each group comprised 14-20 participants, including men and women of various age groups. The discussions focused on key themes such as water sources, challenges in accessing safe drinking water, health impacts, and community coping strategies.

FGD 1

Location:

Village: Jolahar, Union: Jhilim, Upazilla: Chapai Nawabganj Sadar

Date: 17 February, 2025

We surveyed the Santal community in the Jolahar village. The community consisted of 20 households. The FGD group had members from every household of the community.

Key Findings:

Access and Challenges:

The whole village depend on an electric pump that supplies ground water as their drinking water. In this village, they pay a particular amount to have access to the services of the pump. The amount ranges from 20-60 BDT.

The participants of the discussions all agreed that the main challenge in terms of access to safe drinking water was load shedding. It becomes very difficult for them to have access to drinking water when there is frequent load shedding going on.

Besides that, there raises issues of payment among the village residents regarding the electricity bill of the electric pump. The amount that each household has to pay differs according to the number of members in the household. Sometimes conflict arises if the any household doesn’t pay the due bill or makes delay paying.

Perception and Awareness:

The people of the village perceive their water to be safe for drinking. Only two of the households treat their water before drinking. They stated they boil their water before drinking. Others believe as the water is clear and free from any bad odour, it is safe to drink.

The village people are aware of arsenic and how it can affect their health if ever found in their drinking water. However, the water they drink in free from arsenic.

There wasn't any kind of superstitions or beliefs present regarding drinking water among the people of the community.

Health Impacts:

The participants of the discussion group revealed that they rarely get water borne diseases like Diarrhoea and Typhoid. Some of the households had Diarrhoea in the past 6 months but the villagers believe it is not because of the water they drink.

They also revealed most of their children are healthy as they do not suffer from malnutrition. The children of the village get regularly measured. The local mission there regularly measured their heights and weights to determine their nutritional status.

FGD 2

Location:

Village: Delbari, Union: Gobratola, Upazilla: Chapai Nawabganj Sadar

Date: 18 February, 2025

Total of 14 members were present in the discussion. The participants all were very vocal and the discussion was very spontaneous and insightful. Most of the participants belonged from the Santal community and some were from Muslim community.

Access and Challenges:

The village has pipeline system in their households. An electricity pump supplies the water in every household through pipeline. All the households in the community give a fixed amount to acquire the pump-pipeline services. Every household has to pay 90 BDT per month. They do not need to go outside to collect drinking water.

However, there remains the problem of load shedding. Whenever there is load shedding or malfunctions in the electric pump, the villagers face difficulty accessing drinking water. The pump-pipeline service does not stay functional throughout the year. In some years, months from April to June, the villagers face scarcity of drinking water as the ground water level goes down. During that time of the year, they depend on the households which have deep tube wells. Such households are very few in the village. As a result, the waiting time becomes long for the people as they have to stand longer times in line.

Perception and Awareness:

The people of the village are moderately aware and careful in terms of the safety of the drinking water. They used to drink from the pond but now they don't as the quality of the

pond water degraded after cultivating fish. Even in time of water crisis, they do not drink pond water.

Health Impact:

The village did not have any case of water borne diseases in the past 6 months according to the participants. All the participants confirmed that the quality of the drinking water is adequate for drinking.

FGD 3

Village: Amarok, Union: Gobratola, Upazilla: Chapai Nawabganj Sadar

Date: 19 February, 2025

Total of 16 members were present in the discussion. The participants all were very vocal and spontaneous. Most of the participants belonged from the Sanatan Hindu community and some were from Muslim community.

Access and Challenges:

The village has an electric pump for drinking water. All the households in the community give a fixed amount to acquire the pump services. Every household has to pay 20-25 BDT per month.

In some periods of the year, there arises water scarcity problem. The electric pump becomes unable to supply water as the ground water level goes down. They villagers drink water from the pond at those times.

Perception and Awareness:

The people of the village are relatively less aware and careful in terms of the safety of the drinking water. They tend to drink from pond in times of crisis with inadequate treatment of the water. As one participants said, “The pond water has dirt in it but in times of crisis what else can we do? We have to work with what we have.”

Health Impact:

The village faced 12 cases of water borne diseases in the past 6 months according to the participants. As they are not much aware of the quality of water and the adequate water treatment measures, they faced water borne diseases more than other villages comparatively.

Over-All Findings of FGDs

Challenges:

1. Load Shedding: Lack of electricity hampers the supply of drinking water in the villages. Long power cuts induce worry and tension among the people regarding drinking water.
2. Administrative: The committee or the personnel who are entrusted with the responsibility of taking care of the electric pumps sometimes prove to be absent or irresponsible in terms of doing their duties properly. Thus, the people face issues accessing drinking water.
3. Societal Conflict: Sometimes conflict arises between the villagers regarding payment or serial number issue which can be solved if proper co-ordination among the people can be arranged.
4. Lack of Awareness: Even though the people are somewhat aware, the awareness among the villages regarding safety and quality of drinking water is not sufficient in terms of maintaining healthy practices.

The FGDs revealed that while community members recognize the importance of safe drinking water, accessibility remains a critical challenge, especially for women and marginalized groups. Seasonal variations exacerbate the issue, leading to increased reliance on unsafe sources**.** Although some community-led solutions exist, sustained government and NGO intervention is needed to ensure long-term water security. These findings align with the survey results, highlighting the urgent need for improved infrastructure and behavioural change campaigns on water purification methods.

4.6 KII Findings:

Key Informant Interviews	**Name of the Key Informant**	**Designation**	**Organization**
	Engineer Md. Mamunur Rashid	Executive Engineer	BMDA
	Amit Kumar Sarkar	Executive Engineer	Department of Public Health Engineering
	Hasib Hossain	CEO and Executive Director	Proyas Manobik Unnayan Society
	Bokul Kumar Ghosh	Project Co-ordinator (ECCP-Drought)	Proyas Manobik Unnayan Society

Table 8: Personnel for KIIs

Emphasizing the importance of water in the Barind region, Bokul Kumar Ghosh, Project Co-ordinator (ECCP-Drought) stated that, **"Barind is the land where life is written by water."** The land is characterized by its lack of rainfall and forestation. On average only the region faces rainfall of 1400 mm every year. Moreover, the reservoirs of water have low capacity to reserve water. The region mainly depends on surface water for drinking and irrigation.

Over the last decade, to increase food security, unplanned abstraction of ground water has led to deplete the ground water level significantly. In a report of BBC it has been reported that the ground water level has gone from 36 feet under (1991) to 62 feet under. Thus, the access to drinking and irrigation water has been decreased.

As the ground water level has depleted so much, the only way to abstract it for drinking is to install deep tube wells which is very costly. As a part of the ECCP-Drought project, the Proyas is working to make the people depend on surface water more for irrigation and drinking purposes under PKSF. To lower the dependency on ground water, they are taking strategies like pond and canal excavation.

Hasib Hossain, CEO and Executive Director, Proyas Manobik Unnayan Society gave valuable insights on the behavioural aspects of the people of the Barind region. He brought light to the issue of lack of awareness among the people regarding safety of drinking water and proper hygiene practices. He also spoke about the lack of affordability among people of some specific areas who lack facilities like pipeline system, deep tube well etc. Some of the areas in the district face quality concerns like presence of arsenic in their drinking water. He said, **"Many low-income households cannot afford private wells and are forced to rely on contaminated surface water."** The areas sought to sources that are nor safely managed and thus have many water borne diseases.

To battle the water scarcity issue, Engineer Md. Mamunur Rashid, Executive Engineer, BMDA suggested the double lifting process where the water from Mahananda River gets fetched and gets flowed into surface water reservoirs like canals and ponds. This way the dependency on ground water can be lowered. The use of MAR (Managed Aquifer Recharge) system was also suggested to tackle the challenges of water scarcity in the region.

The co-ordination among all the government and non-government entities working on the water scarcity issue is a must to lower the costs and make the measures more effective for the people. DC office, BMDA, Union Parishad Water Management, Water Development Board etc. should collaborate and have proper communication in terms of implementing the policies that are taken by government.

5. Recommendations

By implementing these recommendations, access to safe and sustainable drinking water in the Barind region can be significantly improved, reducing water-related health risks and improving the overall well-being of the communities.

Infrastructure Development for Sustainable Water Supply

Even though deep tube well installation are very costly, some installation should be made. Given the depletion of groundwater, we should give efforts to install more deep tube wells in a cost-effective manner. Government and NGOs should come forward to help in the process trough subsidies. Investments should be made in expanding and maintaining the pipeline network to ensure year-round access to safe drinking water. Households and community centers should be encouraged to adopt rainwater harvesting systems to supplement groundwater sources during dry months.

Enhancing Water Storage and Management

MAR systems will help replenish groundwater levels, ensuring long-term water security. Initiatives such as pond and canal excavation should be expanded to reduce dependence on groundwater for both drinking and irrigation purposes. Water from the Mahananda River should be efficiently collected and distributed to surface water reservoirs to enhance availability through double lifting process.

Strengthening Electricity and Pumping Systems

The issue of load shedding should be addressed properly. Solar-powered or hybrid water pumps should be introduced to mitigate the impact of frequent power cuts on water supply. A community-based approach to maintaining and managing electric pumps should be introduced, with clear guidelines for payment and accountability.

Improving Water Safety and Hygiene Practices

Since most households do not treat their drinking water, awareness campaigns should be launched to promote boiling, filtering, and chlorination. Government and NGOs should conduct periodic testing of drinking water sources to monitor contamination, particularly for arsenic and microbial pollutants. Providing affordable filtration systems to vulnerable communities can reduce health risks.

Increasing Community Awareness and Participation

Community training sessions should be conducted to improve hygiene and sanitation behaviors related to drinking water. Involvement of Local Committees is an essential. Strengthening community-based water management committees can help resolve conflicts related to payments and maintenance responsibilities.

Strengthening Policy and Institutional Coordination

Government and NGOs should collate effectively. A coordinated effort between the DC office, BMDA, Water Development Board, and NGOs is needed to implement water security projects effectively. Policies should be introduced to regulate unplanned groundwater abstraction while promoting sustainable water use. The existing policies like “Water Act 2013” and “Bangladesh Water Rules 2018” should be effectively maintained and implemented.

6. Limitations

Measurement Issues

The study relied on self-reported data from surveys and FGDs, which may be subject to recall bias or social desirability bias, potentially affecting the accuracy of responses. Some indicators of water quality, such as contamination levels, were based on perceived safety rather than laboratory testing, limiting the ability to verify actual water quality.

The study did not incorporate longitudinal data, which could have provided a clearer understanding of seasonal variations in water access and health impacts. The measurement of indicators like height and weight of under five children may have little inaccuracies because of time constraint and absence of flat surfaces in the villages.

Site Selection Issues

The study focused on three villages in the Barind Area was under the ECCP-Drought project but they may not be fully representative of the entire region. Differences in geographical, ethnic, socioeconomic and infrastructural factors could limit the generalizability of findings.

Due to resource and time constraints, certain highly affected or remote areas could not be included, potentially overlooking critical variations in water accessibility challenges.

7. Conclusion

Access to safe drinking water remains a critical challenge in the Barind region of Bangladesh due to groundwater depletion, seasonal water scarcity, and infrastructural limitations. This study assessed the availability, accessibility, and health impacts of drinking water through a survey of three villages, incorporating both quantitative and qualitative insights. The findings highlight the severe dependence on deep tube wells, the burden of long-distance water collection, and the health risks associated with untreated water consumption. Additionally, infrastructural gaps, electricity shortages, and financial constraints further hinder consistent access to safe drinking water.

To address these challenges, a multi-pronged approach is necessary, focusing on sustainable water management, improved infrastructure, community participation, and policy support. Implementing rainwater harvesting, managed aquifer recharge, and improved pumping systems can enhance water availability, while awareness campaigns and affordable filtration options can mitigate health risks. Stronger coordination between government agencies, NGOs, and local communities is crucial for long-term water security in the region.

Ensuring equitable access to safe drinking water is not just a matter of infrastructure but a fundamental public health concern. Addressing these issues will improve the well-being of communities in the Barind region, reducing waterborne diseases and enhancing overall quality of life. Continued research, investment, and policy interventions are essential to creating a sustainable and resilient water supply system for the region.

8. Appendices

8.1 Consent Form

সম্মতি ফরম

শিরোনাম: Assessing Availability and Accessibility of Safe Drinking Water and Exploring the Health Impacts: A Study in the Barind Area of Bangladesh

গবেষক: কাব্য কনীনিকা রহমান
প্রতিষ্ঠান: পল্লী কর্ম সহায়ক ফাউন্ডেশন

গবেষণার উদ্দেশ্য:
এই গবেষণার মাধ্যমে বরেন্দ্র অঞ্চলে পানীয় জলের প্রাপ্যতা ও স্বাস্থ্যগত প্রভাব বিশ্লেষণ করা হবে।

আপনার অংশগ্রহণ:

- স্বেচ্ছাসেবী ও গোপনীয়।
- কিছু প্রশ্নের উত্তর দিতে হবে (প্রায় ২০ মিনিট)।
- তথ্য শুধু গবেষণার জন্য ব্যবহার করা হবে।

ঝুঁকি ও সুবিধা:

- কোনো শারীরিক বা মানসিক ক্ষতি হবে না।
- ফলাফল নীতিনির্ধারণে সহায়ক হতে পারে।

গোপনীয়তা:

- আপনার তথ্য সম্পূর্ণ গোপন রাখা হবে।
- পরিচয় প্রকাশ করা হবে না।

যোগাযোগ:
গবেষক: কাব্য কনীনিকা রহমান
ফোন: ০১৭০১৬৭০০২০
ইমেইল: kabyakoninika@gmail.com

□ আমি গবেষণার উদ্দেশ্য বুঝেছি ও স্বেচ্ছায় অংশগ্রহণ করছি।

অংশগ্রহণকারীর নাম: _____
স্বাক্ষর: _____
তারিখ: //__

8.2 Questionnaire

১। সামাজিক ও জনমিতিগত তথ্য (Demographic Information)

ক্রমিক নং	প্রশ্ন	উত্তর	কোড	স্কিপ
১০১	উত্তরদাতার নাম			
১০২	বয়স			
১০৩	ফোন নং			
১০৪	ধর্ম		১। ইসলাম ২। হিন্দু ৩। খ্রিষ্টান ৪। বৌদ্ধ ৫। অন্যান্য (উল্লেখ করুন)	
১০৫	পরিবারের প্রধানের শিক্ষাগত যোগ্যতা (শিক্ষা বছর)			
১০৬	পরিবারের মূল পেশা		১। কৃষক ২। জেলে ৩। দিনমজুর ৪। চাকুরিজীবী ৫। তাতী ৬।রিক্সাচালক ৭। অন্যান্য (উল্লেখ করুন)	
১০৭	পরিবারের অন্যান্য উপার্জনকারীর পেশা		১। কৃষক ২। জেলে ৩। দিনমজুর ৪। চাকুরিজীবী ৫। তাতী ৬।রিক্সাচালক ৭। অন্যান্য (উল্লেখ করুন)	
১০৮	পরিবারের সদস্য সংখ্যা	মোট পুরুষঃ মহিলাঃ		
১০৯	পরিবারের মাসিক আয়			
১১০	পরিবারের মাসিক ব্যয়			

২। পানীয় পানির প্রাপ্যতা ও গুনমান (Drinking Water Availability and Quality)

ক্রমিক নং	প্রশ্ন	উত্তর	কোড	স্কিপ
২০১	আপনার পরিবারের পানির প্রধান উৎস কী?		১। ভূগর্ভস্থ পানি (যেমন, কূপ, নলকূপ) ২। পৃষ্ঠস্থ পানি (যেমন, নদী, পুকুর, খাল) ৩। সংগ্রহ করা বৃষ্টির পানি ৪। অন্যান্য (উল্লেখ করুন): _____	
২০২	আপনার পরিবারের প্রধান পানির উৎস কি সারা বছর কার্যকর থাকে?		১। হ্যাঁ ২। না	"হ্যাঁ" হলে প্রশ্ন ২০৫ যান।
২০৩	খাবার পানির প্রধান উৎস কার্যকর না থাকলে অন্য কোন উৎস থেকে খাবার পানি পান করেন?		১। ভূগর্ভস্থ পানি (যেমন, কূপ, নলকূপ) ২। পৃষ্ঠস্থ পানি (যেমন, নদী, পুকুর, খাল) ৩। সংগ্রহ করা বৃষ্টির পানি ৪। অন্যান্য (উল্লেখ করুন): _____	
২০৪	যদি না থাকে, তাহলে কোন মাসগুলোতে আপনি পানি সংকটে পড়েন?		১। জানুয়ারি, ২।ফেব্রুয়ারি, ৩। মার্চ, ৪।এপ্রিল, ৫। মে, ৬।জুন, ৭।জুলাই, ৮। আগস্ট, ৯।সেপ্টেম্বর, ১০।অক্টোবর, ১১। নভেম্বর, ১২। ডিসেম্বর	
২০৫	আপনি কত ঘনঘন পানি সংকটের সম্মুখীন হন?		১। মাঝে মাঝে (বছরে কয়েকবার) ২। ঘন ঘন (প্রতি মাসে) ৩। সবসময়	

২০৬	আপনার পানির সরবরাহ কি পরিবারের দৈনন্দিন চাহিদা মেটাতে যথেষ্ট?		১। হ্যাঁ ২। না	
২০৭	আপনি কি মনে করেন আপনার পানীয় পানি পান করার জন্য নিরাপদ?		১। হ্যাঁ ২। না	
২০৮	আপনি কি আপনার পানীয় পানির কোনো সমস্যা লক্ষ্য করেছেন? (প্রযোজ্য সবগুলো চিহ্ন দিন)		১। দুর্গন্ধ ২। অস্বাভাবিক রং ৩। খারাপ স্বাদ ৪। দৃশ্যমান কণা ৫। কোনো সমস্যা নাই	
২০৯	আপনি কি আপনার পানি নিরাপদ করার জন্য কোনোভাবে পরিশোধন করেন?		১। হ্যাঁ ২। না	**"না" হলে ৩ নং সেকশনে যান।**
২১০	আপনি সাধারণত পানিকে নিরাপদ করে তোলার জন্য কী কী ব্যবস্থা গ্রহণ করেন?		১। ফিটকিরি দেওয়া ২। পানি ফিল্টার ব্যবহার করা ৩। সৌরশক্তি দ্বারা পানি জীবাণুমুক্ত করা ৪। পানি ফুটানো ৫। কাপড় দিয়ে পানি ছাঁকা ৬। পানি রেখে পাতন করা	

৩। পানীয় পানির প্রবেশযোগ্যতা (Drinkin Water Accessibility)

ক্রমিক নং	প্রশ্ন	উত্তর	কোড	স্কিপ
৩০১	**আপনার বাসস্থান থেকে পানির প্রাথমিক** উৎসের দুরত্ব কতটুকু?		১। ৫০০ মিটারের কম ২। ৫০০ মিটার থেকে ১ কিলোমিটার	

			৩। ১ কিলোমিটারের বেশি	
৩০২	পানির জন্য পরিবারের সদস্যরা প্রতি যাত্রায় কত সময় ব্যয় করেন?		১। ১৫ মিনিটের কম ২। ১৫–৩০ মিনিট ৩। ৩০ মিনিটের বেশি	
৩০৩	পরিবারের পানির চাহিদা মেটাতে প্রতিদিন কতবার পানি আনতে হয়?		১। ১–২ বার ২। ৩–৪ বার ৩। ৪ বারের বেশি	
৩০৪	আপনার পরিবারের কি নিম্নলিখিত পানি সুবিধাগুলোর কোনোটি আছে? (যা প্রযোজ্য তা চিহ্নিত করুন):		১। হাত পাম্প ২। কূপ ৩। পাইপলাইন সংযোগ ৪। অন্যান্য (উল্লেখ করুন)	
৩০৫	আপনি কি নিরাপদ খাবার পানির জন্য অর্থ ব্যয় করেন?		১। হ্যাঁ ২। না	**"না" হলে ৪ নং সেকশনে প্রশ্নে যান।**
৩০৬	মাসে কত টাকা প্রদান করেন?			
৩০৭	নিরাপদ খাবার পানির পিছনে ব্যয় এর উৎস কী?		১। পারিবারিক চলতি আয় ২।সঞ্চয় থেকে ৩।ঋণ নিয়ে ৪।ধার করে	

৪। স্বাস্থ্যগত প্রভাব (Health Impact)

ক্রমিক নং	**প্রশ্ন**	**উত্তর**	**কোড**	**স্কিপ**
৪০১	গত ৬ মাসে আপনার পরিবারের কোনো সদস্য কি পানিবাহিত রোগে আক্রান্ত হয়েছেন?		১। হ্যাঁ ২। না	**"না" হলে ৩০৩ নং**

				প্রশ্নে যান।
৪০২	কী রোগে আক্রান্ত হয়েছেন?		১। টাইওফয়েড ২। কলেরা ৩। জন্ডিস ৪। ডায়রিয়া ৫। অন্যান্য (উল্লেখ করুন)	
৪০৩	আপনার পরিবারের মধ্যে পাঁচ বছরের নিচে কোনো শিশু আছে কি?		১। হ্যাঁ ২। না	**"না" হলে ৩০৫ নং প্রশ্নে যান।**
৪০৪	এই শিশুদের কি পুষ্টির অভাবজনিত সমস্যা হয়েছে?		১। উচ্চতা অনুযায়ী অল্প বৃদ্ধি (Stunting) ২। অতি পাতলা (Wasting) ৩। কম ওজন (Underweight) ৪। নেই	
৪০৫	পানির প্রাপ্যতার চিন্তায় আপনার পরিবারে কি উদ্বেগ বা মানসিক চাপ সৃষ্টি হয়?		১। হ্যাঁ ২। না	

8.3 FGD Questionnaire

১। এলাকায় নিরাপদ পানির যথেষ্ট ব্যবস্থা আছে বলে মনে করেন কি? মতামত দিন।

২। এলাকায় মানুষের নিরাপদ পানির সহজলভ্যতার ক্ষেত্রে প্রধান কোন কোন কারণ বাধা সৃষ্টি করছে?

৩। পানি সংরক্ষণ ও নিরাপদ পানি সম্পর্কে এলাকার মানুষ কতটা সচেতন?

৪। পানি প্রাপ্যতার আপনার সম্প্রদায়ের স্বাস্থ্যগত প্রভাব সম্পর্কে আপনাদের অভিজ্ঞতা সম্পর্কে বলুন।

৫। পরিষ্কার পানির অভাব কি আপনার বা আপনার প্রতিবেশীদের জন্য মানসিক বা আবেগজনিত চাপ সৃষ্টি করে? এই চাপটি কীভাবে প্রকাশ পায় (যেমন, চিন্তা, উদ্বেগ, শারীরিক ক্লান্তি)?

8.4 KII Questionnaire

সাধারণ তথ্য:

নাম: _____
পদবি/ভূমিকা: _____
সংস্থা/প্রতিষ্ঠান (যদি প্রযোজ্য হয়): _____

১। নিরাপদ পানীয় জল সংগ্রহে মানুষ কী কী প্রধান সমস্যার সম্মুখীন হয় বলে আপনি মনে করেন?

২। কোন সম্প্রদায় বা গোষ্ঠীগুলো পানির অভাব ও প্রবেশযোগ্যতার সমস্যায় সবচেয়ে বেশি ক্ষতিগ্রস্ত হয় বলে মনে করেন? এবং কেন?

৩। নিরাপদ পানীয় জল সরবরাহ উন্নত করতে কী ধরনের নীতি, কর্মসূচি বা উদ্যোগ বর্তমানে বিদ্যমান আছে?

৪। বিদ্যমান নীতি, কর্মসূচি বা উদ্যোগ কতটুকু কার্যকর বলে মনে করেন?আপনার মতামত দিন।

৫। এই অঞ্চলে নিরাপদ পানীয় জলের সহজলভ্যতা নিশ্চিত করতে কী কী পরিবর্তন আনা যেতে পারে বলে মনে করেন? মতামত দিন।

৬। অনিরাপদ পানি ব্যবহারের ফলে কী এলাকায় কোন ধরনের স্বাস্থ্যগত প্রভাব দেখা দেয় বলে মনে করেন? কোন জনগোষ্ঠী এতে বেশি প্রভাবিত হয়?

9. References

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10. Photo Gallery

FGD discussion in Jolahar village

Resident of Amarok village

With Mr. Hasib Hossain, CEO of Proyas Manobik Unnoyon Society

Residents of Delbari village

Gombhira presentation by Proyas cultural team

With Mr. Bokul Kumar Ghosh, Project Co-ordinator, ECCP-Drought, Proyas Manobik Unnoyon Society.