

Understanding implementers' perspectives on the barriers and facilitators of wash interventions under the JAMUNA project in climate-vulnerable char areas of Bogura, Bangladesh: a qualitative implementation research study

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Declaration

I, Ismat Zaman Urboshi, hereby declare that this thesis entitled "Understanding implementers' perspectives on the barriers and facilitators of wash interventions under the JAMUNA project in climate-vulnerable char areas of Bogura, Bangladesh: a qualitative implementation research study" is an original work submitted in partial fulfilment of the requirements for the degree of Master of Public Health (MPH) at the James P. Grant School of Public Health (JPGSPH), BRAC University, Dhaka, Bangladesh.

I further declare that this work has not been submitted previously, in whole or in part, for any other degree or examination at this or any other university or institution.

All sources used in this thesis have been duly acknowledged and cited. Any assistance received has been mentioned in the acknowledgements section.

I have also added a separate declaration on GenAI use at the end of this work.

Ismat Zaman Urboshi

Date: 2nd June, 2026

Approval

The thesis titled “Understanding implementers’ perspectives on the barriers and facilitators of wash interventions under the JAMUNA project in climate-vulnerable char areas of Bogura, Bangladesh: a qualitative implementation research study”

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Ismat Zaman Urboshi (Student ID: 25167025) of 2025-26 has been accepted as satisfactory in partial fulfilment of the requirements for the degree of Master of Public Health.



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Ethics statement

Ethical approval for this study was obtained from the Institutional Review Board of BRAC James P Grant School of Public Health, BRAC University (IRB Protocol No: MPH-2025-025). Written informed consent was obtained from all participants prior to data collection. Participants were informed that participation was voluntary and that they could withdraw at any time without penalty, and steps were taken to protect confidentiality and anonymity. All procedures conducted in this study involving human participants were in accordance with the ethical standards of the Institutional Review Board and the 1975 Helsinki Declaration.

Abstract

Background: Bangladesh's riverine char communities are among its most climate-vulnerable populations, where recurrent flooding and erosion repeatedly destroy water and sanitation infrastructure and raise the burden of diarrhoeal disease. The JAMUNA project, a joint venture by BDRCS and Swiss Red Cross, delivers WASH interventions here, yet implementers' experiences of delivery remain largely undocumented.

Objectives: To identify the barriers and facilitators experienced by implementers of WASH interventions under the JAMUNA project, and the adaptive strategies they used to overcome challenges in the char areas of Bogura.

Methods: A qualitative exploratory study was conducted in Chaluabaria and Kazla unions, Sariakandi Upazila, Bogura. Between March and April 2026, 17 key informant interviews were conducted with implementers from multiple project tiers. Participants were selected purposively until data saturation was reached, using six semi-structured guides based on the CFIR domains. Interviews were held in Bangla, transcribed verbatim, and analysed using the Framework Method in Dedoose, producing 657 coded excerpts.

Results: Facilitators included dismantlable, displacement-friendly latrines and raised DRR tubewells suited to flooding; community co-financing that strengthened ownership; organisational coverage of field-staff travel costs; school-based hygiene sessions; and revitalization of the Ward Disaster Management Committee, anchoring delivery in local governance. Barriers included geographic isolation, recurrent displacement, poverty, political and kinship influence over beneficiary selection, and workforce shortages from reliance on unpaid volunteers. Adaptive strategies included multi-step beneficiary verification, engaging religious leaders, instalment-based bKash payments, and locally tailored session delivery.

Conclusions: This study demonstrates that WASH delivery in the char areas is not a discrete technical task but a continuous process of adaptation to displacement, poverty, and local power dynamics. Although portable, raised infrastructure was essential, its effectiveness depended on community co-financing, digital payment mechanisms, the engagement of trusted local leaders,

and an adequately supported frontline workforce. Together, these social and organisational factors were as central to implementation as the infrastructure itself.

Keywords: WASH; implementation research; CFIR; char areas; climate vulnerability; Bangladesh

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Contents

Declaration	2
Approval	3
Ethics statement	4
Abstract	5
Acknowledgement	7
Contents	8
List of acronyms	13
Chapter 1: Introduction	15
1.1 Background and rationale	15
1.2 Problem statement.....	18
1.3 Research questions.....	19
1.3.1 General research question:	19
1.3.2 Specific research question:	19
1.4 Study objectives	20
1.4.1 General objective	20
1.4.2 Specific objectives	20
1.5 Structure of the thesis.....	21
Chapter 2: Literature review	22
2.1 Global and local evidence	22
2.2 Conceptual Framework: The Consolidated Framework for Implementation Research (CFIR)	27
2.2.1 Innovation	28
2.2.2 Outer setting.....	29
2.2.3 Inner setting	29
2.2.4 Individuals (roles & characteristics)	29
2.2.5 Implementation process	29
2.3 WASH interventions implemented in JAMUNA project	30
2.3.1 Co-financing for latrine construction.....	31

2.3.2 Disaster Risk Reduction (DRR) tubewell	32
2.3.3 Community awareness sessions	33
2.3.4 School awareness sessions for students of classes 4 & 5.....	33
2.3.5 Common Resilience Platform	34
2.3.6 Revitalising the Ward Disaster Management Committee (WDMC)	34
Chapter 3: Methods	35
3.1 Study design.....	35
3.2 Study area and setting	35
3.3 Study Population.....	36
3.4 Sample size	37
3.5 Sampling	37
3.5.1 Inclusion and exclusion criteria	37
3.6 Operational definitions.....	38
3.7 Data collection	40
3.7.1 Data collection tools	40
3.7.2 Data collection procedure	40
3.8 Data analysis	41
Step 1: Transcription.....	41
Step 2: Familiarization with the interview.....	41
Step 3: Coding.....	42
Step 4: Developing a working analytical framework	42
Step 5: Applying the analytical framework	42
Step 6: Charting data into the framework matrix.....	43
Step 7: Interpreting the data.....	43
3.9 Data management and quality assurance	44
3.10 Ethical considerations	44
4. Findings	46
4.1 Facilitators.....	47
4.1.1 Innovation	47

4.1.2 Outer setting.....	51
4.1.3 Inner setting	52
4.1.4 Individuals.....	54
4.1.5 Implementation process	56
4.2 Barriers.....	57
4.2.1 Outer setting.....	57
4.2.2 Inner setting	62
4.3 Adaptive strategies.....	64
4.3.1 Multi-step verification process of beneficiary selection.....	64
4.3.2 Engaging religious leaders	65
4.3.3 Instalment-based payment through mobile financing app	65
4.3.4 Adapting session delivery to local realities	66
Chapter 5: Discussion	68
Summary of key findings.....	68
Discussion of findings.....	68
Strengths of the study.....	73
Limitations of the study	73
Implications for public health policy and practice.....	74
Chapter 6: Conclusion and recommendations	76
6.1 Conclusion	76
6.2 Recommendations.....	77
For programme implementers.....	77
For policymakers	77
For future research	78
Declaration of Use of Artificial Intelligence (AI):	79
References	80
Appendices.....	91
1. Information sheet	91
2. Consent form	95
3. Semi-structured guidelines.....	97

Guideline 1: for officials	97
Guideline 2: for teachers	111
Guideline 3: for DPHE engineer	119
Guideline 4: for CRVs	127
Guideline 5: for health worker	136
Guideline 6: for household beneficiaries	145
4. Excerpts	153

List of figures;

Figure1: Consolidated Framework for Implementation Research (CFIR)
2.0.....228

Figure 2: Study area map.....36

Figure 3: Facilitators, barriers and adaptive strategies for WASH implementation in the Bogura
chars, mapped to the five domains of the Consolidated Framework for Implementation Research
(CFIR).....46

List of tables:

Table 1: The CFIR domains.....30

List of acronyms

Acronyms	Full Form
BDRCS	Bangladesh Red Crescent Society
CRP	Common Resilience Platform
CRV	Community Resilience Volunteer
DPHE	Department of Public Health Engineering
DRR	Disaster Risk Reduction
FO	Field officer
IRB	Institutional Review Board
JAMUNA	Joint actions to mitigate climate uncertainties and natural adversities
KII	Key Informant Interview
LGI	Local Government Institute
SRC	Swiss Red Cross
UNICEF	United Nations International Children's Emergency Fund
WASH	Water, Sanitation and Hygiene
WDMC	Ward Disaster Management Committee
WHO	World Health Organization

Chapter 1: Introduction

1.1 Background and rationale

Bangladesh is one of the most susceptible countries to climate change because of its unique geographical location with low-elevated land, and significant reliance on natural resources sensitive to climatic variability (Habib et al., 2025). Bangladesh was ranked as the world's 11th most vulnerable disaster-prone country in 2025 (IFHV, 2025). Climate hazards such as floods, riverbank erosion, and extreme rainfall directly affect access to safe water, sanitation, and hygiene (WHO, 2023), thus disproportionately burdening vulnerable populations, particularly those living in coastal and flood-prone areas, with adverse health outcomes (Alam et al., 2025).

In Bangladesh, riverine char communities are among the most climate-vulnerable populations. Chars are small islands in the river that result from the deposits of soil and the erosion of the river. This usually happens in the major rivers in the country such as the Jamuna, Padma, and Meghna (Saha & Mazumder, 2025). Char areas hold about 8% of the total land area (Zaman & Alam, 2021). About 20 million people of Bangladesh are char dwellers (Zaman & Alam, 2021). Among these, the Jamuna river basin holds about 60-70% of the total riverine char area in Bangladesh (Sarker et al., 2003). National estimates indicate that poverty among char dwellers is 1.5 times higher than the national average (Barua & Sulaiman, 2007, as cited in Rahman & Asad, 2022).

The char dwellers of the Jamuna basin suffer repeated displacement, progressive landlessness, and loss of property and infrastructure due to riverbank erosion (Mohiuddin, 2022). They face a vicious cycle where climate hazards destroy Water, Sanitation and Hygiene (WASH) infrastructure, increasing disease burden while poverty and geographic isolation prevent recovery before the next climate related hazard. Floods damage latrines, contaminate water sources, and disrupt routine hygiene, which raises the risk of diarrhoeal and mosquito-borne diseases. Globally, diarrhoea is the most commonly reported outbreak after floods, while malaria and dengue rise after monsoon and cyclonic events, with poor water supply and low sanitation being key risk factors (Saatchi et al., 2024). Reliance on unsafe water sources also rises during the flood season (Islam, 2021). Moreover, the sanitation facilities become non-functional or are left abandoned (Rahman et al., 2025). Faecal matter spreads directly from unsafe latrine overflow, which often mixes with surface

water, that is used for washing and drinking (Brown et al., 2013). Poor sanitation is a major contributor to diarrhoeal deaths (Abadi et al., 2022). Without a physical barrier, such as a toilet slab, worm eggs contaminate the soil and infect people through the faecal-oral route (Brown et al., 2013). These soil-transmitted worm infections are a recognised cause of anaemia, particularly among children (Caldrer et al., 2022). Conversely, the shift from open defecation to a basic facility, such as a pit latrine with a slab, has been shown to reduce childhood diarrhoeal prevalence. A cluster-randomised trial in rural Bangladesh found that an on-site sanitation intervention reduced diarrhoea among children under five by about 32% during the monsoon season, mainly through reduced open defecation by children and safer disposal of children's faeces (Contreras et al., 2024). A study across 27 low- and middle-income countries found that access to both improved water and sanitation reduced diarrhoea among rural children under five by about 24.5% (Merid et al., 2023).

The JAMUNA project, implemented by the Bangladesh Red Crescent Society (BDRCS) in partnership with the Swiss Red Cross (SRC) in the char communities along the Jamuna River, was designed to address the above-mentioned WASH related challenges. This project, JAMUNA, stands for “Joint Actions to Mitigate climate Uncertainties and Natural Adversities”. The baseline report of this project indicates that although many households have basic latrines, coverage of hygienic latrine and access to safe water remain inadequate, particularly during floods (JAMUNA APR, 2025). A basic latrine refers to any improved sanitation facility that hygienically separates human waste from human contact, such as a pit latrine with a slab, a ventilated improved pit latrine (VIP), or a composting toilet (WHO/UNICEF JMP, 2017). A hygienic latrine in the Bangladesh context refers specifically to a latrine that has a water seal (siphon), a concrete slab, and a sealed pit or septic tank that prevents leakage and exposure to faecal matter (Akter et al., 2014; DPHE-UNICEF, 2014).

In response to this problem, the project implemented a set of WASH activities in that area consisting of co-financing in constructing improved household latrines, Disaster Risk Reduction (DRR) tubewells, repairing and maintaining existing WASH facilities, and conducting community and school hygiene awareness sessions.

The first is a co-financed household latrine designed specifically for char areas. Rather than constructing permanent structures, the project builds dismantlable latrines that can be relocated

when a household moves due to river erosion. Beneficiary households contribute a share of the construction cost. Households may contribute this share in cash, in labour, or in a combination of the two, which reinforces their sense of ownership and supports long-term maintenance. Priority is given to the most vulnerable households, including widows, female-headed households, persons with disabilities, and the extremely poor.

The second intervention is a Disaster Risk Reduction (DRR) tubewell, installed on a raised platform set above the highest recorded flood level. Standard tubewells are submerged and contaminated during the annual flood, whereas the DRR tubewell stays accessible and supplies safe drinking water year-round. Each one serves a cluster of neighbouring households and is placed in a shared location, such as a local market or an open field.

The third intervention is a series of weekly community hygiene awareness sessions, delivered in household courtyards by trained Community Resilience Volunteers (CRVs). These sessions cover safe water use, handwashing, latrine maintenance, menstrual hygiene, and climate-related health risks, using pictorial flipcharts suited to low-literacy settings.

The fourth is a school-based hygiene session programme targeting Class 4 and 5 students in 106 primary schools and madrasas across the project sites. Using drawing books and coloured pencils, students are introduced to key hygiene practices, which they then carry back to their households. This creates a secondary channel of behaviour change that reaches adults through children.

In addition to these direct WASH interventions, the project works through two coordination and governance mechanisms. The Common Resilience Platform brings together 12 partner NGOs to divide geographic coverage, reduce duplication, and extend reach across the char area. The Ward Disaster Management Committee (WDMC), a ward-level government body under the Standing Orders on Disaster, is revitalised in each project ward to lead beneficiary identification, support construction monitoring, and anchor implementation within existing local governance. Full technical descriptions of each intervention are provided in Chapter 2.

These interventions together aim to improve health outcomes and strengthen climate resilience in char communities.

Although WASH interventions are widely implemented in those areas, research suggests that their results depend not only on the intervention design but also on how consistently and effectively they are carried out in real-world conditions (Damschroder et al., 2009).

In complex settings such as char areas, interventions must be adapted to local realities. They require continuous timely decision-making by frontline implementers. These implementers operate under many constraints. The constraints are related to time, workload, logistics, community dynamics, and environmental conditions (Peters et al., 2013). Therefore, an implementation research (IR) lens helps identify how contextual, organisational, and individual factors influence programme delivery, making it especially relevant for climate-affected settings.

Whether WASH interventions work as intended depends largely on the setting in which they are delivered and on the implementers. Environmental conditions such as flooding, geographic isolation, and limited infrastructure can interrupt routine WASH activities, while organisational features, including staffing levels, workload, supervision, and coordination, shape how implementers cope with these constraints (Gkouliaveras et al., 2025). If implementation challenges are not addressed early, interventions may be delivered inconsistently. Additionally, interventions may be changed in unintended ways, or stopped when external support ends. This can weaken programme quality and long-term sustainability (Damschroder et al. 2009). Characteristics of the intervention, including its complexity, flexibility, and demands on staff and materials, influence the consistency with which activities are implemented in real-world conditions. This is especially evident in settings with limited resources and vulnerable geography (Dryden-Palmer et al., 2020). Implementers often develop practical approaches to manage constraints while maintaining service delivery. Examining these barriers, facilitators, and mitigation strategies helps explain why WASH interventions succeed in some areas. At the same time, it is understandable why they fail in other areas. This may help inform future interventions (Proctor et al., 2011).

1.2 Problem statement

Much of the existing WASH literature focuses on community knowledge, attitudes, and practices and on beneficiary satisfaction, including large community-based studies in Bangladesh (Luby et al., 2018; Akter & Ali, 2014). Empirical evidence on WASH implementation from the perspective

of programme implementers remains limited, particularly in climate-vulnerable riverine settings. This is an important gap, because the challenges of implementation, the local adaptations made, and the day-to-day operational constraints are often overlooked when assessments rely solely on community-level perspectives. Implementers' practical experience with co-financed latrine construction, disaster-resilient water sources, and hygiene promotion shapes how these interventions are adjusted and maintained over time.

This study examines implementers' experiences of delivering WASH services under the JAMUNA project in the char areas of Bogura, in order to identify the main barriers, enabling factors, and practical strategies that influence implementation. Its findings are intended to inform programme improvements, support adaptations suited to local conditions, and strengthen the long-term sustainability of WASH interventions in climate-affected char settings.

1.3 Research questions

1.3.1 General research question:

What are the barriers and facilitators influencing the implementation of WASH interventions under the JAMUNA programme, and what adaptive strategies do implementers use to address these challenges in the climate-vulnerable char areas of Bogura, Bangladesh?

1.3.2 Specific research question:

1. What are the barriers to implementation of the JAMUNA Project's WASH interventions?
2. What are the enablers to the implementations of the JAMUNA Project's WASH interventions?
3. What adaptive strategies or actions do implementers use to deal with barriers while delivering JAMUNA Project's WASH interventions?

1.4 Study objectives

1.4.1 General objective

To understand what are the barriers and enablers experienced by implementers of WASH interventions under the JAMUNA programme, and to identify the contextual factors that shape their implementation in selected char communities.

1.4.2 Specific objectives

The specific objectives of this study are:

1. To identify the key barriers experienced by implementers while delivering WASH interventions in the Char areas.
2. To identify the key facilitators or enablers that support implementers in delivering the WASH interventions.
3. To explore the adaptive strategies or actions implementers use to overcome challenges during WASH interventions delivery.

1.5 Structure of the thesis

This thesis is organised into six chapters.

Chapter 1 provides the introduction, background, problem statement, research question and study objectives.

Chapter 2 presents a comprehensive review of existing literature.

Chapter 3 outlines the methodology used in this study.

Chapter 4 presents the findings.

Chapter 5 provides a discussion and interpretation of the results in light of existing evidence.

Chapter 6 concludes the thesis with key conclusions, recommendations, and limitations.

Chapter 2: Literature review

2.1 Global and local evidence

WASH interventions are widely recognized as essential public health strategies for reducing waterborne diseases (Bartram & Cairncross, 2010; Wolf et al., 2018) and for improving maternal and child health (Cumming & Cairncross, 2016; UNICEF & WHO, 2023). Beyond disease reduction, access to WASH services is linked to dignity, school attendance, women's safety and broader community wellbeing (Sommer et al., 2015; WHO & UNICEF, 2021). Their effectiveness, however, depends on both programme design and successful implementation. This distinction between intervention efficacy and implementation effectiveness is central to implementation science (Proctor et al., 2011). A well-designed intervention can still fail if it does not address local context barriers (Peters et al., 2013). Community perception about access and uptake of WASH facilities is also important. But at the same time, perspectives of implementers are also important to understand the barriers and facilitators that influence WASH programme delivery.

Implementer perspectives are particularly valuable because they capture the day-to-day operational realities, and adaptations. These are rarely visible in outcome-focused evaluations (Aarons et al., 2011; Damschroder et al., 2022). This is especially important for hard-to-reach areas such as rural communities, flood-prone regions, coastal belts, char lands, and informal settlements. "Hard-to-reach" in this review refers to populations that are geographically isolated, environmentally vulnerable, or socio-economically marginalized in ways that limit consistent service delivery (WHO, 2018; UNICEF, 2020). Such populations remain the most underserved. In 2020, eight out of ten people who still lacked even basic drinking water lived in rural areas (Dickin & Gabrielsson, 2023).

The implementers related to the complete process can be from different institutions. They can be government officials, NGO personnel, frontline health workers, engineers, community facilitators. Across studies from sub-Saharan Africa, South Asia and South-East Asia, evidence suggests that WASH implementation is influenced by multiple interconnected factors operating at different levels, like- organisational, community and system levels (Damschroder et al., 2009; Nilsen, 2015). Implementers commonly report inadequate infrastructure, resource shortages, limited

workforce capacity, and financial constraints as major barriers which affect their intervention delivery (Hutton & Chase, 2016).

In many low- and middle-income countries (LMICs), programmes are difficult to implement. Implementers working in remote settings often face challenges in transporting materials, maintaining sanitation infrastructure (WaterAid, 2020). Ensuring regular monitoring and supervision activities is also challenging for them in many cases (Carter et al., 1999; Hueso & Bell, 2013). Studies show that, insufficient training can reduce implementation quality and continuity, which further worsens in resource-limited settings (Damschroder et al., 2022; Aarons et al., 2011).

Another major barrier identified is weak institutional coordination since WASH interventions often require collaboration among multiple sectors (Bartram et al., 2014; Cairncross et al., 2010). Poor communication mechanisms and bureaucratic delays often cause hindrance (Damschroder et al., 2022; Proctor et al., 2011). Alongside institutional barriers, implementers also report low community awareness and resistance to behavioural change (Hulland et al., 2015; Curtis et al., 2009). Traditional sanitation practices and lack of community ownership have been identified as barriers in the uptake of interventions (WaterAid, 2009; Kar & Chambers, 2008). Gender dynamics and inequalities also play a role. These prevent women and girls from having an informed voice in WASH related decisions (Caruso et al., 2017; Sommer et al., 2015). These issues are typically more prevalent in hard-to-reach contexts where many individuals and communities have limited literacy and little access to health education (Tseole et al., 2022; Akter & Ali, 2014; UNICEF, 2019).

Despite many challenges to WASH implementation, there are also several facilitators. Studies from India, Bangladesh, Indonesia, and several African countries show that community engagement, participation in planning, and the involvement of local leaders act as key facilitators from the perspective of implementers (Kar & Chambers, 2008). Help from community volunteers and local champions in building trust also acts as a facilitator (Whaley & Webster, 2011). Moreover, adaptive intervention strategies in accordance with local cultural and environmental contexts act as an important positive influence (Stirman et al., 2019; Moore et al., 2019). In addition, literature has identified that organisational facilitators such as supportive leadership,

supervision, technical training, and inter-organisational collaboration can enhance implementation outcomes (Damschroder et al., 2022; Aarons et al., 2015).

From a South Asian perspective, particular challenges to effective WASH implementation include high population density, vulnerability to climate change, poverty, and uneven development (Mara et al., 2010; Howard et al., 2016). These challenges shape the reality in which WASH implementers in countries such as Bangladesh, India, Nepal and Pakistan operate, particularly in disaster-prone and remote locations which experience seasonal flooding, river erosion, and poor transportation routes (Hossain et al., 2016; Mertz et al., 2009).

Additionally, the short duration of projects and dependence on external funding also impact sustainability (Carter et al., 1999; Hueso & Bell, 2013). While interventions might result in some positive behavioural change during the life of a project, they are less effective in sustaining such changes after the project ends (Cairncross et al., 2010). There is a general lack of effective monitoring and an overall deficit in simple, practical maintenance and repair routines (Foster, 2013). Furthermore, South Asia has a long history of fragmented governance at sub-national level, which leads to duplication and poor coordination amongst government and nongovernment organisations. It leads to resource waste (Mehta & Movik, 2011).

While regional literature highlights several challenges to scaling up of WASH interventions in hard-to-reach settings, community-based organisations, women's groups and local governance structures facilitate mobilisation of communities for implementation of WASH interventions and sustain them post-intervention (Routray et al., 2017; Hanchett et al., 2003). Implementers of these interventions perceive that locally adapted communication strategies and culturally appropriate hygiene behaviour change approaches have played important role in achieving good community participation and acceptance (Mosler, 2012; Aunger & Curtis, 2016). Integration of WASH interventions with other health, nutrition and disaster management programmes has also facilitated effective implementation in hard-to-reach areas (Cumming et al., 2014).

Bangladesh-specific context

WASH interventions in Bangladesh are complicated by the country's large and dense population, regular flooding, coastal salinity, and the vast number of people living in highly inaccessible areas

such as char lands and coastal areas (Khan et al., 2014; Benneyworth et al., 2016). The char lands of the Jamuna, Padma and Brahmaputra river systems are particularly under-served, with seasonal submergence, river erosion and population displacement undermining infrastructure investments (Haque & Jakariya, 2023; Rahman et al., 2025; Sarker et al., 2003). A large number of WASH programmes are being implemented in rural, urban and humanitarian settings by government, national and international NGOs. Programmes by NGOs include the WASH Benefits Bangladesh trial (Luby et al., 2018), the BRAC WASH programme (Akter & Ali, 2014), and government-led initiatives such as SHEWA-B implemented through DPHE and UNICEF (Hanchett et al., 2011).

Common challenges faced by implementers include lack of expert staff, poor logistics, and limited budgets (Ahmed et al., 2026; Unicomb et al., 2018). Delays caused by transport difficulties and environmental changes (such as the monsoon season) particularly affect areas which are characterised by seasonal flooding, such as the char lands of Bangladesh. In addition, the remoteness of many char locations and their poor physical access make supervision and coordination more difficult for implementers (Tillett & Jones, 2021).

Furthermore, institutional barriers also affect WASH implementation in Bangladesh. Weak coordination between agencies and rigid financial rules have been shown to hinder government programme delivery and to create administrative burdens for implementers (Ahmed et al., 2026). In the WASH sector, fragmented institutional frameworks and weak coordination among government agencies, NGOs, and local councils can lead to duplication of effort and inefficient use of resources (Shoab et al., 2026). Health-focused WASH programmes are particularly affected by insufficient personnel dedicated to WASH. Evidence from WASH coordination in other low-resource settings also shows that weak monitoring and limited accountability mechanisms hinder effective delivery (Yimenu et al., 2026).

Community level challenges like poverty, low literacy, migration are also important (Hoque, 2003; Halder et al., 2010). Livelihood priorities can reduce community participation in WASH activities, as people in hard-to-reach areas normally prioritise immediate economic survival over sanitation improvement (Routray et al., 2015). However, it is also reported that, trust-building activities like regular community meeting and engagement of local leaders can significantly improve the

community participation and sense of ownership over the interventions (Kar & Chambers, 2008; Hanchett et al., 2011).

Despite the challenges, several factors help WASH programmes succeed in Bangladesh. These include strong NGO networks, experienced volunteers, and well-established disaster response systems (Akter & Ali, 2014; Matin & Taher, 2001). Using participatory approaches can also be a positive influencer. Community Led Total Sanitation (CLTS) and community-based hygiene promotion cause behavioural change (Kar & Chambers, 2008; Pickering et al., 2015). It also helps in sustainable ownership over the interventions. Co-financing models, in which beneficiaries contribute a portion of construction costs, have also been associated with stronger ownership. It also helps in post-implementation maintenance in rural sanitation programmes (Cairncross & Shordt, 2004; Whaley & Webster, 2011). Implementers also note that support from the local government and donors is essential for keeping programmes running in hard-to-reach areas.

In summary, WASH implementation can be shaped by a mix of environment, socio-culture, institutional and organisation factors, when mapped onto the five domains of the Consolidated Framework for Implementation Research (Damschroder et al., 2022). The framework will provide us with a comprehensive lens to understand the barriers and facilitators in intervention delivery in char areas, which have specific geographic characteristics that differ from other areas in Bangladesh. The lens will guide us on how and where the delivery needs to be strengthened to meet the local needs and to ensure sustainability of the initiatives.

Research gap

While the global, regional and Bangladesh literature has documented a wide range of barriers and facilitators to WASH implementation, three gaps remain particularly relevant to this study.

First, most existing evidence centres on user and community perspectives. Comparatively few studies examine the implementation processes, decision-making, and lived experiences of those responsible for delivering WASH services, especially in char and flood-prone settings (Islam et al., 2026; Shoab et al., 2026).

Second, although NGOs in Bangladesh increasingly use beneficiary co-financing and community-contribution models for hardware, such as latrines and disaster-resilient tubewells (BRAC, 2024;

PKSF, 2020), the specific implementation realities of these household-level financial commitments in char contexts remain largely undocumented.

Third, sustainability beyond a project period remains under-examined despite being repeatedly identified as a concern (Carter et al., 1999; Hueso & Bell, 2013).

This study seeks to address these gaps by exploring implementer perspectives on barriers, facilitators and adaptations in the delivery of WASH interventions under the JAMUNA project in the Bogura chars, using the CFIR as an analytical framework.

2.2 Conceptual Framework: The Consolidated Framework for Implementation Research (CFIR)

To understand the implementation of WASH interventions in the Bogura chars, the CFIR (Consolidated Framework for Implementation Research) was used in the current study. The CFIR is a comprehensive framework to identify and organize barriers and facilitators, and explore implementers' experiences within relevant intervention, contextual, and organisational domains (Damschroder et al., 2009).

For this study, the updated CFIR (Damschroder et al., 2022) was used in preference to the 2009 version, because the updated framework reflects a decade of user feedback and offers clearer boundaries between the Innovation, the Implementation Process, and the Individuals delivering the intervention.

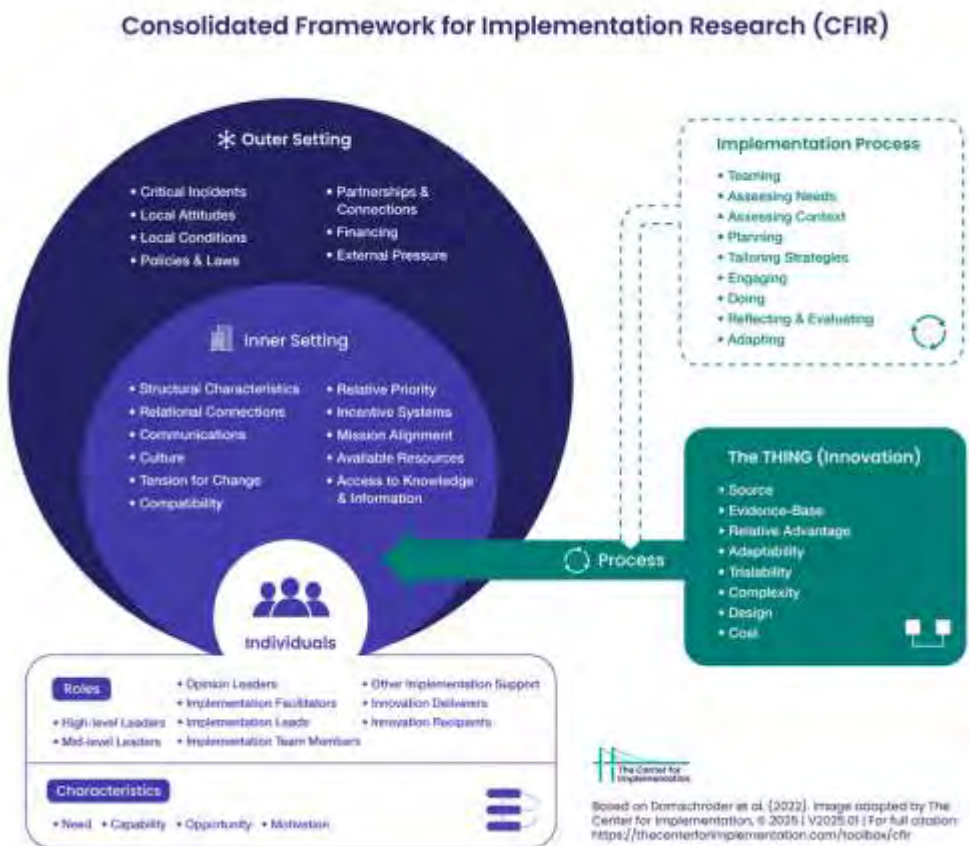


Figure1: Consolidated Framework for Implementation Research (CFIR)
(Damschroder et al., 2022)

2.2.1 Innovation

The Innovation domain captures the specific features of the WASH activities being delivered. In this study, these include the household latrines, the DRR tubewells, and the community and school hygiene awareness sessions. It covers the design and components of each intervention, its adaptability to local conditions, its complexity, the strength of its underlying evidence, and the cost of delivering it in the char setting.

2.2.2 Outer setting

The Outer Setting domain captures the broader environmental context outside the implementing organisation. In this study, it covers the local culture, community needs and resources, geographic conditions of the char areas, external policies and incentives, and the project's partnerships with local NGOs and government bodies.

2.2.3 Inner setting

The Inner Setting domain captures the internal environment of the implementing organisation. In this study, it covers the local team and staff, the organisational culture, available resources, leadership support, and the structural features of BDRCS as the implementing organisation. The availability of resources and the complexity of the organisational structure both shape whether the intervention succeeds in delivery.

2.2.4 Individuals (roles & characteristics)

The Individuals domain captures the people involved in delivering the WASH interventions. In this study, this includes senior implementers, field-level implementers, community volunteers, and government-affiliated stakeholders who participate in implementation. The domain covers their roles within the project, their knowledge and beliefs about the intervention, their capability and self-efficacy, their motivation, and their personal sense of ownership of the work.

2.2.5 Implementation process

The Implementation Process domain captures the strategies and steps taken to deliver the WASH programme. In this study, it covers the planning of a detailed and locally adapted delivery plan, the engagement of the community and partner organisations, the execution of activities on the ground, and the reflection and evaluation that follows.

Table 1: The CFIR domains

CFIR domain	What it means
Innovation	Features of WASH interventions like complexity, adaptability, cost that influences implementations.
Outer setting	External factors (community needs, norms, geography, policy, environments) that impact the implementation.
Inner setting	Organisational factors (resources, workload, staffing, coordination) that affect the intervention delivery.
Individuals	Roles, characteristics, knowledge, motivation, and self-efficacy of the people implementing the WASH interventions.
Process	Actions (planning, engagements, execution, monitoring, adaptation) that influence how the interventions are implemented.

2.3 WASH interventions implemented in JAMUNA project

Chapter 1 introduced each intervention briefly in the context of the study rationale. This section provides full technical descriptions of each intervention, organized according to its design features, delivery mechanism, and the implementation structures that support it. These descriptions are drawn from project documents, including the JAMUNA Annual Progress Report (JAMUNA APR, 2025) and the project's construction guidelines.

2.3.1 Co-financing for latrine construction

The JAMUNA project supports the construction of household latrines through a co-financing model between BDRCS and the beneficiary household. The latrine model used in this project is the offset twin-pit (2-pit) design. In this design, a single squatting pan is connected to two separate underground pits through a Y-shaped pipe. Only one pit is used at a time. Once the first pit fills up, the flow is diverted to the second pit. By the time the second pit fills, the contents of the first pit have naturally decomposed into a stable, compost-like material that can be safely removed and handled. This alternating use allows the latrine to remain in continuous service without requiring frequent emptying or external pit-cleaning support, which is particularly important in char areas where such services are not regularly available.

Each latrine has a 4-ft-by-5-ft footprint. The walls are made of 22- to 24-mm corrugated tin, and a ramp with handrails is added for households that include elderly members or persons with disabilities. The internal space is sized to accommodate a mug, a bucket, soap, and a cleaning brush. The use of tin walls and a removable substructure allow the entire latrine to be dismantled within 24 hours and reassembled at a new location if the household has to relocate due to river erosion. A construction guideline issued by the project specifies the required quality and grade of each material used to ensure the latrine remains durable under flood conditions.

Beneficiaries are selected through a multi-step process. The Ward Disaster Management Committee (WDMC) prepares the initial list. The list is verified by field officers, Community Resilience Volunteers (CRVs), and the Union Parishad (UP) Chairman. Priority is given to widows, female-headed households that are economically insolvent, households with physically disabled members, and poor households with a monthly income of about Tk. 5,000 or less. Senior project staff then approve the final list before construction begins.

The total cost of one latrine varies between Tk. 20,000 to Tk. 23,000. The project contributes Tk. 15,000 per latrine, and the household contributes the remaining Tk. 5,000 or Tk. 8,000. The household contribution can be in cash or in non-cash labour, such as earth filling and self-supplied transport. The project share is disbursed to the household's mobile financial account (bKash) in two instalments. The first instalment of Tk. 10,000 is disbursed when the household begins purchasing materials and construction starts. The remaining Tk. 5,000 is disbursed when CRVs,

WDMC members, and field officers verify that construction is progressing as intended. After installation, the completed latrine is inspected and evaluated by project staff. The full process from beneficiary approval to completed construction usually takes around six weeks.

2.3.2 Disaster Risk Reduction (DRR) tubewell

The DRR tubewell is designed to remain functional and safe to use during floods. Standard tubewells in rural mainland Bangladesh is installed at ground level, with the base plate sitting at the soil surface. In contrast, a DRR tubewell is installed on a raised plinth that sits 3 to 4 feet above ground level. The raised installation keeps the base plate above the highest recorded flood level in the area, preventing submergence and contamination of the wellhead during annual flooding. As a result, the tubewell continues to provide safe drinking water throughout the year, including the flood and drought seasons.

Each tubewell is installed in an open shared space rather than on private land, so that at least 10 to 15 households can access the water. The preferred locations are local markets, bazaars, open fields, road junctions, and the edges of crop fields, so that the water can be used for both drinking and irrigating nearby crops. Because the tubewell is a shared facility, the beneficiaries are not individual households but a cluster of 8 to 10 nearby households who jointly fund its construction and use the well. The site is jointly selected by the WDMC, the CRVs, and the cluster of beneficiary households and reviewed by field officers before installation.

The cost of one DRR tubewell is shared among three parties. The JAMUNA project contributes around 70%; the Local Government Institution (LGI), the elected union-level administrative body responsible for local development and basic services, contributes 20%; and the cluster of beneficiary households contributes the remaining 10%. After installation, a maintenance group of 5 to 6 members is formed from these beneficiary households. This group is provided with a basic toolkit and brief training in minor repairs and routine cleaning, so that small maintenance issues can be handled locally without waiting for project staff.

2.3.3 Community awareness sessions

Community awareness sessions are conducted in the village by the Community Resilience Volunteers (CRVs) at least once a week. The sessions are held in the open courtyard of a household in the village, easy for women and elderly members. They often face difficulties travelling long distances alone. Each session is conducted using a flipchart that includes pictures, slogans, simple definitions, and do's and don'ts on climate change, sanitation, hygiene, health, and livelihoods.

A typical session lasts 30 to 40 minutes and is attended by 18 to 25 people. Most participants are women of various age groups, often accompanied by their children. The session timing is kept flexible so that it can be adjusted around domestic and agricultural work schedules. The format is interactive, with the CRVs pausing regularly to take questions, invite responses, and encourage participants to share their own experiences.

2.3.4 School awareness sessions for students of classes 4 & 5

The objective of the school-based sessions is to introduce WASH topics to children at an age when hygiene habits can be formed and carried back into the household. The sessions are conducted in 106 primary schools and madrasas across the project sites. One teacher from each school receives a one-day training from the project on how to deliver the sessions to classes 4 and 5. The training covers hygiene topics that are appropriate for this age group, including brushing teeth, combing hair, bathing, washing hands with soap before meals and after using the latrine, and keeping the toilet clean. The training itself is structured in two parts: a theory session, in which the content and the learning objectives for each topic are explained, and a practical session, in which the teacher rehearses how to demonstrate each behaviour with the students.

In each participating school, the trained teacher delivers sessions to students in classes 4 and 5 using drawing books and coloured pencils supplied by the project in quantities matching the number of students. The teacher first introduces the topic of the week in the classroom, and the students then colour the relevant section of the drawing book that illustrates the topic. In the following week, a practical session on the same topic is held with the same students. This practical session is usually held outside the classroom, in the school courtyard or playground, where

students can demonstrate the behaviour themselves under the teacher's supervision. These awareness sessions are scheduled after the lunch break on Thursday.

2.3.5 Common Resilience Platform

The Common Resilience Platform is not a direct WASH intervention. It does not build latrines, install tubewells, or run hygiene sessions. Instead, it functions as a coordination mechanism that shapes how WASH and other interventions reach the community in the char areas. The platform brings together 12 NGOs working in the same project geography. These organisations meet periodically to divide the area of operation between themselves, so that one organisation takes responsibility for a defined set of wards or villages while others take responsibility for the remaining areas. This explicit division reduces duplication of activities, prevents gaps in coverage, and allows the partner organisations to focus their resources where they have the most operational capacity.

2.3.6 Revitalising the Ward Disaster Management Committee (WDMC)

The WDMC is a ward-level body formed under the government's Standing Orders on Disaster (SOD). It includes ward members, women leaders, religious figures, teachers, and trained Community Resilience Volunteers (CRVs). The JAMUNA baseline assessment found that in many char wards, the committee was largely inactive prior to the project, with the formation of an existing committee on record but no functional activity at the ward level.

Reactivating the WDMC is therefore one of the first activities the project carries out in a new ward. With support from the local government, members are selected from the community itself.

Once active, the committee supports WASH delivery in three ways. It prepares the primary list of households eligible for the co-financed latrine. Its members, together with CRVs and field officers, visit construction sites to check material quality and to confirm the 20-foot minimum distance between the latrine pit and the nearest tubewell. It also coordinates the venue and attendance for courtyard awareness sessions in the ward.

Chapter 3: Methods

3.1 Study design

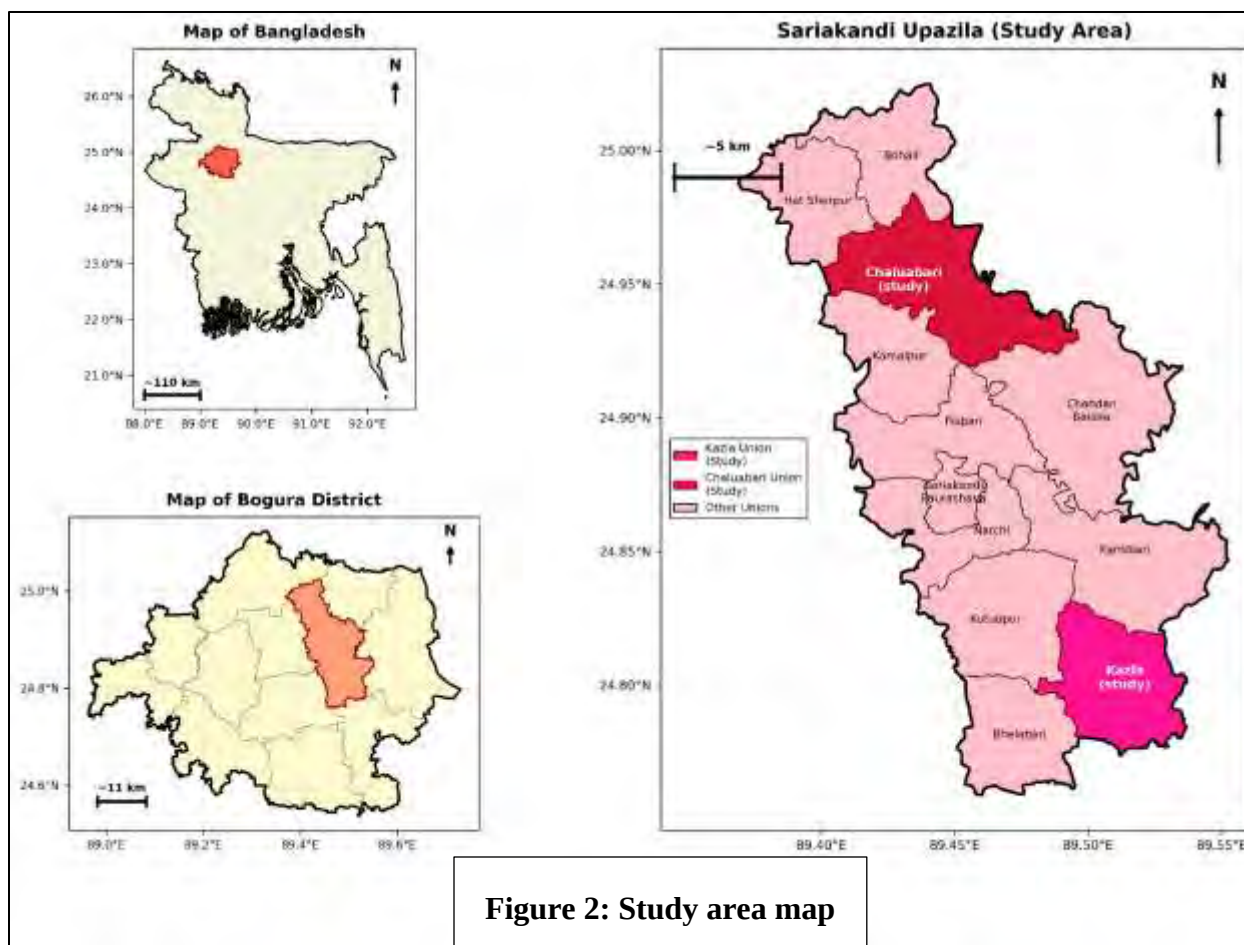
The research followed a qualitative exploratory study design. I chose the qualitative method as the aim is to understand the deep-rooted causes that create barriers and at the same time the facilitators for the implementation. This is a flexible approach, capturing rich data with details and complex experiences through interviews.

Limited literature on the Bangladeshi char context and from implementers' perspective- led to the choice of exploratory research design. It helps to investigate problems which are poorly understood, and gain insights that lay the foundation for future research (Given, 2008).

This type of study focuses on "what" and "how" questions. Thus, it helped in exploring the thesis topic with small samples. This study design helped gain in-depth insights into implementation barriers and facilitators, as well as implementers' perspectives and experiences, focusing on understanding the context using semi-structured guidelines rather than quantifying data (Hunter & Howes, 2020).

3.2 Study area and setting

The study areas were two unions named Chaluabaria and Kazla in the Sariakandi Upazila of Bogura District. These are the two unions in Bogura where JAMUNA project interventions are given.



The data collection was conducted from 10th March, 2026 to 13th April, 2026.

3.3 Study Population

The study population includes implementers at different tiers who were involved in designing, approval and delivering the interventions of the project in the target area.

Manager level (SRC and BDRCS)	4
Field level (BDRCS)	4

Teacher	2
Local government	1
Partner representative	3
Committee member	1
Community members (1 from each union who were involved in latrines construction)	2

3.4 Sample size

The number of interviews depended on the principle of data saturation (Hamilton & Finley, 2019). A total of 17 interviews were conducted, given that the data collection process includes Key Informant Interviews (KII) with focal persons involved in implementation. The key informant personnel were selected in such a way that they represent all types of implementers who are involved in delivering the interventions.

3.5 Sampling

3.5.1 Inclusion and exclusion criteria

Inclusion criteria:

Implementers who meet the following conditions were included in this study:

- Directly involved in the planning, coordination, delivery, funding of WASH interventions under JAMUNA project.

- Currently active in selected char communities of Bogura.
- Willing to provide informed consent for participation.

Exclusion criteria:

Implementers were excluded if they were:

- Not directly involved in the delivery of WASH interventions.
- Not currently working in the selected char communities.
- Decline to give consent or unable to participate in an interview.

This study employed purposive sampling. Purposive sampling is a non-probability sampling technique, which is widely utilized in qualitative research. This sampling procedure was chosen because participants with specific role or experience relevant to the research question were deliberately selected (Cresswell & Plano Clark, 2011; Patton, 2015). To gain the authentic information regarding facilitators-barriers and adaptive strategies, this sampling technique helped to gain rich data (Patton, 2015). This sampling strategy helped to capture the complex realities of implementation in "hard-to-reach" settings (Palinkas et al., 2015).

3.6 Operational definitions

To ensure clarity, the following concepts are operationally defined for this study:

Implementers: Personnel who were directly involved in the designing, planning, execution, monitoring and evaluating of the JAMUNA project. This includes the 7 types of implementers mentioned earlier.

In this study, the implementers are considered by function, not by employment status. An implementer is defined as a person who is actively involved in the implementation, oversight or physical creation of the WASH interventions including project staff, community volunteers, committee members or beneficiary households. Beneficiary households are part of this, since they are not the passive recipients of a completed facility, in the JAMUNA co-financing model. They pay, hire labour, do earth-filling, some part of the construction works and provide maintenance of latrines afterwards. This is a co-production approach to service delivery, where beneficiaries play an active role in the production of a service, not just the recipients of a service and where there is an association between participation and ownership and sustainability (Carter et al., 1999; Nelson et al., 2021). The definition of implementer is broader than in studies interviewing only programme staff. This is adopted here because the co-financing design of the project is based on a strategy where household contribution plays a key role in both the delivery and sustainability of WASH in the hardware.

Hard-to-Reach Areas: "'Hard-to-reach area' refers to char areas in the study. Chars are geographically isolated riverine islands. These are characterised by limited transport infrastructure and high vulnerability to river erosion and flooding (Sarker et al., 2022).

Barriers: It means the factors that hinder effective delivery of WASH interventions (Nishu et al., 2025). Here the barriers were guided by CFIR domains.

Facilitators: It means the factors that support or enable successful implementation (Kundu, 2023) in delivering the WASH interventions in two unions of Bogura under JAMUNA project. This was also guided by CFIR domains.

WASH interventions: By WASH interventions, this study means planned activities, programmes, or strategies aimed at improving water quality, sanitation facilities, and hygiene behaviours to prevent disease, promote health, and enhance resilience in communities, including construction, maintenance, and awareness-raising components (Nelson et al., 2021)

Adaptative strategies: The modifications that were made to project designs or timelines after implementation starts. The main focus is to accommodate local environmental or social challenges.

3.7 Data collection

3.7.1 Data collection tools

Semi-structured interview guides were prepared for the Key Informant Interviews (KIIs). The guides were developed around the five CFIR domains and used open-ended questions to capture participants' views on the barriers and facilitators of WASH implementation under the JAMUNA project. Six guides were used. Each guide was tailored to a specific category of participant: officials of the implementing and partner organisations, primary school teachers, local representatives, Community Resilience Volunteers (CRVs), partner representative, and household beneficiaries. The full guides are attached in the appendix.

3.7.2 Data collection procedure

Data were collected from 10th March to 13th April 2026. The scheduling of the KIIs was done before the field visit to Bogura, with the help of programme officials. Interview times were set according to the availability of each participant.

Interviews were conducted at locations chosen by the participants for their convenience. Most interviews were held at implementers' respective offices in Sariakandi Upazila during working hours, with the prior permission. A smaller number of interviews were held in the village courtyard, where the participant normally conducted community awareness sessions. One interview was held at the Dhaka office of the Swiss Red Cross, with prior permission and at the participant's convenience. One interview was conducted over the phone, at a time convenient to the participant.

All interviews were conducted by the principal researcher in Bangla. No research assistant was used during the interviews. Each interview lasted between 30 and 80 minutes. Audio recordings were made on a digital device after obtaining the participant's consent, and field notes were kept in parallel to capture non-verbal cues and contextual observations. The consent procedures applied at each interview are described under section 3.10.

3.8 Data analysis

Data analysis followed the framework method described by Gale and colleagues (2013), a systematic approach to qualitative analysis developed specifically for applied health research. The method was selected for three reasons. First, it provides a transparent and auditable structure for managing large volumes of semi-structured interview data, which suited the size of this dataset. Second, it allows for applying a pre-defined analytical framework, but also remains open to the induction of themes from the data, which is integral to a study that follows the Consolidated Framework for Implementation Research (Damschroder et al., 2022) and is guided by implementer perspectives. Third, the framework matrix at the heart of the method allows comparison both within and across cases, which was important for a study spanning multiple implementer categories ranging from senior management to frontline community volunteers. The seven stages of the method, as applied in this study, are described below.

Step 1: Transcription

All the audio recordings were transcribed in Bangla verbatim. Because all interviews were carried out in Bangla, the transcription was done in the same language, which enabled the original meaning of each statement, including idioms or culture-specific terms, to be captured. Each transcript was re-reviewed after the initial transcription, with careful attention to terminology used by participants, terminology specific to the project and locally-used Bangla terms which did not have a direct English equivalent. Some parts of the transcripts subsequently used in the findings chapter have been translated into English by the researcher and the original Bangla text has been kept in the analytic record, which could be traced back to the English translation.

Step 2: Familiarization with the interview

Before any coding began, each transcript was read in full at least twice. During this stage, initial impressions, recurring ideas, points of uncertainty, and questions for further exploration were recorded in a reflexive memo kept for each transcript. Familiarization also included listening to the corresponding audio recording alongside the transcript on at least one occasion, so that the

participant's tone, pauses, emphasis, hesitation, and emotional weight could be considered together with the written text. This stage allowed to develop an early sense of where the strongest accounts of facilitators, barriers, and adaptive strategies were located in the dataset, and which participants had spoken at length on particular themes.

Step 3: Coding

Open, line-by-line coding was carried out on the first three transcripts to allow inductive codes to emerge directly from the data without being constrained by the framework. Coding was performed in Dedoose software (free version 10.0.59), which allowed each excerpt to be tagged with one or more codes, retained alongside the original transcript context, and exported for later organisation into the framework matrix. The codes generated at this stage were then reviewed against the five domains of the CFIR (Damschroder et al., 2022) to identify how the inductive codes mapped onto the framework, and where additional codes were needed to capture content, the framework did not address.

Step 4: Developing a working analytical framework

A working analytical framework of ten codes was developed for this study. The framework combined the five CFIR domains - Innovation, Outer setting, Inner setting, Individuals (roles and characteristics), and Implementation Process, with five additional study-specific codes that mapped directly onto the research questions. They were: intervention description, facilitators, barriers, adaptive strategies, and facilitator's experience. A codebook was prepared in which each code was given a written definition, explicit inclusion rules specifying the type of content that fell within the code, and explicit exclusion rules specifying content that belonged to a neighbouring code instead. The codebook was treated as a living document throughout analysis, with refinements made as new patterns emerged in later transcripts.

Step 5: Applying the analytical framework

The ten-code framework was applied systematically to the remaining transcripts. Each transcript was coded line by line, and a single excerpt was assigned to more than one code where its content cut across domains. For example, a quote describing how household-level financial constraints

(Outer Setting / barrier) were addressed through instalment-based bKash payments (Innovation / adaptive strategy) received both codes. Further edits were made to the codebook throughout the process of coding to clarify definitions when ambiguities occurred, to resolve overlapping codes with more specific rules of inclusion and exclusion, and to re-review excerpts previously coded using the evolving definition of the codes to ensure consistent application of the codebook to the entire dataset. In the final coded data set, there were 657 excerpts coded out of the 10 codes.

Step 6: Charting data into the framework matrix

The coded excerpts were exported from Dedoose and organized into a framework matrix in spreadsheet form. In the matrix, the columns represented individual respondents, identified by their interview number and implementer category, and the rows represented the codes. Each cell contained the relevant excerpts from a given respondent under a given code. This structure made two types of comparison possible. Reading down a column showed what a single respondent said across all codes, which supported case-level interpretation. Reading across a row showed what every respondent said within a single code, which supported cross-case interpretation of facilitators, barriers, and adaptations across the seventeen interviews. The matrix also functioned as an audit trail, since every analytic claim could be traced back to its source excerpt and transcript.

Step 7: Interpreting the data

Themes were generated through a combination of deductive and inductive approaches by reviewing the matrix. CFIR domains provided the initial organizing structure, while inductive reading of excerpts within each code allowed patterns, contrasts, and linkages to emerge from the data itself. Within each code, excerpts were re-read to identify recurring patterns, contrasts between different categories of implementers, convergences across respondents, and links between codes that signalled how one feature of implementation produced or shaped another. Each theme was then classified, in line with the research questions, as a facilitator, a barrier, or an adaptive strategy. Barriers and facilitators were drawn only from the accounts of implementers themselves, in keeping with the study's focus on lived implementation experience. Where a theme spanned both a barrier and an adaptive response, for example, household poverty as a barrier and the bKash

instalment system as an adaptive strategy, the linkage was retained in the analysis so that the cause-and-response logic of implementation could be foregrounded in the discussion chapter.

3.9 Data management and quality assurance

All participant identities were kept confidential through coding. Names, locations, and other personal identifiers were removed during transcription so that no identifiable information appeared in any transcript or report. Audio recordings, field notes, transcripts, and any non-identifiable photographs were accessible only to the research team and were stored on password-protected devices, with backup in secured cloud storage. Each transcript was checked twice against the corresponding audio recording, once during transcription and once before coding, to ensure that the written text accurately reflected what was said in the interview. Code application was reviewed iteratively as the framework was refined, and a subset of previously coded transcripts was re-checked after the codebook was finalized to confirm that earlier coding decisions remained consistent with the final code definitions.

3.10 Ethical considerations

Ethical approval for the study was obtained from the Institutional Review Board (IRB) of the BRAC James P. Grant School of Public Health, BRAC University.

Before each interview, every participant was given a clear verbal explanation of the study and a written information sheet (attached in the appendix). The information sheet explained the purpose of the study, what participation involved, how the participant's input would be used, and how confidentiality and anonymity would be protected. It also stated that participation was voluntary, that the participant could withdraw at any time without any penalty, and that participation was not expected to cause any physical, psychological, or social harm. The information sheet was kept by the participant.

After the participant's verbal consent, a written informed consent form (attached in the appendix) was shared in both Bangla and English. The form stated the aims of the study, what participation involved, and the participant's rights, and asked for explicit permission to audio-record the interview and, where applicable, to take photographs. The form was signed by both the participant and the interviewer, and the signed form was kept by the researcher. Participants were not contacted through their supervisors, so that no perceived pressure to participate was created, and no supervisor or project authority was present during any interview.

4. Findings

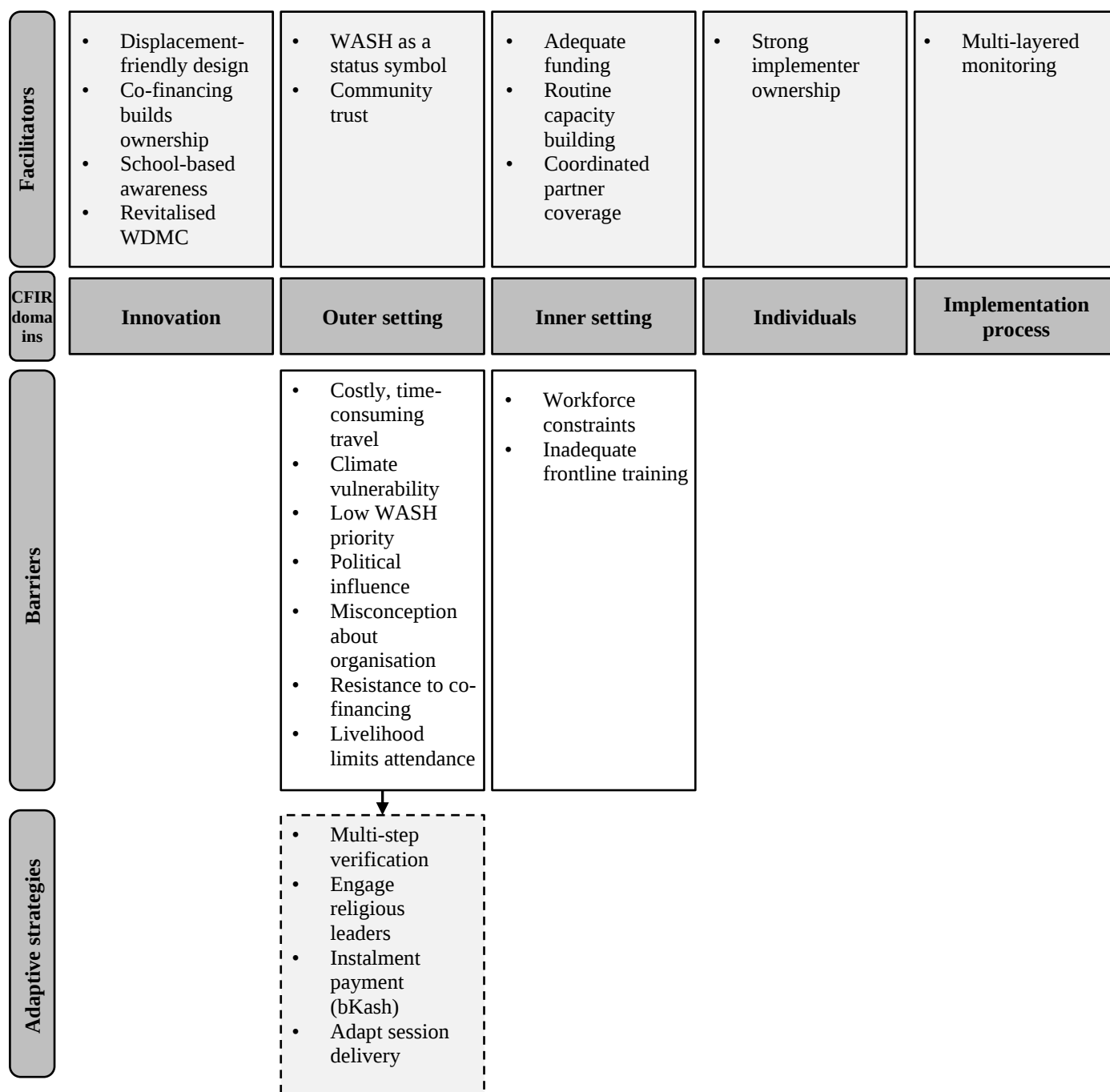


Figure 3: Facilitators, barriers and adaptive strategies for WASH implementation in the Bogura chars, mapped to the five domains of the Consolidated Framework for Implementation Research (CFIR).

Figure 3 presents an overview of the facilitators, barriers, and adaptive strategies identified across the five CFIR domains. Each is described in detail in the sections that follow.

4.1 Facilitators

4.1.1 Innovation

Displacement-friendly design

The JAMUNA project follows a deliberate principle that WASH hardware in the char must be displacement-friendly. Implementers described this through two adaptations: a raised-plinth DRR tubewell that survives the annual flood, and a dismantlable tin latrine with offset pit and ramps that can be relocated with the household and used safely by elderly and disabled members.

The senior implementer described the overall design intent of the project:

Before making any structure, DRR tubewell, latrine, or community clinic, we think about climate change impact and water height. We consider the 20-year flood level and design above that. So that the tubewell does not get submerged every year. Secondly, we try to design it so that the product can be dismantled. The whole char gets washed away. Even if you build a community clinic, 70% of the products can be dismantled. They can be taken apart within 24 hours. Tubewells can be taken away. Latrines can be taken away. We do not promote anything that is permanent- that cannot be taken apart. _KII 17_Male_Senior implementer

The JAMUNA project introduced the DRR tubewell with a raised plinth for the char context. A senior implementer described the technical rationale:

Normally tubewells are installed at ground level. We install them at a higher range. The boring is done 3 to 4 feet above the ground, because we are calling it flood-resilient. We make sure that the base plate of the tubewell does not get submerged in flood water. If it gets submerged, the water becomes contaminated. That is why we install raised tubewells in the char area. _KII 1_Male_Technical implementer

A community volunteer described how the community experiences this adaptation:

If the tubewell is in a low place, it goes under the flood water. Then we cannot use that water. We have to go to another house on higher ground. If everyone does not have a boat, they have to go on a raft made of banana stems. There are risks. If there is a pregnant woman, her dignity is compromised, and many risks arise. It is also risky for disabled children. If the tubewell is in a high place, we can drink water properly. _KII 13_Female_Community volunteer

The JAMUNA project introduced an offset-pit latrine design adapted for the char context. The technical implementer described the design choice:

For the latrine design, we use offset-pit latrines. There are direct-pit latrines and offset-pit latrines. In the direct-pit, the ring sits directly under the pan. In the offset-pit, the ring is to the side. You defecate in one place and it falls to the side. That is more hygienic. For the offset-pit, we say at least five rings have to be installed. _KII 1_Male_Technical implementer

The same technical implementer described the adaptations made for elderly women, people with disabilities, and other vulnerable household members:

For elderly women where a ramp is needed, we make a ramp with a handrail. If there is a person with disability or an elderly woman in the house, we consider that. If the household has no such member and you build it anyway, it becomes inhumane. Then people will say, 'Did you think of us as disabled?' So, we only add it where it is needed. The ramp is gently sloped so the person can climb it. _KII 1_Male_Technical implementer

Co-financing leads to community ownership

The JAMUNA project follows a co-financing model for latrine construction, where the project gives Tk. 15,000, and the beneficiary contributes Tk. 5,000 to 7,000. Implementers reported that this financial contribution shapes how households maintain the latrine after construction.

A field-level implementer described how the financial contribution shapes household care of the latrine. He used a metaphor about a father's shawl and self-earned shoes:

...It is like a father's shawl and a self-earned shoe. If the father gives the shawl (I might not take much care of it) but I earn the shoes through hard work, I clean the shoes with the father's shawl. If we give them 100% support, when they close the door, they will slam it loudly. It feels good with the sound. But when they contribute money, like- we are giving 15,000 Taka and they contribute 5,000 to 7,000 Taka, then they will try to close the door gently... _KII 14_Male_Field- level implementer

The same implementer described what kind of care the household shows after contribution:

There is a saying- government property is easy to throw in the river. That saying exists in the area. But when there is contribution, we try to make them feel attachment to that thing. So, they take care of it, so they maintain it. That is why we keep this co-financing process running. _KII 14_Male_Field- level implementer

A senior implementer described how the model also serves equity in the poorest households:

In their 5 to 7 thousand contributions, we count labour cost and earth-filling cost. Households do the earth-filling themselves. The only paid work is the carpentry. We count the labour they put in. So, in cash, they have to pay very little. Sometimes one thousand five hundred or two thousand Taka. Sometimes they do not even pay any cash. The rest is their own labour. _KII 15_Male_Senior implementer

Participatory school-based awareness sessions act

One intervention is the school-based awareness sessions on WASH, using drawing books and colours to engage children. Implementers reported that these sessions draw high student attendance and that children carry the learned practices home to their parents. These practices include handwashing, nail-cutting, and keeping sandals in the bathroom. The drawing book approach turned out to be more powerful than implementers initially planned for. These sessions, held on Thursdays only, consistently draw more students compared to other classes. A teacher from Chaluabari described one session that exceeded its planned audience:

When I held the handwashing class, I had said only Class Four students would attend. But Class Three, Four, and Five - everyone came and filled the entire room. They sat at the windows - they watched. _ KII 6_Male_Teacher

The reach of these sessions is not limited only to the class. A teacher from Kazla described how the learnings are carried home and that messages are shifting adult behaviours:

Students go home and tell their fathers and mothers (about the hygiene lectures). The next day, the father is doing that work. This is how we know that the discussion is happening. _KII 9_Male_Teacher

Revitalised WDMC for beneficiary identification

An innovation of the JAMUNA project is to revitalise the Ward Disaster Management Committee (WDMC) and work through it instead of setting up a parallel project committee. Implementers reported that the active WDMC drives needs assessment, beneficiary identification, and infrastructure placement decisions through local members who know the ward context.

A senior implementer described how the active WDMC drives needs assessment in each ward:

In every union, there is a Ward Disaster Management Committee (WDMC). The WDMC holds monthly meetings. The committee is chaired by the Union Parishad (UP) member. The rest are villagers, different stakeholders like teachers, men, women. The committee

holds monthly meetings in each ward, and the needs from that ward come up there. _KII 1_ Male_ Technical implementer

Another senior implementer described how the active WDMC supports decisions on infrastructure placement:

It is a little difficult to determine the location. For this, we hold meetings at the WDMC. The WDMC gives us their needs. A WASH block is needed, a DRR tubewell is needed- like this they raise these demands in the meeting. Then my staff say, 'Okay, we will give a DRR tubewell, but where will we give it?' They show us a place. _KII 4_ Male_ Senior implementer

Female volunteers for community engagement and reach

Implementers felt female volunteers were more effective for community engagement activities as they can enter homes freely, speak with mothers in depth, and build the kind of trust that char communities take time to develop. The senior implementer explained on this:

Female volunteers are more suitable to talk to mothers, to have in-depth discussions with them. With a male CRV, mothers do not want share. Especially rural and char people are conservative. _ KII 15_ Male_ Senior implementer

4.1.2 Outer setting

WASH Infrastructure: a symbol of social status

Implementers found that the WASH infrastructures promoted by BDRCS carried social value beyond its use. Families explicitly connected latrine quality to marriage prospects for daughters. This newly created motive rooted in family dignity acted as a facilitator to the use of the improved WASH facilities. One participant explained,

The big thing is... when there is a latrine in a village home, it raises their status. Those who have daughters at home, when they think about marrying off their daughter or

arranging a marriage for their son, they share these things with us. They say, 'Sir, this will be hard for us, but we will do it because I am marrying off my daughter... if there is no good latrine, I cannot marry her off.' _ KII 15_Male_Senior implementer

Community trust in organisation:

In char communities, the Bangladesh Red Crescent Society (BDRCS) is a well-known and well-appreciated organisation. Decades of flood and disaster response by BDRCS have built trust in them. Government officials, too, are familiar with BDRCS's organisational standards and activities have a good partnership with them, which helps in the implementation of interventions in communities.

Bangladesh Red Crescent Society is an auxiliary to the government and a partner. The districts units are kind of permanent. At the beginning of any work, trust is a big thing-trust building. We have that trust with the community from day one because of earlier work, because of the presence of the district unit, because of our engagement with the community.
_ KII 17_Male_Senior implementer

Implementers reported that the institutional familiarity with BDRCS also discourages unethical requests, such as bribes or favours, from local officials, as a result, facilitating their work. The Senior implementer explained:

More or less, all officers now know about the Red Crescent Society. Those who know well - they do not make these (unethical) demands. _KII 15_Male_Senior implementer

4.1.3 Inner setting

Adequate funding

Adequate funds to support project activities were mentioned to facilitate implementation without facing any major constraint. The funder, according to the implementers, is flexible, responsive to

community needs, and has maintained a consistent flow of fund. Moreover, the intervention's budget allocation is adjusted according to the community's needs, rather than being fixed within rigid budget categories, which provides the implementers with the flexibility to adapt their intervention. A senior project staff described the practical freedom this provides:

Our funding is sufficient. There is no problem with it. The donor is also good and relaxed. If suddenly some work is needed, and if we can convince the donor, they give extra funds. And they are giving in every phase. Many donors think you must spend within their set limitation, you cannot go beyond. With Swiss Red Cross, it is not like that. They are very relaxed. _KII 1_Male_Senior implementer

This adequacy extended to operational support for field-level staff. Fuel for motorcycles, boat fare, and communication expenses for project work were fully covered by BDRCS, so that personal cost did not become a barrier to field presence:

For us staff, BDRCS manages this completely. BDRCS covers all communication expenses incurred for project purposes. _KII 13_Male_Field-level implementer

Routine capacity building initiatives

BDRCS runs regular training programmes for its staff and volunteers as part of its standard organisational practice. Community volunteers who received the full three-day training followed by quarterly refreshers are functioning as genuine community facilitators. They are delivering information, running awareness sessions, collecting feedback, and monitoring practice in the field. One of the community volunteers told:

They (trainers) gave us a two-day training... Training means learning... what we have learned, we are applying. About floods, about hygiene, about how to bring people together. The training started it. _KII 13_Female_Community volunteer.

Coordinated geographic coverage by partners

The Resilience Platform is a coordination mechanism convened by BDRCS that brings partner NGOs in project area together to plan WASH and disaster response activities across overlapping geographies. This brings partner organisations together each quarter to map activities and deliberately divide geographic coverage. In a region where reaching a single village can take a full working day, this planned coordination prevents duplicating support. One participant shared:

We have a Resilience Platform... once every quarter we sit and meet. We tell them, 'We are giving (interventions) in this village, you give (interventions) in that village.' This way coverage increases. _ KII 15_Male_Senior implementer

4.1.4 Individuals

Strong ownership among implementers

A strong sense of ownership across the implementers was found to shape how they deliver, monitor, and stay with the project. They feel a strong willingness to help others, and doing good brings them satisfaction, further motivating them to deliver interventions.

The field-level implementer described that without personally visiting the work site, he could not feel that the work had been done well. He framed this as part of his personal sense of responsibility for the project:

I own BDRCS. I do not see this as a profession. If I see something as work, then it becomes pressure. But I enjoy this work in a beautiful way. If I do not visit the people's home whose name are given in the primary list, I cannot find self-satisfaction in whether I am giving to the right person or properly carrying out my responsibility. _ KII 14_Male_Field-level implementer

Ownership was also found among supportive individuals who were not directly involved in implementation. For example, a local government representative shared how he personally reviewed submitted beneficiary lists and protected vulnerable households from being dropped.

I look at the list with my own eyes, or I do the survey myself. As I said- if 70 names come to me, (the NGO) may approve perhaps 30 names. So, 40 names have to be dropped. These 40, I personally check whether they are actually helpless. I keep them in the waiting list and drop the others. They are helpless too, perhaps a little less helpless than the first 30. I keep them on the waiting list. Later if there is another round, (they will be included) ..._KII 16_Male_Local government representative

His commitment to the partnership came across in how he described his readiness to support the project:

If you take one step forward, I will take ten steps towards you. There will be no problem here, Insha'Allah. _KII 16_Male_Local government representative

For community volunteers, who carry the unpaid frontline of delivery, this sense of ownership rests on the personal and social meaning of the role rather than on financial return. A community volunteer described her motivation in terms of self-defined service and the peace she derives from contributing:

I work as a volunteer for the JAMUNA project. A volunteer means one who gives service of their own will. I do not receive any financial support from here. My hope is to work for the development of my own area. In this, I find peace myself. Others also find peace. I like helping people; I cannot bear to see others suffer. _KII 13_Female_Community volunteer

Another located her motivation in the local recognition she gained:

I enjoy it a lot. Explaining things to people. Most people in our village are uneducated. They do not understand many things. When we teach them, perhaps we earn a little recognition. _KII 12_Female_Community volunteer

4.1.5 Implementation process

Multi-layered monitoring system

The JAMUNA project uses a multi-layered monitoring system. It combines internal joint review by government and partner institutions, an annual external evaluation, and field-level quality checks by trained community volunteers and committee members.

The Joint Monitoring Team (JMT) brings together different institutional actors who jointly make decisions about project quality. A senior implementer described who is on this team:

We have a Joint Monitoring Team with government officers. LGD-DPHE engineer, UNO sir's people, member of the Resilience Platform, ward member, project engineer. All of them combined make a five-member committee. _ KII 4_Male_Senior implementer

Beyond the internal review, the project is evaluated each year by an external body. A senior implementer described what this evaluation reported in the second year of the project:

For most indicators, around 80%, we are already above the target value within one year. About 10%t are below target, and the remaining 10% are meeting the target as expected. _ KII 17_Male_Senior implementer

The JMT brings together different institutional actors who jointly make decisions. Beyond these internal reviews, the project is also externally evaluated each year by an independent third-party, which further increases the credibility and transparency of the project.

For field-level quality monitoring, CRVs and WDMC members are trained on standardized checklists designed by the project's technical team. The checklists cover construction quality, material specifications, and site placement. The volunteers check the construction sites because the professional staff cannot consistently visit. Contractors are held to a rebuild-before-payment standard. A field-level implementer described how this works at the construction site:

The masons are told - if the brick is not first-class, if the sand is not coarse, do not work. If you do, you will have to break it and rebuild. We will not pay. _ KII 14_Male_field-level implementer

4.2 Barriers

4.2.1 Outer setting

Time-consuming expensive travel

Reaching char communities is both time-consuming and expensive for implementers. Staff spend several hours travelling by boat and on foot. As the char areas are separated from the mainland by wide waterways, staff typically travel for two or more hours each way, often followed by a couple of hours of walking after reaching the char by river. These long travel hours cause reduction of their working hours and physical strain due to the long walk.

One of the participants described the physical burden directly:

Our staff travel five to six hours - four hours to go and three to four hours to come back. Is this even humane? They have to walk for two to three hours. _KII 5_Male_community-level implementer

Reaching these areas is not only difficult, but also costly. The transport cost makes regular field operations financially difficult, as boats must be hired for each visit. A partner implementer described the cost involved:

In char areas, the transportation system is the number one problem. Reaching the destination requires hiring a boat that costs 3,000 Taka one way and 3,000 Taka return. No one wants to easily go to such remote places. _ KII 8_Male_NGO officer

Geographical climate vulnerability

Char households face recurring displacement due to annual flooding and river erosion. They have to bear the economic and emotional cost of repeated relocation. Because of all this, building permanent WASH infrastructure is not their priority, as it may not last long.

A senior implementer described this cycle from a community member's perspective:

They (community people) say, 'My house is on the char. It is in a low area. Every year, a flood comes. Every year I have to break my house. Every year, I move to the road and take shelter in someone else's home. This is an economic cost, mental anxiety, and repeatedly changing places. _ KII 1_Male_Technical implementer

This yearly damage adds up to something even bigger across a lifetime. A senior official from the partner organisation described the full scale:

On average, every family (of this area) has to shift their household at least three to four times in their lifespan. So, you have to consider, if their lifespan is sixty to seventy years, every fifteen to sixteen years they have to relocate the entire household. _ KII 17_Male_Senior implementer

Economic crisis: Low WASH priority

Poverty among char households makes permanent WASH facilities a lower priority. Daily survival needs like food and livelihood often need to be prioritised first. WASH facilities are not seen as something urgent, even when it is offered through projects. The Senior official explained why permanent WASH facilities are not their first concern:

Our first beneficiary is extremely poor. Now, what is their primary need? Their primary need is food and livelihood. These are the primary focus, right? WASH, they think they will manage somehow. _ KII 17_Male_Senior implementer

This priority pattern also shows up in households' responses to the project's WASH offer. Even when most of the cost is covered by the project, the small share that remains can still be too much for these families. A WDMC Member described this from the community level:

Our area is a poor area. Many people do not want to build it (latrines) because of Taka 5,000 (which they need to pay themselves). 15,000 is being spent on them (from the project), but they do not want it (latrine) because of just Taka. 5,000. Where will they get the money? They cannot take it. _KII 10_Male_Committee member

This created a persistent barrier to maintaining hygiene practices in their everyday life. A teacher described his experience:

Many children say, 'Sir, there is no soap at my home' - then where do I find the answer? I show (hygiene practices) using my own resources, but if there is no soap for use (at home), the consistent practice does not happen." _ KII 6_Male_Teacher

Political instability and influence

JAMUNA's implementation was reported to be affected by Bangladesh's political context in two distinct ways. The first delay caused by the August 2024 political instability, and the second is the ongoing political and kinship-based pressure on beneficiary selection. After the July uprising in 2024, Union council representatives had left their workplaces. The Ward Disaster Management Committee (WDMC) was also inactive during this period. All these caused delays in rolling out the project. A field officer described how this shaped the project's earliest months:

2025 marked the start of the JAMUNA project. The political instability we saw was the biggest reason. And then, all the selection process, making the WDMC and UDMC functional, this took us extra time. _KII 14_Male_Field-level implementer

Political influence also affected the selection of beneficiaries. Additionally, the lists from the Ward Disaster Management Committee (WDMC) often come with names already chosen by powerful or well-connected people in the area, who use their influence over WDMC members to push their preferred names onto the list. One participant described what this looks like in practice:

The names that were given initially (by WDMC members), later we saw that 60% of those names had to be dropped (because they did not match with beneficiary criteria). Then the committee gave another list (after checking), and another 30% had to be changed again. _KII 14_Male_Field-level implementer

Direct political pressure also reaches project officials from individual political leaders who expect special treatment. The Technical Staff described how implementers respond to these requests:

They say, 'I am a leader of the ruling party or 'I am such-and-such leader, you have to give me this latrine.' We avoid that. _KII 1_Male_Technical Staff

Misconception about the organisation

Some communities had misconceptions about BDRCS at the start, which created early resistance to the project, as reported by senior implementer. The organisation's name led people to mistake it for a Christian or foreign-linked NGO, raising concerns about how women in the household would be involved:

...Secondly, there are some religious barriers. They mistake the Bangladesh Red Crescent Society for an NGO. They think that when an NGO comes, it means they will take the women of our households outside their homes. _ KII 15_Male_Senior implementer

Social resistances to co-financing model

The project's co-financing model also created early misunderstanding and suspicion in the community. Implementers reported that some community members misread the direction of the money. They thought the project was asking money from them rather than giving to them. Initially, this model added a trust barrier.

This cost-sharing approach was new to them. A committee member described the misunderstanding that was common in the early project phase:

We tell them, 'Brother, we will give you Taka. 15,000. To make this latrine, you may need Taka. 2-3 or 5,000.' Many people think the opposite - that we are asking them for Taka. 5,000. _ KII 10_Male_Committee member

A community volunteer described what the early phase of engagement actually looked like on the ground:

At first, many would say, 'Why should we give money? You use it yourselves, what do you do with that money?' They didn't understand that the Red Crescent is not an NGO. We had to explain - we faced many obstacles. Many arguments happened. _ KII 13_Female_Community volunteer

Nature of livelihood limiting session attendance

Implementers reported that the daily and seasonal work patterns of char families directly shape who can attend awareness sessions. Men are away at agricultural work during most of the day. Women, although easier to reach in general, also leave their homes during peak harvest seasons to earn additional household income through paid agricultural labour

Most men in char areas work in field-based agriculture during the day. This makes it difficult for them to join sessions held during working hours. The Senior implementer described how the project sees this pattern:

In our context, the number of men in the community area is usually low. Because during the daytime, men are at work. And women work at home, so reaching women is easier for us. _KII 15_Male_Senior implementer

In case of women, their availability shifts with the agricultural calendar and seasonal household work. During the chili harvest season, many women from char households work as paid agricultural labour on others' land to support their families. They also leave home in the morning to cut grass for their cows. The community volunteer from one of the project sites described this:

Now (early summer), most people want to go pick chilies. Their financial condition is low. Many of them also have cows. They go to cut grass around 10 o'clock. I cannot say the timing (of session) exactly. _KII 12_Female_Community volunteer

4.2.2 Inner setting

Workforce constraints

Implementers of JAMUNA implementation face two workforce barriers. The first one is the staff shortage. This shortage overburdens staff, who must cover more than their capacity allows. The second is the dropout rate among volunteers, especially men, who leave when they realize the role offers no payment.

The project operated with fewer staff than required. The Senior implementer described what this looks like in practice:

Our team is 20-25% smaller than what was needed. That is, 100% of the work has to be done by 75% of staff. The whole team is overloaded. _ KII 15_Male_Senior implementer

While the senior implementer described the overall team-level shortage, a field-level implementer pointed to a Bogura-specific gap that other districts do not have:

Our staffing is complete overall. But our char area is very remote... Every district has a Project Officer. But Bogura does not. If another Project Officer was recruited here, better service could be delivered. _ KII 14_Male_Field-level implementer

The volunteer side faces a different but related problem. The community volunteers' role is unpaid, and this affects who chooses to stay in it. A CRV described the pattern she has seen with volunteers:

Many people ask me - 'Do you get a salary or not? How much salary per month?' If I say I do not get even a single penny, no one believes me. At first, everyone is interested. Then they realize there is nothing - and they drop out. No one comes without money. _ KII 12_Female_Community volunteer

A community volunteer explained that the higher dropout among men was directly linked to the unpaid nature of the role. She described:

It is not that they (male volunteers) have less attachment to community development. They do not get any money - that is probably why. They think, we do not get even one taka here; maybe if we work elsewhere, we would get few taka._ KII 13_ Female_ Community volunteer

Alongside the dropout pattern, community volunteers also described what kinds of support would make their work easier. A community volunteer told:

If we could be given a tab or mobile, or even one of your official SIM cards for communication, that would help us. The project may run for four years or even longer; after the project ends, you can take it back....At first everyone is interested. Then after a few days of working with the Red Crescent, when they realize there is really nothing, everyone drops out. _ KII 13_ Female_ Community volunteer

Inadequate training for frontline workers

Community volunteers felt that the initial training duration was too short. On the other hand, in the case of school-based implementers, only one teacher per school received training, which is not enough to run sessions consistently.

Community volunteers and field-level workers received initial training that they felt was too short. They wanted more time to fully learn the material. A community volunteer described this gap simply:

They had given us two days of training. We wanted it to be 5 to 7 days. Training means learning, after all. _KII 2_Female_Community volunteer

School-based implementer faced similar problem. Only one teacher per school was given training, which meant the WASH related sessions depended entirely on that one person. A school-based implementer from Chaluabari described what this looks like in practice:

I do this (school awareness session) myself. The day I am there, I do it. When I am not there, the session usually does not happen. Or I tell my colleagues, 'Brother, at least take the theory class, I will do the practical work later. _KII 6_Male_School-based implementer

Another participant shared why he felt more colleagues should also be trained: *"It is definitely needed. What I have learned in the training, I am sharing here. But if someone else also gets the training, or learns hands-on, they could teach better too."* (KII 9_Male_Teacher)

4.3 Adaptive strategies

4.3.1 Multi-step verification process of beneficiary selection

The Ward Disaster Management Committee (WDMC) prepares the initial beneficiary list (see Sections 2.3.6). Implementers reported that this initial list was not always accurate. Some names were influenced by local political or kinship ties, and many had to be checked carefully before approval. The project's adaptive strategy was to add multiple verification layers to the selection process.

We CRVs go on visits. We assess whether giving the latrine is fair. If we notice that the person is poor or cannot afford a latrine because of a lack of money, we write down their names and phone numbers and bring them back (for future inclusion in the project's support). _KII 2_Female_Community volunteer

I will see the list with my own eyes, or I will do the survey myself. Suppose 70 names came to me - he might give 30 names. I personally check the 40 - those people are actually helpless. I keep them and drop the others. _KII 16_Male_Union chairman

4.3.2 Engaging religious leaders

Implementers responded to misconception about organisation's religious affiliation by engaging local religious leaders. Imams were invited to project meetings and asked to deliver messages on hygiene practices from the mosque during Friday prayers; madrasa teachers and Hindu priests distributed materials. A senior implementer described why this worked:

In every area, we hold meetings with the imams of mosques. We get the imams to share the messages during the Friday prayer khutba. We use Madrasa students and Hindu priests to distribute materials. So, villagers see that whoever is talking about these things is connected to the project. _ KII 15_Male_Senior implementer

4.3.3 Instalment-based payment through mobile financing app

The implementers initiated instalment-based payment through a mobile financing app (bKash) for those who could not pay a lump-sum amount and to gain trust from the community regarding the co-financing model

When the intervention was rolled out, the beneficiaries were expected to pay the full amount (15,000 BDT), which was reimbursed to them only after the construction of the latrine was completed. This was a financial burden for households with no savings, a critical situation for most families in the poverty-stricken Char community. Therefore, the project responded by shifting to an instalment-based model where beneficiaries receive a certain portion of money in advance to begin with the construction. A senior implementer described how this works:

When Taka. 10,000 goes to their bKash, many can start the work with that money. When the work has progressed about 75%, we transfer the remaining amount. _ KII 15_Male_Senior implementer

A community member from Pakuria, Kazla union shared his experience when such a model was implemented:

They gave us the money before we started the work. Before starting, 10,000 Taka came in. Once they (BDRC) checked that the work was on track, the remaining 5,000 came through bKash. _KII 11_Male_Community Member

Using a mobile financing app like bKash was reported to help those without a bank account, therefore making cash transfers easy and ensuring the implementation is not hampered. One senior implementer described the arrangement:

We transfer this money through bKash, directly to the beneficiaries' bKash accounts. BDRCs has a central-level agreement with bKash. They provide the service at only 0.85%. This way, the beneficiaries do not have to bear any cash-out charge. They receive the full 15,000 Taka. _KII 15_Male_Senior implementer

4.3.4 Adapting session delivery to local realities

To address the challenge related to attendance at community sessions due to daily and seasonal work, the implementers adapted the timing of the sessions and their delivery mechanisms. Community volunteers adapted session timing, location, and notification practices to match the community's daily life, and they also fine-tuned the messages to match the realities of the community.

The community volunteers also visited door-to-door to notify the households about the awareness sessions to be held the next day. Sessions rotate between household locations rather than fixed venues. A community volunteer from Chaluabari described her flexible scheduling practice:

I tell them (community people) the day before. I go house to house. If I do it at one person's home today, then at another's tomorrow. I take sessions only after 2 PM. During Ramadan, I finish by 10 AM. _KII 12_Female_Community volunteer

With respect to content modification and delivery, community volunteers began to deliver the messages in the flipchart in the local language. This was particularly found to be useful for people living in char areas where literacy is low. A community volunteer explained:

In char areas, you have to speak in your own language. Even here, I have spoken in my own dialect - they will not understand book language. And not everyone in char areas is educated. _ KII 13_Female_Community volunteer

Another field-level implementer described a specific instance of how a rhyme-based delivery of handwashing messages was easy to grasp and spread, particularly from children to parents:

I am teaching them through handwashing rhymes. The children recite the rhyme. Then I say, 'Dear, say it once' - they listen, they find it interesting. _ KII 14_Male_Field-level implementer

Chapter 5: Discussion

Summary of key findings

This study explored the facilitators, barriers, and adaptive strategies influencing implementation of the JAMUNA project in climate-vulnerable char communities of Bangladesh. The findings suggest that successful implementation depends not only on the practical design of WASH infrastructure, but also on how interventions can be adapted to the realities of displacement, poverty, mobility, and local social structures. Displacement-friendly infrastructure design, community co-financing, revitalization of local governance structures, and strong ownership facilitated implementation. At the same time, geographical isolation, recurrent climate displacement, poverty, political influence, and workforce shortages created substantial barriers. Implementers responded to these contextual challenges through adaptive strategies such as multi-step beneficiary verification, engagement of religious leaders, flexible financing mechanisms, and locally tailored community engagement approaches.

Discussion of findings

This study used the Consolidated Framework for Implementation Research (CFIR) to examine the implementation of WASH interventions under the JAMUNA project in the climate-vulnerable char areas of Bogura. The findings suggest that implementation success in hard-to-reach areas depends on a transition from technical permanence to socio-technical adaptation.

One of the significant findings of this study is that dismantlable and displacement-friendly infrastructure is a key facilitator of implementation. The use of hardware designed to withstand flooding and relocation addresses the reality that conventional WASH hardware is often a liability in the chars. This finding highlights the importance of designing climate-resilient interventions that align with the lived realities of highly mobile and disaster-prone populations. As implementers noted, having the scope to dismantle a latrine within a day is an effective way to protect community assets from being washed away. Moving from architectural permanence to displacement-friendly semi-permanent design represents a fundamental shift in the definition of sustainability. It ensures that households do not revert to unsafe practices, such as using contaminated surface water, during and after relocation.

This necessity for more flood-resilient infrastructure is validated by historical data from Bangladesh. Rahaman et al. (1991) found that only 40% of standard latrines still worked after major flooding, and use among children fell from 88% to 78%. Cocciolo et al. (2021) found something similar for water sources. Community deep tubewells in rural Bangladesh were about 26% less likely to test positive for faecal contamination than other local tubewells, and even this gain was often offset during water transport and storage. This pattern is not unique to Bangladesh. Climate-related hazards routinely destroy WASH infrastructure before people can even form new habits in many parts of the world. Across rural sub-Saharan Africa, roughly one in four water systems are non-functional at any given time, often because of weak maintenance systems rather than the original construction (Foster et al., 2020), and climate shocks add to this burden by damaging infrastructure faster than communities can repair it (Howard et al., 2016). This suggests that the raised platform alone is not enough. It is one part of the system that protects water quality from source to household. Flexible, portable, context-responsive interventions are more likely to be accepted and sustained where shocks repeat. UNICEF (2024) also emphasizes climate-resilient designs, including raised platforms and adaptable materials for keeping WASH functional during high-water-table events and floods.

The current study found that the implementing organisation covered all fuel, transport, and communication costs for its field staff working in the char areas. Reaching these communities required long boat journeys and repeated transport hiring, which would have been financially unsustainable if staff had to pay out of their own pockets. By covering these costs, the organisation allowed field-level implementers to visit regularly and remain consistently present in the community over time. This suggests that, in geographically isolated areas, consistent field presence depends as much on institutional cost coverage as on the technical design of the intervention. Reaching geographically isolated communities is harder and more expensive than serving the mainland. Globally, 62% of rural people have safely managed water compared with 81% in urban areas, reflecting the added cost and difficulty of reaching remote populations (World Bank, 2022).

The study findings also imply that co-financing enables ownership of the latrines, which in turn can ensure long-term maintenance and use. In the chars, extreme poverty often forces households to prioritise immediate survival over WASH investments. By allowing households to contribute through building the latrine and paying some amount for it, the amount of which can depend on

the economic conditions of the beneficiary, the project can foster adoption and acceptability, besides ownership, of the latrines. These findings align with evidence from India (Routray et al., 2015), which indicates that fixed cash payments often exclude the poorest 25% of households, whereas flexible models can considerably increase uptake. Nelson et al. (2021), in a realist review spanning low- and middle-income countries, found that community participation in financing was a consistent predictor of ownership and service longevity. A global review of community-managed water supply found that systems are more sustainable when communities contribute to operating costs at affordable rates and this is combined with government or donor co-financing (Machado, Oliveira & Matos, 2022).

Moreover, the ability to pay digitally, which is through mobile banking, was found to help those who were in remote areas. Evidence from Bangladesh shows that mobile money has a measurable effect on poverty: every one billion Taka (about US\$11.76 million) increase in bKash transactions in 2015 was associated with a 0.71 percentage points reduction in the district poverty rate, with the strongest effect in the poorest districts (Islam, Basher & Haque, 2022). A Bangladesh Bank impact study found that 74% of mobile financial services users reported saving on travel time and transport costs compared with using traditional banks (Rashid, 2025). The findings strongly imply that merging flexible contribution models with digital finance is essential to prevent the exclusion of the most vulnerable households.

Furthermore, the current study suggests that even with facilities in place, success depends on raising awareness so that families understand the value of the infrastructure. To address this, the project conducted primary community awareness sessions for adults. This strategy implies that in char areas, providing hardware alone is insufficient; families need awareness to ensure facilities are actually used and kept clean. In rural Bangladesh, people who took part in a community hygiene programme were about 1.6 times as likely to know correct handwashing practices as those who did not (Siddiqua et al., 2023).

Engaging Class 4 and 5 students gave the project a second route for spreading hygiene knowledge, alongside the sessions held for adults. Reaching children at this early learning stage helps build good hygiene habits, and they then share what they learn at home, passing the lessons on to their

families. This "horizontal transfer" of knowledge from students to households means the project can reach families even when adults are busy with daily or seasonal work.

Research from Bangladesh suggests that this approach can be more effective than adult education alone. A school-based pilot in primary schools found that handwashing with soap after using the toilet increase from 0.7% to 82% (Sultana et al., 2023). Evidence from India supports this as well: when children experience a clean school environment, they come to value hygiene and pass that learning on to their families (Snel, Ganguly & Shordt, 2002). This horizontal transfer of knowledge from students to households has been documented across multiple low-income country settings. McMichael (2019), reviewing school WASH programmes across sub-Saharan Africa and South Asia, found consistent evidence that hygiene messages delivered to children reached adult household members through informal daily interaction. A 2026 systematic review of 33 studies found that school-based hand-hygiene programmes reduced respiratory-infection absences by up to 50% and acute gastroenteritis absences by 36%, and were most effective when they combined education, resources, and behaviour change (Singh, Silburn & Moore, 2026). A limitation of this model is its reliance on a single trained teacher per school, as reported by implementers in this study. The continuity of the sessions, therefore, depends on that teacher's availability, a pattern McMichael (2019) has also documented for school WASH programmes more broadly. The implication is that training more than one teacher per school would help ensure hygiene sessions continue when one teacher is unavailable.

Sustainability in isolated regions also depends on integrating technical projects into existing local governance. Beyond delivering hygiene knowledge, the project ensured the integrity of its implementation by integrating its administrative processes in existing local governance structures. Specifically, the revitalization of the Ward Disaster Management Committees (WDMC) provided a trusted platform for beneficiary selection and project planning. Embedding within the official Union Parishad cycle allows a project to inherit a sustainability pathway that parallel donor-led committees cannot replicate. Whaley & Webster (2011), studying two demand-driven sanitation approaches in Zimbabwe, found that delivery embedded in existing local structures achieved better continuity and maintenance than parallel donor-created bodies. The wider literature points the same way. A scoping review of collaboration between local authorities and civil society organisations for health found that working through local government pools resources and

expertise and can improve service delivery, with the durability of such partnerships depending on sustained trust, funding, and clear working arrangements (Bäck et al., 2025).

Finally, the findings suggest that social legitimacy is a prerequisite for technical acceptance. Implementers improved community acceptance by engaging religious leaders to validate the project's goals. This strategic adaptation recognizes that religious leaders possess the social influence needed to overcome community resistance. A study of an imam-training programme across eight districts of Bangladesh found that people in the trained areas had about twice the knowledge of key health practices compared with before the training (Bari et al., 2026). Religious leaders provided the social trust the project needed to begin its work (Kabir, 2010). The role of trusted community figures in facilitating health behaviour change is well established beyond Bangladesh. Curtis et al. (2009), in a review of hygiene behaviour across 11 countries, found that hygiene adoption is driven by social and emotional motivators such as disgust, nurture, comfort, and affiliation rather than health messaging alone, which is why locally trusted figures matter for acceptance.

While implementers build trust, the model's long-term reliability depends on the frontline workforce. This highlights a critical imbalance; female volunteers remain active because they value social recognition and feel a personal sense of duty, while male volunteers frequently drop out because there is no salary. The implication is that relying solely on volunteerism is an unsustainable strategy; while women reach households that men cannot access, leaving them to pay for their own travel and mobile costs creates a sustainability risk. This aligns with studies of community health volunteers showing that, without pay or practical support, volunteers, especially men, are more likely to become overburdened and drop out over time (Aseyo et al., 2018). This reflects the importance of "organisational readiness" and funding flexibility. If a project covers fuel and communication costs for paid staff, it should do the same for volunteers to ensure the workforce remains stable and capable of navigating the difficult terrain of the chars over the long term.

Overall, this study contributes to the WASH implementation literature by providing evidence from Bangladesh's climate-vulnerable char areas, where recurrent flooding, displacement, poverty, and geographic isolation continually shape how interventions are delivered. By drawing on

implementers' perspectives at multiple levels, it shows that successful WASH implementation in hard-to-reach settings depends not only on technical infrastructure but also on institutional trust, flexible financing, engagement with local governance, and adaptive delivery. WASH implementation in such settings is therefore an ongoing process of adaptation rather than a fixed technical task. For programmes to work in these regions, they need to move away from rigid, one-size-fits-all models and stay flexible enough to respond to displacement, poverty, and the shifting conditions of the chars.

Strengths of the study

This study addresses a significant gap in the WASH literature in Bangladesh, which typically focuses on community members' knowledge and attitudes. By examining the perspectives and experiences of those who deliver WASH services in hard-to-reach areas, this research provides evidence on sustainability and effectiveness from an implementation research lens. A major strength of the study is the inclusion of diverse implementer categories, ranging from senior management to frontline volunteers, which allowed for a multi-level understanding of the project. The qualitative approach also captured rich contextual data from an extremely remote setting, and the in-depth interviews helped capture the lived implementation experience, including the specific barriers, facilitators, and adaptations that shape how projects are delivered in climate-fragile chars. These details rarely appear in routine project reports or quantitative evaluations.

Limitations of the study

There are several limitations to consider when interpreting these results. First, the findings are based on implementers of a single project in a specific geographic setting; therefore, the results may not be transferable to other settings or to broader WASH programmes. Second, as this was the researcher's first experience conducting a formal qualitative study, there was a risk that inexperience in interviewing could affect the depth of the data. To address this, the researcher employed a persistent probing technique, repeatedly asking "why" and "how" questions to move beyond surface-level answers and capture the true essence of the implementers' experiences.

Third, this study adopts a broad, function-based definition of implementer that includes beneficiary households who contributed cash and labour to construction and maintenance under the co-financing model. This is wider than the conventional use of the term, which is often limited to programme staff and volunteers, and findings drawn from these households should be read with this definition in mind. The study did not, however, capture the views of pure beneficiaries who only received the interventions without contributing to their delivery. Triangulating implementer accounts against the experiences of these recipients would require a separate study to provide a complete picture of the project's impact.

Implications for public health policy and practice

The findings of this study offer critical insights for the design of public health interventions in climate-fragile regions. Rather than focusing on generic hygiene knowledge, the study points to the following specific implications:

Climate-adaptive implementation: To maintain health outcomes in displacement-prone areas, policy must shift toward prioritizing flexible, portable, and context-responsive infrastructure. Designs that can be dismantled and relocated ensure that families do not lose access to safe water and sanitation during recurrent environmental shocks.

Working through existing local governance: Successful implementation depends on anchoring projects within existing local structures, such as the Ward Disaster Management Committees (WDMC). By embedding implementation into the official Union Parishad planning cycle, programmes inherit a sustainability pathway that parallel donor-led committees cannot replicate.

Trust and legitimacy: Technical delivery in isolated areas is insufficient without social validation. Utilizing religious leaders is a vital strategy for building community acceptance, overcoming misconceptions, and protecting the integrity of beneficiary selection from political or kinship-based interference.

Durable delivery mechanisms: While the current model reaches households effectively, it rests mostly on the labour of unpaid female volunteers. For WASH programmes to be both effective

and durable, organisations must demonstrate "organisational readiness" by absorbing the practical operational costs of these frontline workers to prevent fatigue and ensure long-term workforce stability.

Chapter 6: Conclusion and recommendations

6.1 Conclusion

This study examined the implementation of WASH interventions in the climate-vulnerable chars of Bogura through the experiences of service providers. The findings demonstrate that successful WASH delivery in such hard-to-reach settings is an ongoing adaptive process rather than a fixed technical task. While hardware resilience, which is defined by portability and elevation, is a vital precondition for service continuity, its effectiveness is deeply linked to how well the project navigates the socio-economic realities of the dwellers.

The research highlights that strategies such as flexible co-financing, mobile-based financial transfers, and school-based reinforcement are not merely project features but essential responses to poverty and geographic isolation. Furthermore, the study underscores that social legitimacy, built through local governance and trusted community leaders, enables technical interventions to take root in politically sensitive landscapes. Ultimately, the perspective of the implementer reveals that sustainability in the chars depends on a "double resilience": the physical resilience of the infrastructure and the organisational resilience of the delivery model. Understanding these dual requirements is essential for designing public health programmes that can withstand the physical and social volatility of climate-fragile regions.

6.2 Recommendations

For programme implementers

- **Extend and Integrate Training Duration:** CRV training should be extended to at least one week to include additional field-based modules. Furthermore, to ensure programme continuity, training could be provided to two teachers per school rather than one, ensuring hygiene sessions do not stop during staff absences.
- **Provide essential field support:** To support the high motivation of volunteers and reduce their personal financial burden, organisations could provide the logistic supports requested by implementers, such as tablets or official SIM cards. These could be returned to the organisation at the end of the project. Providing a modest transport allowance to cover multi-modal travel and official certification would also strengthen their local recognition and help maintain their commitment to the work.

For policymakers

- **Adopt "displacement-friendly" standards:** Public health policy for flood-prone regions could prioritise dismantlable and raised designs as the standard for resilient hardware. Moving away from permanent, static infrastructure would better suit the reality of shifting riverbanks and recurrent relocation.
- **Develop inclusive co-financing frameworks:** To prevent the exclusion of the extremely poor, policies could include a "safety net" within co-financing models. This might involve a waiver for the most vulnerable or allowing in-kind contributions (labour/earth-filling) to replace the entire cash share.
- **Standardize NGO coordination platforms:** The government could formally support and participate in regional coordination platforms. This would reduce the risk of overlapping services and ensure that resources are distributed more equitably across isolated char areas.

For future research

- **Long-term hardware performance:** Future research could track how dismantlable structures perform after multiple relocation cycles to determine the sustainability of such design over several years of displacement.
- **Volunteer motivation:** Further qualitative work could focus on the lived experiences of community volunteers to understand how to design fairer frontline models that do not rely solely on unpaid labour.

Declaration of Use of Artificial Intelligence (AI):

I, Ismat Zaman Urboshi, declare that in preparing this thesis, Artificial Intelligence (AI) tools, including Grammarly, DeepSeek, ChatGPT, Scribbr, and Claude, have been used for sentence articulation, grammatical correction, translation of guidelines and interview transcriptions, and citation formatting. The free or standard versions of these tools were used, within the limits instructed by BRAC JPGSPH. GenAI was not used to generate original arguments, interpret results, or produce final academic content. All substantive ideas, analytical judgments, references, and conclusions are my own and have been independently verified in line with JPGSPH academic integrity guidelines.

References

- Aarons, G. A., Ehrhart, M. G., Farahnak, L. R., & Hurlburt, M. S. (2015). Leadership and organisational change for implementation (LOCI): A randomized mixed method pilot study of a leadership and organisation development intervention for evidence-based practice implementation. *Implementation Science*, 10(1), 11. <https://doi.org/10.1186/s13012-014-0192-y>
- Aarons, G. A., Hurlburt, M., & Horwitz, S. M. (2011). Advancing a conceptual model of evidence-based practice implementation in public service sectors. *Administration and Policy in Mental Health and Mental Health Services Research*, 38(1), 4–23. <https://doi.org/10.1007/s10488-010-0327-7>
- Abadi, A. T., Gizaw, Z., Mekonnen, F. A., & Worku, A. (2022). Water, sanitation, and hygiene service ladders and childhood diarrhea in Haramaya Demographic and Health Surveillance Site, Eastern Ethiopia. *Acta Biomedica*, 93(1), e2022046. <https://doi.org/10.23750/abm.v93i1.11551>
- Ahmed, M. W., Sakib, Q. N., Hasan, M. Z., Mehdi, G. G., Khan, J. A. M., Islam, Z., & Ahmed, S. (2026). Implementation challenges for achieving universal health coverage through social health protection scheme: What can we learn from Bangladesh? *International Journal of Qualitative Studies on Health and Well-being*, 21(1), 2623094. <https://doi.org/10.1080/17482631.2026.2623094>
- Akter, T., & Ali, A. R. M. M. (2014). Factors influencing knowledge and practice of hygiene in Water, Sanitation and Hygiene (WASH) programme areas of Bangladesh Rural Advancement Committee. *Rural and Remote Health*, 14(3), 2628. <https://doi.org/10.22605/RRH2628>
- Akter, T., Ali, A. R. M. M., & Dey, N. C. (2014). Transition over time in household latrine use in rural Bangladesh: A longitudinal cohort study. *BMC Public Health*, 14(1), 721. <https://doi.org/10.1186/1471-2458-14-721>
- Alam, M. S., Billah, M., Hossen, M. R., Awal, F., Alam, M., & Das, R. C. (2025). Climate change and impacts on human health: An experience of coastal region people in Bangladesh. *Climate Resilience and Sustainability*, 4(2), Article e70022. <https://doi.org/10.1002/cli2.70022>
- Aseyo, R. E., Mumma, J., & Cumming, O. (2018). Realities and experiences of community health volunteers as agents of behaviour change: Evidence from an informal settlement in Kenya. *Human Resources for Health*, 16(1), 53. <https://doi.org/10.1186/s12960-018-0320-5>
- Aunger, R., & Curtis, V. (2016). Behaviour centred design: Towards an applied science of behaviour change. *Health Psychology Review*, 10(4), 425–446. <https://doi.org/10.1080/17437199.2016.1219673>
- Bangladesh Red Crescent Society & Swiss Red Cross. (2025). *JAMUNA project annual progress report 2025*. BDRCS.

Bäck, A., Modin Asper, M., Madsen, S., Eriksson, L., Costea, V. A., Hasson, H., & Bergström, A. (2025). Collaboration between local authorities and civil society organisations for improving health: A scoping review. *BMJ Open*, 15(3), Article e092525. <https://doi.org/10.1136/bmjopen-2024-092525>

Bari, S., Basher, S. A., Haque, A. K. E., & Ahmed, S. (2026). Impacts of religious leader training on maternal and child health in underserved communities of Bangladesh. *Frontiers in Reproductive Health*, 8, Article 1764081. <https://doi.org/10.3389/frph.2026.1764081>

Bartram, J., & Cairncross, S. (2010). Hygiene, sanitation, and water: Forgotten foundations of health. *PLOS Medicine*, 7(11), e1000367. <https://doi.org/10.1371/journal.pmed.1000367>

Bartram, J., Baum, R., Coclanis, P. A., Gute, D. M., Kay, D., McFadyen, S., Pond, K., Robertson, W., & Rouse, M. J. (Eds.). (2015). *Routledge handbook of water and health*. Routledge. <https://www.routledge.com/Routledge-Handbook-of-Water-and-Health/Bartram/p/book/9781138495302>

Benneyworth, L., Gilligan, J., Ayers, J. C., Goodbred, S., George, G., Carrico, A., Karim, M. R., Akter, F., Fry, D., Donato, K., & Piya, B. (2016). Drinking water insecurity: Water quality and access in coastal south-western Bangladesh. *International Journal of Environmental Health Research*, 26(5–6), 508–524. <https://doi.org/10.1080/09603123.2016.1194383>

Brown, J., Cairncross, S., & Ensink, J. H. J. (2013). Water, sanitation, hygiene and enteric infections in children. *Archives of Disease in Childhood*, 98(8), 629–634. <https://doi.org/10.1136/archdischild-2011-301528>

Cairncross, S., & Shordt, K. (2004). It does last! Some findings from a multi-country study of hygiene sustainability. *Waterlines*, 22(3), 4–7. <https://doi.org/10.3362/0262-8104.2004.005>

Cairncross, S., Hunt, C., Boisson, S., Bostoen, K., Curtis, V., Fung, I. C. H., & Schmidt, W.-P. (2010). Water, sanitation and hygiene for the prevention of diarrhoea. *International Journal of Epidemiology*, 39(Suppl. 1), i193–i205. <https://doi.org/10.1093/ije/dyq035>

Caldrer, S., Ursini, T., Santucci, B., Motta, L., & Angheben, A. (2022). Soil-transmitted helminths and anaemia: A neglected association outside the tropics. *Microorganisms*, 10(5), 1027. <https://doi.org/10.3390/microorganisms10051027>

Carter, R. C., Tyrrel, S. F., & Howsam, P. (1999). The impact and sustainability of community water supply and sanitation programmes in developing countries. *Water and Environment Journal*, 13(4), 292–296. <https://doi.org/10.1111/j.1747-6593.1999.tb01050.x>

Caruso, B. A., Clasen, T. F., Hadley, C., Yount, K. M., Haardörfer, R., Rout, M., Dasmohapatra, M., & Cooper, H. L. F. (2017). Understanding and defining sanitation insecurity: Women's gendered experiences of urination, defecation and menstruation in rural Odisha, India. *BMJ Global Health*, 2(4), e000414. <https://doi.org/10.1136/bmjgh-2017-000414>

Centre for Policy Dialogue. (2024). *State of the Bangladesh economy in FY2023–24 (Third reading)* [Report]. https://bea-bd.org/assets/articlesPhoto/Page_20240607210239.pdf

Chars Livelihoods Programme. (2012). *Water, sanitation and hygiene in the chars: The CLP's contribution* (Impact Series). Maxwell Stamp PLC.
<https://assets.publishing.service.gov.uk/media/57a08a80e5274a27b2000621/final-WASH-brief.pdf>

Cocciolo, S., Ghisolfi, S., & Habib, A. (2021). *Access to safe drinking water: Experimental evidence from new water sources in Bangladesh* (3ie Impact Evaluation Report 114). International Initiative for Impact Evaluation. <https://3ieimpact.org/evidence-hub/publications/impact-evaluations/access-safe-drinking-water-experimental-evidence-new>

Concern Worldwide. (2021). *Understanding the impact of climate change on poor and vulnerable char people*. <https://admin.concern.net/sites/default/files/documents/2022-01/Understanding%20the%20impact%20of%20climate%20change%20on%20poor%20and%20vulnerable%20Char%20people%202021.pdf>

Contreras, J. D., Islam, M., Mertens, A., Pickering, A. J., Arnold, B. F., Benjamin-Chung, J., Hubbard, A. E., Rahman, M., Unicomb, L., Luby, S. P., Colford, J. M., & Ercumen, A. (2024). Improved child feces management mediates reductions in childhood diarrhea from an on-site sanitation intervention: Causal mediation analysis of a cluster-randomized trial in rural Bangladesh. *Journal of Epidemiology and Global Health*, 14(3), 765–778.
<https://doi.org/10.1007/s44197-024-00210-y>

Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research* (2nd ed.). SAGE Publications.

Cumming, O., & Cairncross, S. (2016). Can water, sanitation and hygiene help eliminate stunting? Current evidence and policy implications. *Maternal & Child Nutrition*, 12(S1), 91–105. <https://doi.org/10.1111/mcn.12258>

Cumming, O., Elliott, M., Overbo, A., & Bartram, J. (2014). Does global progress on sanitation really lag behind water? An analysis of global progress on community- and household-level access to safe water and sanitation. *PLOS ONE*, 9(12), e114699.
<https://doi.org/10.1371/journal.pone.0114699>

Curtis, V., Danquah, L. O., & Aunger, R. V. (2009). Planned, motivated and habitual hygiene behaviour: An eleven country review. *Health Education Research*, 24(4), 655–673.
<https://doi.org/10.1093/her/cyp002>

Damschroder, L. J., Aron, D. C., Keith, R. E., Kirsh, S. R., Alexander, J. A., & Lowery, J. C. (2009). Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. *Implementation Science*, 4(1), 50. <https://doi.org/10.1186/1748-5908-4-50>

Damschroder, L. J., Reardon, C. M., Widerquist, M. A. O., & Lowery, J. (2022). The updated Consolidated Framework for Implementation Research based on user feedback. *Implementation Science*, 17(1), 75. <https://doi.org/10.1186/s13012-022-01245-0>

Department of Public Health Engineering & UNICEF. (2014). *Bangladesh national hygiene baseline survey*. DPHE & UNICEF.

Dickin, S., & Gabrielsson, S. (2023). Inequalities in water, sanitation and hygiene: Challenges and opportunities for measurement and monitoring. *Water Security*, 20, 100143. <https://doi.org/10.1016/j.wasec.2023.100143>

Dryden-Palmer, K. D., Parshuram, C. S., & Berta, W. B. (2020). Context, complexity and process in the implementation of evidence-based innovation: A realist informed review. *BMC Health Services Research*, 20(1), 81. <https://doi.org/10.1186/s12913-020-4942-z>

Foster, T. (2013). Predictors of sustainability for community-managed handpumps in sub-Saharan Africa: Evidence from Liberia, Sierra Leone, and Uganda. *Environmental Science & Technology*, 47(21), 12037–12046. <https://doi.org/10.1021/es402086n>

Gale, N. K., Heath, G., Cameron, E., Rashid, S., & Redwood, S. (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Medical Research Methodology*, 13(1), 117. <https://doi.org/10.1186/1471-2288-13-117>

Given, L. M. (Ed.). (2008). *The SAGE encyclopedia of qualitative research methods* (Vols. 1–2). SAGE Publications. <https://doi.org/10.4135/9781412963909>

Gkouliaveras, V., Kalogiannidis, S., Kalfas, D., & Kotsas, S. (2025). Effects of climate change on health and health systems: A systematic review of preparedness, resilience, and challenges. *International Journal of Environmental Research and Public Health*, 22(2), 232. <https://doi.org/10.3390/ijerph22020232>

Habib, M. A., Babur, K. M. A. R., Islam, M. M., Akter, N., Bari, M. S., Bashir, M. A., & Ali, M. M. (2025). Climate change dynamics and their effects on Bangladeshi agriculture: A systematic review. *Nature-Based Solutions*, 8, 100275. <https://doi.org/10.1016/j.nbsj.2025.100275>

Halder, A. K., Tronchet, C., Akhter, S., Bhuiya, A., Johnston, R., & Luby, S. P. (2010). Observed hand cleanliness and other measures of handwashing behaviour in rural Bangladesh. *BMC Public Health*, 10, 545. <https://doi.org/10.1186/1471-2458-10-545>

Hamilton, A. B., & Finley, E. P. (2019). Qualitative methods in implementation research: An introduction. *Psychiatry Research*, 280, 112516. <https://doi.org/10.1016/j.psychres.2019.112516>

Hanchett, S., Akhter, S., Khan, M. H., Mezulianik, S., & Blagbrough, V. (2003). Water, sanitation and hygiene in Bangladeshi slums: An evaluation of the WaterAid–Bangladesh urban programme. *Environment and Urbanization*, 15(2), 43–56. <https://doi.org/10.1177/095624780301500223>

- Hanchett, S., Krieger, L., Kahn, M. H., Kullmann, C., & Ahmed, R. (2011). Long-term sustainability of improved sanitation in rural Bangladesh. Water and Sanitation Programme, World Bank. <https://documents.worldbank.org/en/official-documents/curated/en/785841468203378342>
- Haque, C. E., & Jakariya, M. (2023). Bengal Delta, charland formation, and riparian hazards: Why is a flexible planning approach needed for deltaic systems? *Water*, 15(13), 2373. <https://doi.org/10.3390/w15132373>
- Hoque, B. A. (2003). Handwashing practices and challenges in Bangladesh. *International Journal of Environmental Health Research*, 13(Suppl. 1), S81–S87. <https://doi.org/10.1080/0960312031000102831>
- Hossain, M. S., Dearing, J. A., Rahman, M. M., & Salehin, M. (2016). Recent changes in ecosystem services and human well-being in the Bangladesh coastal zone. *Regional Environmental Change*, 16(2), 429–443. <https://doi.org/10.1007/s10113-014-0748-z>
- Howard, G., Calow, R., Macdonald, A., & Bartram, J. (2016). Climate change and water and sanitation: Likely impacts and emerging trends for action. *Annual Review of Environment and Resources*, 41, 253–276. <https://doi.org/10.1146/annurev-environ-110615-085856>
- Hueso, A., & Bell, B. (2013). An untold story of policy failure: The Total Sanitation Campaign in India. *Water Policy*, 15(6), 1001–1017. <https://doi.org/10.2166/wp.2013.032>
- Hulland, K. R. S., Chase, R. P., Caruso, B. A., Swain, R., Biswal, B., Sahoo, K. C., Panigrahi, P., & Dreibelbis, R. (2015). Sanitation, stress, and life stage: A systematic data collection study among women in Odisha, India. *PLOS ONE*, 10(11), e0141883. <https://doi.org/10.1371/journal.pone.0141883>
- Hunter, D. J., & Howes, D. (2020). Defining exploratory-descriptive qualitative (EDQ) research and considering its application to healthcare. *GSTF Journal of Nursing and Health Care*, 7(1). https://doi.org/10.5176/2382-5537_7.1.274
- Hutton, G., & Chase, C. (2016). The knowledge base for achieving the Sustainable Development Goal targets on water supply, sanitation and hygiene. *International Journal of Environmental Research and Public Health*, 13(6), 536. <https://doi.org/10.3390/ijerph13060536>
- Institute for International Law of Peace and Armed Conflict (IFHV) & Bündnis Entwicklung Hilft. (2025). *WorldRiskReport 2025*. Bündnis Entwicklung Hilft. https://www.misereor.org/fileadmin/user_upload_misereororg/publication/en/worldriskreport-2025.pdf
- Islam, M. R. (2021). Water, sanitation and hygiene practices among disaster-affected char land people: Bangladesh experience. *Natural Hazards*, 107, 2787–2804. <https://doi.org/10.1007/s11069-021-04623-x>

Islam, M. S., Basher, S. A., & Haque, A. K. E. (2022). *The impact of mobile money on long-term poverty: Evidence from Bangladesh* (SSRN Scholarly Paper No. 4128510). Social Science Research Network. <https://doi.org/10.2139/ssrn.4128510>

Islam, M. S., Basher, S. A., Haque, A. K. E., & Ahmed, S. (2026). *Barriers and challenges of implementing WASH FIT in healthcare facilities in Bangladesh* [Preprint]. Research Square. <https://doi.org/10.21203/rs.3.rs-8908475/v1>

Kar, K., & Chambers, R. (2008). *Handbook on community-led total sanitation*. Plan International & Institute of Development Studies. <https://www.communityledtotalsanitation.org/>

Khan, A. E., Scheelbeek, P. F. D., Shilpi, A. B., Chan, Q., Mojumder, S. K., Rahman, A., Haines, A., & Vineis, P. (2014). Salinity in drinking water and the risk of (pre)eclampsia and gestational hypertension in coastal Bangladesh: A case-control study. *PLOS ONE*, 9(9), e108715. <https://doi.org/10.1371/journal.pone.0108715>

Kundu, A. K. (2023). A study on how climate change affects the water, sanitation, and hygiene (WASH) sectors in Barguna Sadar Upazila, Bangladesh. *International Journal of Environment and Climate Change*, 13(11), 2684–2696. <https://doi.org/10.9734/ijecc/2023/v13i113437>

Luby, S. P., Rahman, M., Arnold, B. F., Unicomb, L., Ashraf, S., Winch, P. J., Stewart, C. P., Begum, F., Hussain, F., Benjamin-Chung, J., Leontsini, E., Naser, A. M., Parvez, S. M., Hubbard, A. E., Lin, A., Nizame, F. A., Jannat, K., Ercumen, A., Ram, P. K., ... Colford, J. M. (2018). Effects of water quality, sanitation, handwashing, and nutritional interventions on diarrhoea and child growth in rural Bangladesh: A cluster randomised controlled trial. *The Lancet Global Health*, 6(3), e302–e315. [https://doi.org/10.1016/S2214-109X\(17\)30490-4](https://doi.org/10.1016/S2214-109X(17)30490-4)

Machado, A. V. M., Oliveira, P. A. D., Matos, P. G., & Santos, A. S. P. (2023). Strategies for achieving sustainability of water supply systems in rural environments with community management in Brazil. *Water*, 15(12), 2232. <https://doi.org/10.3390/w15122232>

Mara, D., Lane, J., Scott, B., & Trouba, D. (2010). Sanitation and health. *PLOS Medicine*, 7(11), e1000363. <https://doi.org/10.1371/journal.pmed.1000363>

Matin, I., & Taher, R. (2001). The changing emphasis of disasters in Bangladesh NGOs. *Disasters*, 25(3), 227–239. <https://doi.org/10.1111/1467-7717.00174>

McMichael, C. (2019). Water, sanitation and hygiene (WASH) in schools in low-income countries: A review of evidence of impact. *International Journal of Environmental Research and Public Health*, 16(3), 359. <https://doi.org/10.3390/ijerph16030359>

Mehta, L., & Movik, S. (Eds.). (2011). *Shit matters: The potential of community-led total sanitation*. Practical Action Publishing. <https://www.ids.ac.uk/publications/shit-matters-the-potential-of-community-led-total-sanitation/>

- Merid, M. W., Teshale, A. B., Alem, A. Z., Yeshaw, Y., & Worku, M. G. (2023). Impact of access to improved water and sanitation on diarrhea reduction among rural under-five children in low and middle-income countries: A propensity score matched analysis. *BMC Public Health*, 23(1), 1145. <https://doi.org/10.1186/s12889-023-15998-2>
- Mertz, O., Halsnæs, K., Olesen, J. E., & Rasmussen, K. (2009). Adaptation to climate change in developing countries. *Environmental Management*, 43(5), 743–752. <https://doi.org/10.1007/s00267-008-9259-3>
- Mohiuddin, M. (2022). Impact of riverbank erosion on livelihood of char land people in Jamalpur district of Bangladesh. *Jagannath University Journal of Life and Earth Sciences*, 7(2), 95–108.
- Moore, G. F., Evans, R. E., Hawkins, J., Littlecott, H., Melendez-Torres, G. J., Bonell, C., & Murphy, S. (2019). From complex social interventions to interventions in complex social systems: Future directions and unresolved questions for intervention development and evaluation. *Evaluation*, 25(1), 23–45. <https://doi.org/10.1177/1356389018803219>
- Mosler, H.-J. (2012). A systematic approach to behaviour change interventions for the water and sanitation sector in developing countries: A conceptual model, a review, and a guideline. *International Journal of Environmental Health Research*, 22(5), 431–449. <https://doi.org/10.1080/09603123.2011.650156>
- Nelson, S., Drabarek, D., Jenkins, A., Negin, J., & Abimbola, S. (2021). How community participation in water and sanitation interventions impacts human health, WASH infrastructure and service longevity in low-income and middle-income countries: A realist review. *BMJ Open*, 11(12), e053320. <https://doi.org/10.1136/bmjopen-2021-053320>
- Nilsen, P. (2015). Making sense of implementation theories, models and frameworks. *Implementation Science*, 10(1), 53. <https://doi.org/10.1186/s13012-015-0242-0>
- Nishu, N. A., Roy, T., Razu, S. R., & Akter, S. (2025). Barriers to accessing water, sanitation, and hygiene services for persons with disabilities in the southwestern region of Bangladesh. *SAGE Open*, 15(3), 21582440251380013. <https://doi.org/10.1177/21582440251380013>
- Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*, 42(5), 533–544. <https://doi.org/10.1007/s10488-013-0528-y>
- Palli Karma-Sahayak Foundation. (2020). *Bangladesh Rural Water, Sanitation and Hygiene for Human Capital Development Project*. PKSf. <https://www.pksf-bd.org/>
- Patton, M. Q. (2015). *Qualitative research & evaluation methods: Integrating theory and practice* (4th ed.). SAGE Publications.

Peters, D. H., Adam, T., Alonge, O., Agyepong, I. A., & Tran, N. (2013). Implementation research: What it is and how to do it. *BMJ*, 347, f6753. <https://doi.org/10.1136/bmj.f6753>

Pickering, A. J., Djebbari, H., Lopez, C., Coulibaly, M., & Alzua, M. L. (2015). Effect of a community-led sanitation intervention on child diarrhoea and child growth in rural Mali: A cluster-randomised controlled trial. *The Lancet Global Health*, 3(11), e701–e711. [https://doi.org/10.1016/S2214-109X\(15\)00144-8](https://doi.org/10.1016/S2214-109X(15)00144-8)

Proctor, E., Silmere, H., Raghavan, R., Hovmand, P., Aarons, G., Bunger, A., Griffey, R., & Hensley, M. (2011). Outcomes for implementation research: Conceptual distinctions, measurement challenges, and research agenda. *Administration and Policy in Mental Health and Mental Health Services Research*, 38(2), 65–76. <https://doi.org/10.1007/s10488-010-0319-7>

Rahaman, M. M., Aziz, K. M., Hasan, M. S., & Huttly, S. R. (1991). Effects of floods on the use and condition of pit latrines in rural Bangladesh. *Journal of Diarrhoeal Diseases Research*, 9(3), 212–217.

Rahman, H., & Asad, M. A. M. (2022). Role of an NGO in the poverty reduction of the char dwellers in Kurigram district, Bangladesh. *Bangladesh Journal of Political Economy*, 38(2), 99–114. <https://doi.org/10.56138/bjpe.dec2205>

Rahman, M. M., Suchi, M. N. J., Shahide, A. M. S., Hossain, M. T., Alam, E., & Islam, M. K. (2025). Flood risk in char community: An evidence-based study in Bangladesh. *Journal of Flood Risk Management*, 18(2), e70084. <https://doi.org/10.1111/jfr3.70084>

Rashid, M. M. (2025). The impact of mobile financial services in Bangladesh: Usage, benefits, and challenges. *World Journal of Advanced Engineering Technology and Sciences*, 16(2), 271–277. <https://doi.org/10.30574/wjaets.2025.16.2.1290>

Routray, P., Schmidt, W.-P., Boisson, S., Clasen, T., & Jenkins, M. W. (2015). Socio-cultural and behavioural factors constraining latrine adoption in rural coastal Odisha: An exploratory qualitative study. *BMC Public Health*, 15, 880. <https://doi.org/10.1186/s12889-015-2206-3>

Routray, P., Torondel, B., Clasen, T., & Schmidt, W.-P. (2017). Women's role in sanitation decision making in rural coastal Odisha, India. *PLOS ONE*, 12(5), e0178042. <https://doi.org/10.1371/journal.pone.0178042>

Saatchi, M., Khankeh, H. R., Shojafard, J., Barzanji, A., Ranjbar, M., Nazari, N., Mahmodi, M. A., Ahmadi, S., & Farrokhi, M. (2024). Communicable diseases outbreaks after natural disasters: A systematic scoping review for incidence, risk factors and recommendations. *Progress in Disaster Science*, 23, 100334. <https://doi.org/10.1016/j.pdisas.2024.100334>

Saha, O. R., & Mazumder, M. H. (2025). Riverbank migration and island dynamics at the Padma–Meghna confluence: A multi-temporal analysis of erosion and deposition patterns. *Geomatica*, 77(2), 100082. <https://doi.org/10.1016/j.geomat.2025.100082>

Sarker, M. H., Huque, I., & Alam, M. (2003). Rivers, chars and char dwellers of Bangladesh. *International Journal of River Basin Management*, 1(1), 61–80. <https://doi.org/10.1080/15715124.2003.9635193>

Sarker, M. N. I., Alam, G. M. M., Firdaus, R. B. R., Biswas, J. C., Islam, A. R. M. T., Raihan, M. L., Hattori, T., Alam, K., Joshi, N. P., & Shaw, R. (2022). Assessment of flood vulnerability of riverine island community using a composite flood vulnerability index. *International Journal of Disaster Risk Reduction*, 82, 103306. <https://doi.org/10.1016/j.ijdr.2022.103306>

Shoab, A. K., Nasim, M. I., Sen, T., et al. (2026). Great strides, yet a long way to go: A comparative analysis of WASH conditions and associated sociodemographic factors from national hygiene surveys, 2014 and 2018. *Water and Environment Journal*. Advance online publication. <https://doi.org/10.1111/wej.70009>

Siddiqua, T. J., Choudhury, N., Haque, M. A., Farzana, F. D., Ali, M., Naz, F., Ahmed, S. M. T., Rahman, S. S., Faruque, A. S. G., & Ahmed, T. (2023). Assessing the impact of a handwashing knowledge and practices programme among poor households in rural Bangladesh: A cluster-randomized pre-post study. *The American Journal of Tropical Medicine and Hygiene*, 109(3), 697–704. <https://doi.org/10.4269/ajtmh.21-0555>

Singh, S., Silburn, S., & Moore, D. (2026). Hand hygiene practices in school populations: Assessing their impact on infectious disease outbreaks. *Journal of Paediatrics and Child Health*. Advance online publication. <https://doi.org/10.1111/jpc.70311>

Snel, M., Ganguly, S., & Shordt, K. (2002). School Sanitation and Hygiene Education - India: Resource book (Technical Paper Series 39). IRC International Water and Sanitation Centre. https://www.susana.org/_resources/documents/default/2-423-snel-et-al-2002-sshe-resource-book-irc-en.pdf

Sommer, M., Ferron, S., Cavill, S., & House, S. (2015). Violence, gender and WASH: Spurring action on a complex, under-documented and sensitive topic. *Environment and Urbanization*, 27(1), 105–116. <https://doi.org/10.1177/0956247814564528>

Stirman, S. W., Baumann, A. A., & Miller, C. J. (2019). The FRAME: An expanded framework for reporting adaptations and modifications to evidence-based interventions. *Implementation Science*, 14(1), 58. <https://doi.org/10.1186/s13012-019-0898-y>

Sultana, F., Khan, S. M., Rahman, M., Winch, Peter J., Luby, S. P., & Unicomb, L. (2023). Sustaining an elementary school-based hygiene intervention in Bangladesh by forming 'hygiene committees': A pilot study. *Journal of Water, Sanitation and Hygiene for Development*, 13(10), 749–763. <https://doi.org/10.2166/washdev.2023.191>

Tillett, W., & Jones, O. (2021). *Rural sanitation programming in challenging contexts: A desk-based review* (SLH Learning Paper No. 11). The Sanitation Learning Hub, Institute of Development Studies.

Tseole, N. P., Mindu, T., Kalinda, C., & Chimbari, M. J. (2022). Barriers and facilitators to water, sanitation and hygiene (WASH) practices in Southern Africa: A scoping review. *PLOS ONE*, 17(8), e0271726. <https://doi.org/10.1371/journal.pone.0271726>

UNICEF. (2019). *Progress on household drinking water, sanitation and hygiene 2000–2017: Special focus on inequalities*. United Nations Children's Fund. <https://www.unicef.org/reports/progress-on-drinking-water-sanitation-and-hygiene-2019>

UNICEF. (2020). *Reaching the unreached: Building blocks for sustainable progress on water, sanitation and hygiene in the SDGs*. United Nations Children's Fund. <https://www.unicef.org/media/73341/file/Reaching-the-unreached-2020.pdf>

UNICEF & WHO. (2023). *Progress on household drinking water, sanitation and hygiene 2000–2022: Special focus on gender* (Joint Monitoring Programme report). World Health Organisation & United Nations Children's Fund. <https://washdata.org/reports/jmp-2023-wash-households>

Unicomb, L., Horng, L., Alam, M.-U., Halder, A. K., Shoab, A. K., Ghosh, P. K., Opel, A., Islam, M. K., & Luby, S. P. (2018). Health-care facility water, sanitation, and health-care waste management basic service levels in Bangladesh: Results from a nation-wide survey. *American Journal of Tropical Medicine and Hygiene*, 99(4), 916–923. <https://doi.org/10.4269/ajtmh.18-0123>

WaterAid. (2009). *Towards total sanitation: Socio-cultural barriers and triggers to total sanitation in West Africa*. WaterAid. ([A](#) Confirm year on the report's title page.)

WaterAid. (2020). *Mission-critical: Invest in water, sanitation and hygiene for a healthy and green economic recovery*. WaterAid. <https://www.wateraid.org/uk/sites/g/files/jkxoof291/files/mission-critical.pdf>

Welle, K. (2006). *Well-being and health impacts of improved household sanitation: Literature review for WELL*. WELL, Loughborough University. https://bdd.pseau.org/outils/ouvrages/well_health_impacts_of_improved_household_sanitation_2006.pdf

Whaley, L., & Webster, J. (2011). The effectiveness, sustainability and scalability of community-led total sanitation: A review. *Journal of Water, Sanitation and Hygiene for Development*, 1(1), 20–36. <https://doi.org/10.2166/washdev.2011.014>

WHO. (2018). *Guidelines on sanitation and health*. World Health Organisation. <https://www.who.int/publications/i/item/9789241514705>

WHO. (2023). *Climate change and health* [Fact sheet]. World Health Organisation. <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>

WHO & UNICEF. (2017). *Progress on drinking water, sanitation and hygiene: 2017 update and SDG baselines* (Joint Monitoring Programme report). World Health Organisation & United Nations Children's Fund. (Cited in text as WHO/UNICEF JMP, 2017 — basic-latrine definition.)

WHO & UNICEF. (2021). *Progress on household drinking water, sanitation and hygiene 2000–2020: Five years into the SDGs* (Joint Monitoring Programme report). World Health Organisation & United Nations Children's Fund. <https://washdata.org/reports/jmp-2021-wash-households>

Wolf, J., Hunter, P. R., Freeman, M. C., Cumming, O., Clasen, T., Bartram, J., Higgins, J. P. T., Johnston, R., Medlicott, K., Boisson, S., & Prüss-Ustün, A. (2018). Impact of drinking water, sanitation and handwashing with soap on childhood diarrhoeal disease: Updated meta-analysis and meta-regression. *Tropical Medicine & International Health*, 23(5), 508–525. <https://doi.org/10.1111/tmi.13051>

World Bank. (2022). Global Water Security & Sanitation Partnership annual report 2022. <https://www.worldbank.org/en/topic/water/publication/global-water-security-and-sanitation-partnership-annual-report-2022>

Yimenu, A. A., Gemechu, M. T., Shimber, E. T., & Ndugga, P. (2026). Barriers to water, sanitation, and hygiene (WASH) cluster coordination during emergencies in sub-Saharan Africa: A scoping review. *PLOS Water*, 5(2), e0000434. <https://doi.org/10.1371/journal.pwat.0000434>

Zaman, M., & Alam, M. (Eds.). (2021). *Living on the edge: Char dwellers in Bangladesh*. Springer. <https://doi.org/10.1007/978-3-030-73591-3>

Appendices

1. Information sheet

Information Sheet for Key Informant Interview (KII)
BRAC James P. Grant School of Public Health (JPGSPH), BRAC University
Title of the study: Understanding Implementers' Perspectives on the Barriers and Facilitators of WASH Interventions under the JAMUNA Project in Climate-Vulnerable Char Areas of Bogura, Bangladesh: A Qualitative Implementation Research Study

Dear participant, Greetings!

My name is Ismat Zaman Urboshi, and I come from the James P. Grant School of Public Health, BRAC University (JPGSPH BRACU). We are conducting a study on JAMUNA Projects in collaboration with the Bangladesh Red Crescent Society (BDRCS), funded by the Swiss Red Cross (SRC).

Serial no.: MPH-2025-025

Aim of the study: This study aims to understand the barriers and facilitator affecting the implementation of the interventions on WASH of the JAMUNA programme among the char areas of Bogura, Bangladesh which is vulnerable to climate change.

To gain understanding of implementers' adaptive strategies to manage implementation challenges in these contexts is also the study's aim.

The study also aims to understand the adaptive strategies used by implementers to address implementation challenges in these contexts.

Justification of participation: It is self-evident that WASH experiences influence implementation of activities and their adaptation in context. Their perspective is crucial to informing adaptations to the programme, including barriers and facilitators in context and how to address them. That will also be helpful for the sustainability of interventions in flood-prone and resource-constrained areas.

Procedure: A semi-structured interview will be conducted upon your agreement. The interview will last approximately 40-50 minutes. You will be asked questions about your experience delivering WASH activities, the challenges you faced, what helped the intervention run smoothly, and how you adjusted your approach in the interventions of improved latrines, DRR tubewells, hygiene sessions, and maintenance work. The interview will be audio recorded, and photos may be taken when relevant; this will be done only for research purposes.

Potential Risks and Benefits of Participation: There is no physical or psychological risk associated with participation. You may choose not to answer any question without penalty.

This work does not offer any direct financial gain or personal benefit. Your insights will help improve how future WASH programmes are designed and delivered in climate-vulnerable and flood-prone areas; thus, this will support interventions that better fit local needs and can be maintained over time.

Confidentiality and anonymity: All participant information will be confidential. The research team will ensure that audio recording and transcriptions will only be accessible by members of the research team and kept on password protected devices. To ensure that no personally identifiable information will be part of any publication, presentation or report all data will be anonymized during transcription. Supervisors or project authorities will not receive any notification on who agrees or declines to participate.

Nature of participation: This study is, voluntary. You have the choice not to participate, or to skip any question you may not want to answer, or to not continue with the interview without penalty or negative consequences. Your professional function or evaluations, contracts, benefits

or standing in the project or institution will not be affected if you decline or submit a withdrawal from the study.

Recruitment and consent procedures are designed to minimize any perceived pressure (for example, invitations are sent broadly rather than through direct supervisory channels), and no supervisors or higher authorities will be present during the interview.

If at any time you experience discomfort, the interview will be paused or stopped immediately according to your preference.

Without your explicit consent, no photograph will be taken or used for any purpose.

If you wish to withdraw your participation after the interview, you may contact us within 24 hours at the following email.

Use of AI: Translation of the transcribed conversation will be done using tools that function based on artificial intelligence. This will be done under the direct supervision of the researchers, where participants' identification will be preserved with confidentiality. No identifiable data will be uploaded to AI platforms, and transcripts will be de-identified before AI-assisted processing.

Contact information:

If you have any further queries about the research project, please contact Ismat Zaman Urboshi at ismat.zaman.urboshi@g.bracu.ac.bd.

For ethical concerns, contact the Institutional Review Board: +801993379512. Email:

irb-jpgsph@bracu.ac.bd.

List of the Investigators:

1. Ismat Zaman Urboshi, JPGSPH, BRAC University.

2. Dr. Mrityika Barua (Primary Supervisor), JPGSPH, BRAC University.
3. Dr. Humayra Binte Anwar (Co-Supervisor), JPGSPH, BRAC University.
4. Muhammad Abdual Mannan (Mentor), JPGSPH, BRAC University.
5. Sharmin Akter Shitol (Mentor), JPGSPH, BRAC University.

2. Consent form

Consent Form

Title of the study: Understanding Implementers' Perspectives on the Barriers and Facilitators of WASH Interventions under the JAMUNA Project in Climate-Vulnerable Char Areas of Bogura, Bangladesh: A Qualitative Implementation Research Study

If you agree to participate in this study, please confirm by putting your signature/thumbprint.

Signature/Thumbprint of participant

Date: _____

Thank you for your cordial cooperation.

Do you give permission for the interview to be audio recorded?

☐ Yes

☐ No

*** Please note that at any point during the interview, you can ask the interviewer to turn off the recording device.*

Do you give permission to share your findings?

☐ Yes

☐ No

Do you give permission to take photos?

☐ Yes

☐ No

Do you give permission to share the photos?

☐ Yes

☐ No

*** Refusal to allow photography will not affect participation.*

In some cases, we may contact you after the interview for a brief follow-up discussion or to confirm details you shared. May we contact you again in the future if we need to follow up?

☐ Yes

☐ No

Do you have any questions?

☐ Yes

☐ No

State the question: _____

Interviewer Name:

Interviewer signature: _____

Date:

3. Semi-structured guidelines

Guideline 1: for officials

Guideline for Key Informant Interview (KII)	
Informant: SRC Country Manager/ BDRCS Programme Manager/ BDRCS Project Coordinator/ Project Officer (Bogura District)/ BDRCS Field Officer (Kazla Union)/ Member of partner NGO	
Name of the Interviewer:	
Interview Start Time:	
Interview End Time:	
Note Taker:	
Date:	

Introduction to the Interview: ● Introduction of the interviewer, study context, study purpose, and obtaining the informant's consent. ● Upon the informant's verbal consent, the audio recording will be started.

- The informants will be asked to introduce themselves and provide their demographic information.
- This discussion is not intended to evaluate individual performance. There are no right or wrong answers. We are interested in your experience and perspectives.
- All information will remain confidential and will be used only for research purposes. The interview will start.

Name of the informant:	
Designation of the informant:	
Institution:	
Duration of the current role:	
Name of the village/union	
Total years of experience in WASH or related sectors	
Previous experience working in char or climate-vulnerable areas	☐ Yes ☐ No

	If yes, for _____ years
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Section 1: Role and Responsibilities		
	Main Question	Probing Questions / Instructions
** No 1 question will be asked to all		
1	Can you describe your current role and responsibilities related to the Jamuna Project?	• How long have you been working in this role? • What are your key responsibilities related to this programme?
** No 2 question will be asked to all		
2	How are you involved in the WASH activities of the JAMUNA project?	• What are your key responsibilities related to WASH interventions?
3.	What are the necessary WASH components for which you are directly responsible?	• Household latrines • DRR tubewells • Hygiene promotion • Repair & maintenance

4.	How do you ensure these responsibilities?	• What method or methods is/are used to oversee or regulate such actions? • Does this vary across situations? If yes, why? How do you manage them? • Primarily, with whom do you work? • How do you coordinate with the team?
Section 2: Description of WASH Interventions		
5.	Could you describe how the WASH interventions are currently being implemented in the field?	Household Latrines/ DRR Tubewells: • How are beneficiaries identified? • Based on what characteristics are the beneficiaries identified? Can you share?
6.	Please tell me about all the activities related to the implementation of household latrines one by one.	• How are the installation sites decided? Who provides materials and technical support? • How are construction materials supplied? Can you tell me about the cost? How is it managed? • Tell us something about the latrines. How is it designed? What are the special features?
7.	Please tell me about all the	DRR Tubewells:

	activities related to the implementation of DRR Tubewells one by one.	● How are beneficiaries identified? ● Based on what characteristics are the beneficiaries identified? Can you share? ● How are installation sites selected? ● Tell about the platform height (for char condition) ● Who is responsible for technical approval? ● How are construction materials supplied? ● What are the sharing procedures among the households? ● Is there any community contribution? ● Can you tell me about the cost? How is it managed?
8.	Please tell me about all the activities related to the hygiene sessions.	Hygiene Sessions: ● How do you arrange the members for the sessions? ● Who becomes a member? ● What kind of information is given? ● How the topics were selected?

		● Where is it given? ● Who gives the information? ● Tell us about their response. ● What kind of discussions happen in the meetings? ● Are there any materials used? Tell us about that.
9.	Could you please tell me about the repair and maintenance process?	Repair & Maintenance: ● What is the criterion for repairing the damage? To whom are you providing the services? ● What is the repair process? ● Who monitors damaged facilities? ● How are construction materials supplied? ● Is there any community contribution? Can you tell me about the cost? ● How do you evaluate the progress?
10.	How do you identify where these interventions should take place?	● How do these interventions fit the char context of Bogura? ● Were any characteristics of char areas

		considered during intervention design? Can you give us an example? • Are there situations where the context influences how activities are carried out? How do you manage them? Can you give us an example? • Do you see these interventions as a good fit to the needs of the community? Why or why not?
11.	Are there situations, if any, in which implementations vary?	• Why? • How do you manage them? Could you please give an example?
Section 3: Implementation Experience		
<i>** No 12 will be asked to Programme Manager, Project Coordinator, Project Officer, Field Officer</i>		
12.	Has there been any change compared to the initial phase?	• If yes, what are they? • What factors influenced these changes? • Did you observe any effects following these changes? • Were there any outcomes that were not anticipated at the beginning? Why does that outcome occur? Please tell us a bit in detail.

**** No 13- Programme Manager, Programme Coordinator, Project Officer, Field Officer, NGO**

13.	How would you describe your experience across different stages of implementation?	• How would you describe what has worked well or not worked well in the implementation so far? • Why did that work well? Can you provide a specific example? • Why did that not work well? • How did you solve these challenges?
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Section 4: Organisational Context (Inner Setting)

**** all informants**

14.	Please tell us what facilities are available for proper implementation.	• Are there adequate facilities? (e.g., adequate human resources, funding, equipment, materials, etc.)
15.	Tell us about the manpower involved in the intervention.	• Is the manpower sufficient? If not, how do you manage that?
16.	Tell us about the economic capability of implementing the intervention.	
17.	Kindly tell us about the	• What is the role of Union Parishad?

	different stakeholders involved in this project.	• What is the role of DPHE? • What is the role of NGOs? How does coordination take place among the different stakeholders involved in this project? • Please give a description of the total collaboration experience. • Do you face any challenges during coordination? How did you resolve that?
<i>Q-18- Programme Manager, Programme Coordinator, Project Officer, Field officer</i>		
18.	What kind of monitoring and supervision system is in place?	• How did you evaluate the interventions? • What are the methods used to gather or record data? • How often are review meetings held? • How is feedback given?
<i>Q-19- All informants</i>		
19.	What training and capacity building activities were you or your team involved in related to the JAMUNA WASH interventions if any?	• What kind of activities were those? • What was the planning or structure of these training activities? • For whom were the training sessions

		conducted? • Who takes the training? • What is the frequency of the training? • What considerations informed the selection of training topics? • How did training fit into the overall implementation approach?
Section 5: Contextual and Environmental Factors (Outer Setting)		
<i>Q-20 ** Project Manager, Project Officer, Field Officer, NGO</i>		
20.	Are there any contextual conditions that influenced how activities were carried out?	• What types of natural or seasonal conditions are common in this area? • What type of variation do you normally face during implementation? • Does the accessibility of the interventions in these areas change across seasons? How does the accessibility change across the seasons? • Are there any contingency plans? • How do you ensure continuity of services during this type of situation? • How do these conditions interact with

		implementation activities? In what ways? Can you give an example?
Q-21 ** <i>Project Manager, Project Officer, Field Officer, NGO</i>		
21.	Does the local context influence implementation?	• If yes, how? • How is it related to the infrastructure of latrines and DRR tubewells? • How is it related to the accessibility of the interventions to the areas? • How does the community's livelihood pattern influence participation in the interventions? Especially in construction-related intervention? • Does this affect their participation in the awareness session? • What do you do to ensure their (communities') participation?
Q-22 ** <i>Project Officer, Field Officer, NGO</i>		
** <i>Perception of Programme Manager</i>		
22.	How do community norms and local practices shape the implementation and use of WASH interventions?	• Are there any practices that support the adoption of the interventions? Can you give an example? • How do local practices interact with implementation activities? Can you give an

		example? ● Did you face any resistance from the community? What type of resistance? Please explain.
<i>** for all</i>		
23.	How do community members respond to WASH interventions?	● What was their participation in latrine construction? ● What was their participation in the DRR tubewell concentration? ● What was their view on the awareness session? ● What is your view on their overall participation? How to improve it?
<i>Q-24- All informants</i>		
24	What factors supported the implementation process in this setting?	● Who or what played a helpful role? ● How did that support influence implementation? ● Can you share an example?
<i>Q-25- Project Manager, Project Officer, Field Officer, NGO</i>		
25.	How do you balance responsibilities related to the	● How does this work in practice?

	JAMUNA project with your other professional duties?	• Does this balance change at different times of implementation? • What factors influence how responsibilities are managed? Can you give us an example?
Section 7: Adaptation and Mitigation		
<i>Q-26 Programme Manager, Programme Coordinator, Project Officer</i> ** Field officer- How do you respond? (operational response)		
26	When implementation conditions change, how does your team usually respond?	• How do you try to mitigate? • How do you adjust the plans? • What kinds of responses are common? • Who partakes in decision-making? • Does the school have a plan to change plans? • Can you tell us about the procedure?
Section 8: Sustainability and Reflection		
27.	What factors affect sustainability of these WASH interventions?	• Please tell us about financial support. • What is the community approach? • What about institutional commitment?

		• What about other partner organisations? • What about manpower?
28.	In your opinion, which intervention seems most sustainable in this context? Why?	
29.	What improvements would you suggest for the implementation?	

Guideline 2: for teachers

Guideline for Key Informant Interview (KII)	
Informant: Primary School Teacher (Class 4-5)	
Name of the Interviewer:	
Interview Start Time:	
Interview End Time:	
Note Taker:	
Date:	

Introduction to the Interview: ● Introduction of the interviewer, the context of the study, the purpose of the study, and obtaining the informant's consent. ● Upon the informant's verbal consent, the audio recording will be started. ● The informants will be asked to introduce themselves and provide their demographic information. ● The interview will start.
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Name of the informant:	
Designation of the informant:	
Name of School:	
Classes Taught	
Years of Teaching Experience:	
Name of the village/union	
Experience with JAMUNA WASH Sessions (duration)	

Section 1: Role and Involvement		
	Main Question	Probing Questions
1.	Are you able to tell me what you have done and how you have been involved in WASH awareness within the	- Which classes do you teach? - What do you teach? - From where did you learn about the programme?

	school?	• How are you involved in the WASH sessions for students? • Is there any routine for the sessions? Is it part of the normal school curriculum? • How many sessions did you conduct? • Can you describe how session responsibilities are divided and how decisions are made about who covers which topics? • What were the time of initiation and completion of the sessions and how many times in week/month were they held?
2.	What kind of guidance or support did you get in conducting these sessions?	• Were you trained/counselled? • What are the take-aways from this training course? • Who gave the instructions/training? • How do you think that training was performed?
Section 2: Description of Awareness Sessions		
3.	Can you describe how the WASH awareness sessions were conducted in your school?	• Please tell us the process one by one. • What topics were discussed during the sessions? • Based on what were the topics selected? • How were lessons structured- practical or

		theoretical? • Can you tell us about the materials used during the sessions? • Is there any relevance of study topics and materials to the context of this region? How? Can you give us an example? • Are there any hard materials that are used in the sessions? • How many teachers are involved in these sessions? • What is the other teacher's role? • What is your opinion on the appropriateness of these materials? • Who provided these materials?
4.	4. What practical/ demonstration sessions have you taken with pupils? (if relevant)	• What practical activities did it involve? Have you been given any directions? • How were students involved in these sessions?
Section 3: Experience of Implementation		
5.	How was your experience delivering these WASH sessions to students?	• How did students generally respond to the sessions? How to improve their response? • Were there moments that felt different from

		regular classroom teaching?
6.	Which parts of the sessions felt easier to conduct?	• Why did you think so? • Can you give an example?
7.	Did participants have to work extra on any segments of the sessions?	• In what way did they require extra effort? • How did you mitigate the challenges?
8.	How would you describe the level of participation in these sessions?	
Section 4: School and Community Context (Inner & Outer Setting)		
9.	What is the role of the school environment in the delivery of these sessions?	• How was the time for class scheduled? • Is there any reason why they chose this time?
10.	Please tell us what facilities are available for conducting these sessions.	• Are there adequate facilities? (e.g., adequate human resources, funding, equipment, etc.)
11.	Tell us about the teachers involved in the intervention.	• Is it sufficient? If not, how do you manage that? • How were these sessions received by the teachers?
12.	When planning or	• Who would help you in these sessions?

	implementing WASH sessions, how would you work with others, for example other teachers or school staff?	• What is the teacher's role? • Are there any overlap or adjustment of roles in the situations? • What do you do about those times?
12a.	Do you have any supervision system in place to monitor this?	• If yes, what are they?
13.	What are other colleagues thinking about this programme?	• Positive or negative? • Why?
14.	How did students usually respond to the WASH topics discussed in class?	• How were these sessions received by the students? • Were students engaged? • How do you make them engaged?
15.	Did students relate these lessons to their home or community life?	• Did students refer to sharing with home/community? • Can you give an example?
16.	How in line is that with their customs and norms and beliefs?	• What are some cultural norms and/or community traditions that impacted students' participation? • Did any behaviours during learning need to be reinforced or hindered at home?

17.	Does the environment or seasonality have an impact on delivering WASH sessions at your school?	• Do sessions in your school happen at times where delivering them is easier or harder? • How can your teaching be impacted by the space, facilities, or environment in your school or classroom? • Were there any seasonal challenges during the process that impacted student participation and/or session scheduling (e.g., monsoon, floods, etc.)? • What other factors in the community did they find that might have impacted the sessions (factors other than the schools)?
Section 5: Factors Influencing Delivery of WASH Sessions (Teachers)		
18.	During WASH awareness sessions, what factors determined how the sessions are delivered?	• What was your experience in giving these sessions? • Does there seem to have been any conditions that they were better or more manageable? • Did you have to do anything differently? • How did you respond at the time?
19.	During the sessions, were there times when you adjusted how you taught the material?	• What influenced those adjustments? • What changes did you make to the session? • Can you give some examples?

20.	How did you manage the transition from classroom teaching to practical sessions?	● What is the impact of this type of transition? ● What do you do as preparation?
Section 6: Reflection and Sustainability		
21.	In your opinion, how suitable are school-based WASH sessions for students of Classes 4 and 5?	● What makes them suitable or not? ● Share your experience.
22.	What suggestions would you give to improve future WASH awareness sessions in schools?	
Closing question		
23.	Is there anything else from your experience that you would like to share?	● Any observation not discussed earlier

Guideline 3: for DPHE engineer

Guideline for Key Informant Interview (KII)

Informant: Official from the Department of Public Health Engineering (DPHE) involved in WASH activities in the JAMUNA project area

Project	
Interview Date	
Name of the Interviewer:	
Note Taker:	
Interview Start Time:	
Interview End Time:	

Introduction to the Interview:

- Introduction of the interviewer, study context, study purpose, and obtaining the informant's consent.
- Upon the informant's verbal consent, the audio recording will be started.
- The informants will be asked to introduce themselves and provide their demographic

information. • The interview will start.

Name of the informant:	
Designation	
Institution	
Name of the village/union:	
Experience with JAMUNA WASH intervention	

Section 1: Role and Engagement		
	Main Questions	Probing Questions
	Please elaborate on your designation and responsibilities	

2.	What is your current role and responsibilities in the WASH activities of the JAMUNA project?	• What kind of WASH activities you are involved in? • What is your experience with it? • When did you get involve? How long have you been in this role? • What do you have to do?
Section 2: Organisational Context and Internal Process		
3.	Can you describe DPHE's role in the planning or technical aspects of WASH facilities in this area?	• How are you providing services as part of DPHE? • Do you know the exact process? Please tell us about that. • How do your JAMUNA WASH responsibilities fit alongside your other governmental duties?
4.	What is the process for the approval of sites or designs for WASH facilities? Is there a standard design for latrines/tubewells?	• Is there a standard design for latrines/tubewells? • If so, what are they? • What is the reason for the selection of these designs? • Can it be used in all seasons? • What about privacy/ safety issues of this

		kind of latrine? Can you give us a little information?
5.	What is the supply chain and material management process?	• Where are materials from? • Do they arrive on time? • What quality control measures do you take for the materials you use? • Who supervises the supply chain?
6.	How do you handle the requisition of materials?	• What is the procedure for requisition submission? • How do you ensure the materials meet DPHE quality standards before they reach the field? • What kinds of internal adjustments are made? • Do you have any examples in mind?
7.	How does DPHE manage unexpected technical or administrative situations during implementation?	• What kinds of internal adjustments are made when a plan fails? • What was an example of a “course correction” that the team made? Can you give example?
8.	To what extent does DPHE’s internal capacity	• Do you think specialized training for your team could improve the implementation?

	(training/staffing) influence the success of these interventions?	
Section 3: Community, Field Implementation, External Environment		
9.	Could you describe how the Household Latrine and DRR Tubewell interventions are implemented in the field?	• How are beneficiaries identified? • What criteria are used to determine need? • Did you consult with or discuss the appropriateness of latrine construction with the community? Is the design feasible for them? • How are the installation sites decided?
10.	Can you tell us about the logistics and timeline in the field?	• How are construction materials supplied to the sites? • Can you tell me about the cost and how it is managed? • Normally, how much time is needed to construct a latrine or tubewell? • Are projects completed on time?
11.	What are the impacts of the environmental or seasonal conditions on the implementation of WASH?	• Are there adjustments made when conditions change? • Can you describe a situation of a seasonal/environmental challenge and how you managed it?

		• Do these conditions affect the time or place of activities? • Are there other norms or traditions in the community affecting the use of latrines or tubewells? • Are there practices at home that support or hinder adoption of these facilities?
12.	What was your experience of working with community level actors/beneficiaries?	• With whom did you engage the most? • How were those interactions? • Did you experience any difficulties in dealing with the community? • What did you do about them? • What was the response of households to the designs/materials?" • Were there any problems or issues of acceptance you noticed?
Section 4: Adaptation, Coordination, and Sustainability		
13.	Primarily, with whom do you work, and how do you coordinate with other actors?	• How does DPHE coordinate with other organisations involved in WASH here?
14.	Could you please tell me about	• What is the criterion for repairing damage?

	the repair and maintenance process?	• What is the repair process and expected time for completion? • Who monitors damaged facilities? • Is there any community contribution or cost involved? • How do you evaluate the progress?
15.	From your experience, how has WASH implementation progressed over time in this area?	• Can you describe any changes observed (e.g., changes in open defecation or diarrheal disease)?
16.	Was there any situation in which the implementation did not go as planned?	• What factors caused the plans to change? • What was your team's reaction? • Have adaptations been made to continue activities?
17.	What factors affect the life of WASH facilities?	• What specific elements have you observed that either support or hinder the life of a facility? • What feedback, if any, have you received from users regarding the day-to-day operation and cleaning of these latrines? • How is the current design working with the

		users' cleaning habits? • How has the actual lifespan of these facilities compared to their planned technical lifespan?
18.	How would you describe the division of responsibility between the community and the implementing organisation in ensuring these facilities last?	• What are the pros and cons of the current balance of roles?
19.	What could improve future WASH implementation in char or flood-prone areas?	• If you were to design a similar intervention in the future, what changes—if any—would you recommend to the implementation model
Closing Question		
20.	Were there any experiences during implementation that left a strong impression on you? (What happened and what was the impact?)	
21.	Do you have other comments about your experience that you think are important?	

Guideline 4: for CRVs

Guideline for Key Informant Interviews (KII) Informant: Community Resilience Volunteers (CRVs)	
Project	
Interview Date	
Name of the Interviewer:	
Note Taker:	
Interview Start Time:	
Interview End Time:	

Introduction to the Interview: ● Introduce the moderator and note-taker ● Explain the purpose of the discussion ● Assure confidentiality and voluntary participation ● Obtain verbal consent for participation and audio recording

- Encourage everyone to share freely; there are no right or wrong answers
- The interview will start.

Institution	
Name of the village/union:	
Experience with JAMUNA WASH intervention	

Section 1: Introduction and Role		
	Main Questions	Probing Questions
1.	Please introduce yourselves and briefly describe your role as a Community Resilience Volunteer.	• How long have you been working as a volunteer? • What kind of activities are you usually involved in?
Section 2: Involvement in WASH-Related Activities, Resource Mobilisation		
2.	Can you describe the types of WASH-related activities you are involved in through this project?	• What kinds of activities were you part of? • How did you get involved? • How long have you been in this role?

		• What do you have to do? • To whom are you providing the services? • How are you providing the services? • Where are you providing the services? • Who do you mostly work with during this work? • Did you work collaboratively with anyone or any organisation? • Approximately how many times do you have to meet with the team? • What usually happens during these activities? • Have you received any training? • Please tell us about the training. Its frequency, time, and trainer, • Tell us about available resources, fund, staff, etc.
3.	How do these activities (construction of latrines/tubewell/conducting awareness sessions) usually take place in the community?	• Where do these activities usually happen? • How are people informed or mobilized? • Can you describe how these fits into your routine? • How do you manage?
4.	How is the construction of	• How are the beneficiaries selected?

	latrines/tube wells done?	● Based on any criteria? ● When did you contact them? ● How are the places selected for the tubewell? ● What about the water quality of the tubewell? ● What happens of the tubewell during any natural disaster? ● Please tell me about the drainage system? ● What kinds of resources are usually needed? ● How are these arranged or managed? ● Can you tell us something about how you got the supply of materials for different activities? ● From where are the materials supplied? ● Who supervises this supply chain?
5.	Tell us about the awareness session.	● How do you arrange the members for the sessions? ● Who becomes a member? ● What kind of information is given? ● How were the topics selected? ● Where is it given? ● Who gives the information?

		● Tell us about their response. ● What kind of discussions happen in the meetings? ● Are there any materials used? Tell us about that.
6.	Can you tell us about the repair? and maintenance? What is your role here?	● Who monitors damaged facilities? ● What is the monitoring process? ● What is the criterion for repairing the damage? ● What is the repair process? ● How are construction materials supplied? ● Is there any community contribution?
Section 3: Coordination		
7.	Can you describe your experience with mobilizing resources or support during WASH activities?	● Can you describe the process for requesting materials for different activities? Whom do you contact?
8.	How do you coordinate with different people or groups during implementation?	● Who do you usually coordinate with? ● Why is coordination needed? ● How does this coordination usually work?

		• Can you tell me about your experience working with community members on hygiene or sanitation issues?
Section 4: Community Interaction and Response		
9.	How do community members usually respond to WASH-related activities?	• How is the information regarding the WASH interventions given? • What kinds of reactions do you notice? • How much does this align with their customs, norms, or beliefs? • Do responses differ among different groups? • If yes, how did you manage that?
10.	Were there situations where implementation did not go as initially planned?	• Can you tell me about one such situation? • What is your opinion about this?
11.	Can you recall any situation that stood out to you while working in the community?	• What happened in that situation? • Why do you think it stood out?

12.	Can you describe situations that made it harder to carry out WASH-related activities?	• What was happening at that time? • Do you face any challenges? If yes, what kind? • How did you manage the situation? How did you resolve them? • Can you give me any examples?
13.	Can you describe situations that made your work easier or smoother?	• What helped in those situations?
14.	How are environmental or seasonal conditions considered in WASH implementation?	• Can you give an example from this area? • How did the considerations influence the interventions? Please explain.
Section 5: Experiences Over Time (Challenges and Enablers)		
15.	From your experience, how has the implementation process gone over time?	• When conditions change in the field, how do you usually respond as volunteers? • What kinds of changes do you usually face? • How are decisions made in those situations?
16.	From your experience, what helps community members continue good hygiene or sanitation practices?	• Can you explain further?

17.	Based on your experience, what could improve future WASH implementation in char or flood-prone areas?	• Why do you think that? • Is there any example of a similar context?
Section 6: Adaptation and Practical Decision-Making		
18.	Can you describe a time when you had to adjust your usual way of working?	• What adjustment was needed? • Why were these changes made? • Any change in the community • How did the team handle it?
Section 7: Reflection and Sustainability		
19.	Do you think the intervention, as designed/implemented, has fulfilled its desired objectives?	• Why or why not? • In your opinion, which aspects of the intervention were the best practice?
20.	From your experience, what helps WASH activities continue in the community?	• What role do volunteers play in this? • What role do community members play?

21.	What changes, if any, would you suggest to improve WASH-related work in the future?	● Why do you think that?
Closing Question		
22.	Is there anything else about your experience that you think is important to share?	

Guideline 5: for health worker

Guideline for Key Informant Interview (KII)

Informant: Community Clinic / CCHST Staff (e.g., CHCP, HA, FWAs)

Project	
Interview Date	
Name of the Interviewer:	
Note Taker:	
Interview Start Time:	
Interview End Time:	

Introduction to the Interview:

- Introduction of the interviewer, study context, study purpose, and obtaining the informant's consent.
- Upon the informant's verbal consent, the audio recording will be started.
- The informants will be asked to introduce themselves and provide their demographic information.

- The interview will start.

Name of the informant:	
Designation	
Institution	
Name of the village/union:	
Experience with JAMUNA WASH intervention	

Section 1: Background and Role		
	Main Questions	Probing Questions
	Can you tell me about your role at this community clinic?	• What kind of work do you usually do in this area?
2.	How long have you been working in this community?	• Can you describe your level of involvement?

Section 2: Involvement in WASH Activities (Intervention Description)		
3.	Can you describe your involvement in WASH-related activities in this area?	• What types of WASH activities are you involved in? (Community hygiene awareness sessions, health education linked to WASH behaviours, referral, and reinforcement during routine health services) • When did you get involved? • How long have you been in this role? • What do you have to do?
4.	How do these WASH activities usually connect with your regular health work?	• Can you describe how these fit into your routine? When do you deliver these hygiene messages? • How do you manage the workload?
Section 3: Implementation Process and Coordination (Inner Setting)		
5.	How do you coordinate with other actors involved in WASH activities here?	• Who do you usually work with? • How do you communicate with the team? • Approximately how many times do you have to meet with the team? • Can you tell us something about the supply of materials (related to hygiene awareness

		and education) in CC? • From where are the materials supplied? • Who supervises this supply chain? • How do you know about the requisition of materials? • What is the procedure for requisition submission? (Meetings, communication, supply chain, requisition, supervision)
6.	How are responsibilities shared between you and other implementers during WASH activities?	• Who is responsible for which activities? • How do your roles interact with other staff or organisations? • Are there situations where responsibilities overlap? • With whom do you generally coordinate? • Can you explain further?
Section 4: Implementation Experience		
7.	Can you describe your experience of working with community-level actors or	• What does that interaction look like? • How are you conducting the sessions? Can you describe the whole process?

	beneficiaries?	• Can you tell me about your experience working with community members on hygiene or sanitation issues? • Were there any challenges in working with the community? • How did you address those challenges?
8.	How do community members usually respond during WASH-related sessions or discussions?	• Are there differences in how different groups (men, women, and youth) respond? • Have there been moments of high engagement or resistance? • Can you give an example of a memorable interaction?
9.	From your experience, how has WASH implementation progressed over time in this area?	• Do you know about WASH activities here in this area, other than the awareness session? • If yes, kindly tell me about them. • Do they have an impact on the community? What is your opinion on this? • Have there been any notable improvements or setbacks? • What factors contributed to these changes? • Are there particular activities that evolved

		differently from others?
10.	Were there situations where implementation did not go as initially planned?	• What happened differently from what was expected? • What factors contributed to that situation? • How did your team or the community respond to this?
11.	Can you describe situations that made it harder to carry out WASH-related awareness sessions and health education?	• What was happening at that time? • Can you give me any examples?
12.	Can you describe situations that made your work easier or smoother?	• What helped in those situations?
13.	Can you tell me about any situations where things did not go as planned during your work?	• What was happening at that time? • What did you do then? How did you manage the situation? Can you describe? • Who else was involved?
Section 5: Contextual and Environmental Factors (Outer Setting)		
14.	How are environmental or seasonal conditions considered in WASH implementation?	• Can you describe any situations where weather, seasonal changes, or flooding affected your work?

		• How do these conditions influence community participation in WASH activities? • Have you noticed any challenges related to accessibility, mobility, or infrastructure during certain seasons? • Do local community norms or practices influence how WASH interventions are implemented or used? If yes, how? • How did your team respond when these conditions or norms affected activities? • Are there other local factors—such as livelihood patterns, geographic conditions, or community behaviours—that shaped how you carried out WASH interventions?
Section 6: Reflexion and Sustainability		
15.	From your perspective, what factors influence whether WASH facilities remain functional over time?	• Are there factors related to the community, maintenance, or materials that matter? • Are these latrines easy to use and clean? • How does household or community involvement affect longevity? Or is it related to an organisational role? Please explain.

		● Have you noticed situations where facilities stopped working sooner than expected? Why do you think that happened?
16.	Based on your experience, what could improve future WASH implementation in char or flood-prone areas?	● Are there aspects of planning, design, or materials that could be improved? ● What about coordination with the community or partner organisations? ● Do you think training or capacity-building could help? How? Please explain.
17.	Based on your experience, how do community members usually practice hygiene or sanitation over time?	● Does this change over time, or stay the same? ● What seems to influence these practices? ● Can you give an example?
18.	Based on your experience, how do you see WASH activities being carried out in similar areas in the future?	● What would you like to see continue? ● What, if anything, would you like to see done differently? ● Why do you think that?
Closing Question		
19.	Is there anything else about your experience that you think is important to share?	

Guideline 6: for household beneficiaries

Guideline for Key Informant Interview (KII)

Informant: Household beneficiary involved in cost-sharing/construction/maintenance of WASH facilities

Project	
Interview Date	
Name of the Interviewer:	
Note Taker:	
Interview Start Time:	
Interview End Time:	

Introduction to the Interview:

- Introduction of the interviewer, study context, study purpose, and obtaining the informant's consent.
- Upon the informant's verbal consent, the audio recording will be started.
- The informants will be asked to introduce themselves and provide their demographic

information. • The interview will start.

Name of the informant:	
Age:	
Occupation:	
Name of the village/union:	

Section 1: Household Background		
	Main Questions	• Probing Questions
	Please tell me about yourself.	
2.	How long have you been living in this community?	
3.	Do you know about the WASH interventions taking place in the	• What do you know about the interventions?

	area?	• Can you tell us a bit? • From whom or where do you know about this programme? • What do you think about this?
4.	Can you tell me about your involvement with the WASH activities under this project?	• Can you explain a bit more? • What do you have to do? • Primarily, with whom do you work?
5.	How was your household involved in this process?	• Who contacted you? • Can you describe what you did?
• Section 2: Experience with WASH Facility Construction (Household Involvement in Construction)		
6.	Can you tell me about the whole process through which the WASH facility for your household was constructed?	• How did this process begin? • How were decisions made about the construction? • How did you communicate with the project team during this time? • How often did you meet or interact with the team? • What happened after that?

		• How was the process completed?
7.	Can you describe what the process of constructing the WASH facility was like for you and your family?	• How did it feel to be involved in the process? • Did they consult with the community during the construction of the tubewell? • Tell about the water quality from the tubewell. • Are the latrines appropriate for household use? • How did family members participate or respond in utilizing the latrines? • Can you give an example?
• Section 3: Cost Sharing and Contribution		
8.	Can you tell me about your household's contribution to this WASH facility?	• Please tell us a bit about the associated costs of implementing the intervention. • How cost-effective/timely is it? • Can you explain that a bit more?
9.	How did your household decide to take part in this contribution?	• Who was involved in making the decision? • What factors influenced your decision to participate? • How are the common tubewells used by

		community members? Are there any rules developed by the community members? If there, please tell us about this
10.	How did this contribution fit into your household's situation at that time?	• Did it affect your daily routine or finances? • Did it require any adjustments or sacrifices? • How did your household feel about being involved?
• Section 4: Use and Everyday Experience		
11.	Can you describe how you and your family currently use this WASH facility?	• Who in the household uses it most often? • Are there times when it is not used? • How is it maintained by the household?
12.	What changes, if any, have you noticed since using this facility?	• In daily routines? • In health or hygiene practices? (open defecation, water-borne diseases) • In convenience or comfort? • For different family members? • How is the repair process handled? Is it easy or difficult for your household? Tell us the process? Is it easy or tough?

13.	Can you describe how this facility fits into your daily routine now?	• Has it changed your daily schedule in any way? • Does everyone in the household use it similarly? • Are there any difficulties in using it regularly?
• Section 5: Community Engagement and Local Norms (for DRR Tubewell)		
14.	Can you describe how people in the community were involved in these WASH activities?	• Who tended to be involved? • At what stages were community members involved? • How did people respond to being involved?
15.	Can you describe how community members reacted to or discussed these activities?	• How were these interventions received by the communities? • How much does this align with their customs, norms, or beliefs? • Did local customs, gender roles, or traditions influence participation? • Were there any practices in your community that helped or hindered use of the facility? • Were there any concerns or enthusiasm expressed?

Section 6: Implementation Experience and Adaptation (Barriers & Facilitators)		
16.	Can you describe how the interventions have progressed from the beginning to now?	- Were there any key phases or turning points? - Did anything change in the approach over time? Can you tell a bit? Why did that happen? - Were there any major challenges or adaptations?
17.	Can you describe any situations where things turned out differently than you anticipated?	- What was different from what you had expected? - How did you respond at that time? - Did this change anything in how you approached the work afterward? How? Please explain a bit.
18.	How did you and your household respond when that happened?	- What did you do next? - Did anything change in how you used or managed the facility afterward?
Section 7: Support, Decisions, and Adjustments		
19.	When something needed to be decided or changed, how was that handled?	- Who was involved? With whom did you discuss it? - How did you resolve that? How was that done? Can you tell us?

Section 8: Sustainability and Future Perspectives		
20.	How do you see the future of this WASH facility for your household?	Do you foresee any challenges in maintaining it?
21.	What would help households like yours continue using and maintaining it?	Do you think it will continue to meet your household's needs?
22.	Based on your experience, is there anything you would like to see done differently in the future?	- What are they? - Why do you feel that way? - Would you make any changes to it in the future?
Closing Question		
23.	Is there anything else about your experience that you think is important to share?	

4. Excerpts

The image displays a large, dense grid of text excerpts, organized by CFIR domain (columns) and participant (rows). The grid is composed of many small, rectangular cells, each containing a snippet of text. The columns are color-coded at the top, indicating different CFIR domains. The rows are organized by participant, with each participant's excerpts grouped together. The text within the cells is small and dense, typical of a large-scale data analysis or qualitative research output.

Figure: Participants wise excerpts are arranged by CFIR domain