

Climate Change Impact and Adaptation Goal in Climate Vulnerable Areas of SW Bangladesh

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ABSTRACT

The WaSH program aims to respond to the need for greater climate resilient access to water, sanitation and hygiene services (WaSH). These facilities need to be able to withstand disasters and planned with consideration of potential climate change impacts in the future if they are to remain sustainable. However, consultations have highlighted as this business case has been developed, that a key aspect to communities being able to sustain the health and development benefits that access to WaSH brings, is building the resilience of the community and their ability to plan and adapt for future scenarios. This means that after a post-emergency, communities will not find their lives dragged back to 'square one' and resort to drinking unsafe water and open defecation. For this to be achieved WaSH program will also support the local government to understand their communities' needs and plan effectively for emergencies.

INTRODUCTION

In Bangladesh, achieving the SDG 6 target to halve the proportion of people without sustainable access to safe drinking water and basic sanitation is seriously challenged by climate change. Thereafter, following cyclone Aila in May 2009 in Bangladesh, Government, local NGO and INGO have been involved in the recovery efforts to help the population of Koyra Upazila of Satkhira District in Southwest Bangladesh. Safe water resources were contaminated and household latrines destroyed, leaving over 300,000 people without access to these basic services. The scale of impact was unprecedented in many communities even after many years they have still inadequate access. This experience has generated a greater understanding of the vulnerabilities of these communities and their specific needs. It has found in the study areas both in programmes area and control area show that 95 percent of the household members were male in the programmes area whereas 94 percent male of the households in the control area; The maximum age was 90 in the programmes area and 80 in the control area and minimum age in the programmes area was 20 whereas the control area it was 26. The average age of the household members was 44 in the programmes area and 46 in the control area. According to the respondents; 45 percent occurred as illiterate, 28 percent primary, 19 percent people completed their secondary level education, 7 percent have SSC/HSC level education and Graduate only 1 percent in the programmes area where as in the control area the stature of the educational attainment was illiterate 32 percent, primary level 26 percent, secondary level 24 percent, 16 percent got SSC/HSC level education and only 2 percent has got their graduation degree. The major reported occupations of the household head were house wife 3% in the programmes area and 4% in the control area, service 3% in the Programmes area and 8% in the control area, business 25% in the programmes area and 40% in the control area, 54% people is doing farming in the programmes area and it is 18% in the control area; day laborer occurred in the programmes area and control area was 10% & 26% respectively, the unemployment rate is 1% and 3% in the programmes area and control area respectively.

Programmes Overview

The broad goal of WaSH programs in Bangladesh is to contribute to achieve the national goal on WaSH through context-specific and scalable water supply, sanitation and hygiene promotion in climate vulnerable areas of Southwest Bangladesh. The outcomes of the WaSH programs are in the following.

- ✓ Greater access to safe water and improved sanitation through effective, appropriate and scalable climate resilient technologies, contributing to improve health amongst the communities of Satkhira District, through a reduction in waterborne disease
- ✓ Improved community resilience and ability to maintain WaSH behavior in the face of natural disasters, contributing to sustained improved health
- ✓ Increased learning on climate adaptation techniques contributing to improve national knowledge management, which will be disseminated to promote greater access to water and sanitation and disaster response in areas beyond Khulna.

A. Study Objectives

- ✓ To know to what extent the poor and disadvantaged population in intervention areas has access to safe drinking water, improved sanitation and hygiene through effective, appropriate and scalable climate resilient technologies, contributing to improved health amongst the communities of Koyra in Satkhira District, through a reduction in waterborne disease
- ✓ To identify the level of community resilience and ability to maintain WaSH behavior in the face of natural disasters, contributing to sustained improved health
- ✓ To assess the situation of knowledge of targeted population in intervention areas on climate adaptation techniques contributing to improved national knowledge management

STUDY METHODOLOGY

WaSH evaluation was carried out basically using three methods: (i) pre- and post method using recall; (ii) programmes and control method using baseline data; or (iii) simply programmes and control method using new sampling method.

Beneficiary level sample survey in the catchments areas where programs were started. The targets were included randomly selected sample households (within catchments of the programmes where programmes had been implemented) and from each household preferably adult female of the household were interviewed using structured and standardized questionnaire for interpersonal interviews. The samples were taken from both the treatment (programmes intervention: upazilas, unions and villages) areas and also Comparison areas from the adjacent upazilas, unions and villages where programmes program was not implemented by NGOs & INGOs.

Sample Design And Technique Including Sample Size & Distribution

Programmes area: Koyra and Dumuria Upazilas of Satkhira District

Sample design: A stratified sampling technique was adopted for the study.

Sample Selection A stratified multi-stage sampling methodology was applied to select the survey units (i.e. household). The sampling was comprised of two stages, first of 7 programmes unions, 7 villages (1 from each union) were selected randomly. Finally, required number of beneficiary households was selected within each selected village. As the programmes had list of targeted beneficiaries, the beneficiary households were selected with systematic random sampling procedure using an appropriate sampling interval (depending on the number of potential respondents and required number of samples).

In order to determine the required sample size an approach based on confidence level and precision rate were followed. Statistics of the approach was that the statistical validity of a sample did not depend on its size relative to the population being investigated. Rather what matters was the required level of probability (confidence level), required degree of precision and the variability of the population. The following formula had been used to estimate the required sample size:

Sample size had been worked out for the quantitative survey following the formula (Islam 2011) depicted below:

$$n = \frac{Nn_0}{N + n_0}$$

Where $n_0 = z^2 p(1-p)/d^2$

We first calculated n_0 . If n_0/N was negligible, then n_0 was a satisfactory approximation to n .

$$n_0 = \frac{(1.96^2)(0.5)(0.5)}{(0.05)^2} = 385$$

As N (34,045 Target beneficiaries in the Upazila) was known the formula led to the following:

$$n = \frac{34045 \times 385}{34045 + 385} = 380$$

n = sample size, $p=0.50$; $z=1.96$ to 95% was the Confidence Limit and d =desired level of precision or significance was 0.05 or 5%.

As per statistical requirement the study was needed to cover minimum 385 samples and to make the figure round the sample was fixed at 400. To meet the objective a comparison area or control area was selected for the study. A total of 200 (50% of the sample programmes) households had been selected from control Upazilas. The control Upazila was selected adjacent to the programmes upazila. From the control Upazila 7 unions were selected randomly and from the selected union, village were selected randomly and from the selected village required number of households had been taken following systematic random sampling method. Table below shows sample districts, Upazila, union and villages.

Distribution of sample size by districts, unions and villages	Programmes Intervention sample areas				Comparison/Control sample areas				Total sample areas			
Upazila	Upa zilas	Uni ons	Vill ages	HHs/ben eficiary	Upa zilas	Uni ons	Vill ages	H H s	Upa zilas	Un ion	Vill age	HHs/ben eficiary
Koira	1	7	7	400					1	7	7	400
Dumuria					1	7	7	200	1	7	7	200
Total	1	7	7	400	1	7	7	200	2	14	14	600

Samples For Qualitative In-Depth Investigation

Qualitative investigations were conducted applying following methods:

- ✓ Literatures/Documents Search: Reviewed baseline survey and related reports/documents.
- ✓ Focus Group Discussions (FGDs): FGDs with community leaders. Total FGDs were 7, one in each sample programmes union. Each FGD comprised 8 participants comprising men and women of the community. Among the 7 FGDs, 5 were conducted in programmes area (2 with WDMC and 3 with community leaders) and 2 were conducted in control area (with community leaders).

- ✓ Intensive Interviews: 10 intensive interviews (1 in each programmes union and 3 from upazila) with the programmes personnel
- ✓ Union Profile Checklist: 14 Unions Profile Checklist was filled up. Using the Union Profile Checklist data on Catchments' (Unions) Profile, primarily development aspects: NGO working on hygiene, sanitation, health centers and their working area, communication network, development works, trading, marketplaces and growth centers, and the disadvantaged population groups were taken.

FINDINGS FROM QUALITATIVE SURVEY

Idi With Upazila And Union Programmes Officers

Three in-depth interviews (IDI) at Upazila level and 07 (seven) IDI in Union levels were conducted to know the success and challenges of WaSH programs on improvement of water, sanitation and health status in Koyra Upazila.

A. Activities Taken Under Wash Programs

- ✓ Formation of WDMC in each Union.
- ✓ Prepared action plan in Ward and Union level.
- ✓ Construction of toilets.
- ✓ Construction of different types of water sources.
- ✓ Construction of water treatment plant.
- ✓ Improvement of water and sanitation system in cyclone shelter.
- ✓ Awareness raising activities on climate change impacts and disaster risks.
- ✓ Video presentation on cyclones.
- ✓ Health and sanitation related materials distribute within school children.
- ✓ Training on different aspects of the programmes beneficiaries.
- ✓ Encouragement of programmes benefits health and sanitation.
- ✓ Other activities include miking and rally during day observation and validation meetings with Upazila and Ward level stakeholders.
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A. Role Of Wdmc

- ✓ Participatory WASH Vulnerable Assessment.
- ✓ Disaster preparedness (pre-, during and post disaster).
- ✓ Early warning of disaster.
- ✓ Evacuation and rescue during disaster.
- ✓ Help with the construction of roads and infrastructure.

- ✓ Prepare Ward Development Plan and implementation of this plan.
- ✓ Coordination with other NGOs working in the area.
- ✓ Site selection for infrastructures; ensure quality of work, and monitoring and supervision.

C. Role Of Union Parishad In Disaster Risk Management

Each Union Parishad has its own budget for disaster risk management and the amount of budget for disaster risk management is about 5-10% of the total budget. But, for a coastal area such amount of budget is insufficient where natural disaster occurs every year at any time. Respondents also mentioned that Union Parishad has ability to face the disastrous situation. However, if they get more budget, instruments and infrastructure facility and manpower thus they will tackle the situation more effectively. Moreover, Union Parishad must reduce the dependency of NGOs and outsider help. The role of Union Parishad in disaster risk management is given below:

- ✓ Disseminate safe drinking water plan among the community people.
- ✓ Send disaster related messages to all Union level offices.
- ✓ Identify water sources and take initiative.
- ✓ Hand tube well distributed among poor and ultra poor.
- ✓ Increasing awareness of the use of safe drinking water.
- ✓ Regularly follow-up the activities of caretakers.

Households' Observations

Almost 100% of respondents have own latrine both in programmes and control area (fig-1) but 90% in the programmes have hygienic latrine and 60% respondents in the control area used hygienic latrine, remaining 10% & 40% both areas respectively didn't use hygienic latrine (fig-2). 80% & 35% respondents in both areas correspondingly have hand washing place beside their latrine (fig-3) whereas 68% & 25% respondents both in programmes and control areas respectively habituated to keep water for hand washing beside their latrine. 80% in the control area, 20% respondents in the control area didn't use soap after their toilet (fig-5) and 5% & 8% both in the programmes area and control area correspondingly didn't like to keep soap for latrine uses (fig-6). 68% and 40% respondents of the households both in the programmes and control areas used to keep their latrine neat and clean; 25% & 45% both areas respondents respectively used to keep their latrine moderately neat and clean & 7% & 15% didn't clean their latrine regularly (fig-7) and 98% & 95% respectively in the programmes and control areas didn't have own safe water source (fig-8). Only 2% respondents in the programmes area and 5% in the control area used to have own safe water source (fig-9) and 90 % and 10% respondents in the control and programmes areas used cover in their latrine by water pot (fig-10). 5% in the programmes area and 40% in the control area didn't clean their home areas regularly (fig-11) and whereas 15% respondents in the programmes area didn't do this practice and 25% found in the control area who didn't manage their garbage properly by throwing in a fixed place or pothole in considering the safe environment (fig-12).

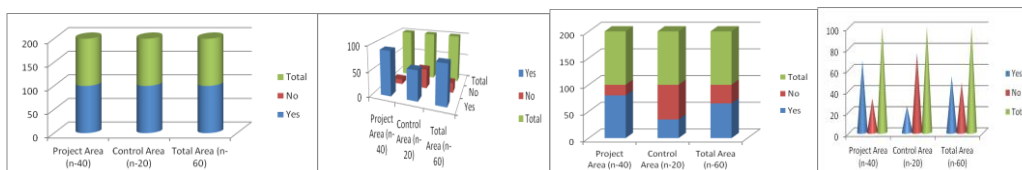


Fig-1

fig-2

fig-3

fig-4

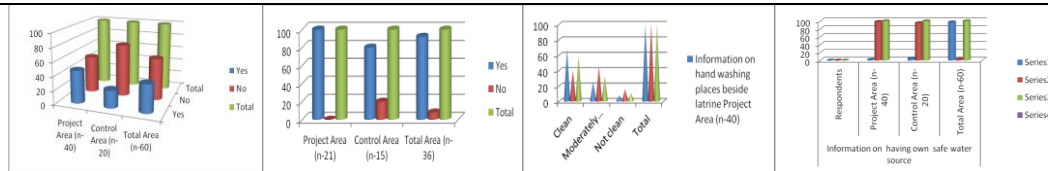


Fig-5

fig-6

fig-7

fig-8

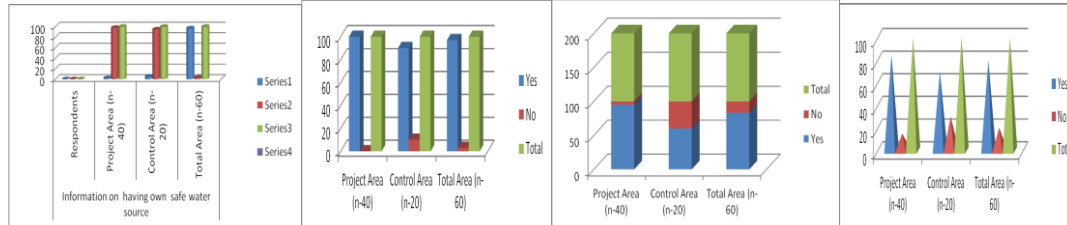


Fig-9

fig-10

fig-11

fig-12

Participatory Wash Vulnerable Assessment

Participatory WASH Vulnerable Assessment (PWVA) is a tool developed under WASH program which involves communities, local authorities and other stakeholders in an in-depth examination of what makes them vulnerable. PWVA provides a solid foundation for designing, planning, implementing and evaluating practical coping and adaptive strategies. Under this programme, the main aim of PWVA is to identify the vulnerability of local communities on safe drinking water, sanitation and hygiene as well as prepare WASH mapping, seasonal calendar, institutional map, and development plan, etc.

Respondents mentioned that climate is changing frequently in the area, and the most common climate change related impacts are:

- ✓ increased temperature.
- ✓ variation of rainfall patterns (high and low rainfall).
- ✓ salinity intrusion.
- ✓ increased the frequency of cyclones and storm surges.
- ✓ flood, water logging and coastal erosion.
- ✓ damage house, road, infrastructure.
- ✓ damage agriculture field and shrimp farm, and
- ✓ Sea level rising, etc.

They also mentioned that, to respond to the impacts of climate change that are already happening, while at the same time prepare for future impacts to prevent or minimize the damage they can cause, or taking advantage of opportunities that may arise are called climate change adaptation. These responds/ adjustments can be protective (i.e., guarding against negative impacts of climate change), or opportunistic (i.e., taking advantage of any beneficial effects of climate change).

Some examples of adaptation measures in the study area include:

- ✓ Tree plantation activities in the roadside and homestead (50%);
- ✓ Raise the platform of house, tube well and toilet (100%);

- ✓ Repair road, culvert, dam and shelter centre (56.25%);
- ✓ Make portable stove and pile up firewood (62.5%);
- ✓ Collect dry food like Chira, Muri and Khoi, molasses, biscuits, and essential medicines (75%);
- ✓ Ensure safe drinking and cooking water (100%);
- ✓ Save an amount from family expenditure whenever possible (87.5%).

Disaster Risk Management (Drm)

Respondents mentioned several activities or planned adaptive management strategies for disaster risk reduction/ management, such as:

- ✓ Increase tree plantation activities under social forestry programme (81.25%);
- ✓ Construction and repair of dam and road (100%)
- ✓ Proper drainage facility (43.75%);
- ✓ Rainwater harvesting technology (37.5%);
- ✓ Construction of more cyclone shelters (25%);
- ✓ Protection of riverbank (81.25)

CONCLUSION

Natural disaster affected by last 5 years in considering the terms of climatic resilience and disaster risk reduction; 99.5% respondents have said 'Yes' & only 0.05% said 'No' in this issue in the programmes area. That's mean; almost every respondent in the programmes area was aware that how many disasters affected them in the last five years. 38% respondents in the programmes area were affected by floods in the last five years as a type of natural disaster, 14% were affected by drought, 79% by tornado, 25% by cyclone, 82% have had bitter experience on flown of water, 2% affected by river erosion and 63% respondents suffered by saline water. 7% didn't get water from water source due to water layer depleted, 2% were unable to collect water from water source due to water source dry & 40% respondents faced unusable problem due to increasing of salinity in the source water. 96% responded that they faced distance problem that water source was far away from their homestead; 80% considered that it was time constraints; 46% thought it was cost effective & 2% collected their water in the ebb time. 60% respondents willingly considered the distance for collecting their water, 17% to avoid distance they were collected water from other source areas, 5% sacrificed the cost for considering the collection of safe water, 8% repaired their water source by their own cost, 2% collected ebb water without hesitation; 2% used to collect water from forest area, 3% used to solve their problem altogether, Costic soda used for water purification by 1% respondents and 2% respondents installed water pump for identified new water source.

Respondents were asked to know how they were affected by climate change. To get this answer, it shows that 87% in the programmes area and 80% respondents in the control area were frequently affected by cyclones: unseasonal flood affected to 20% respondents both programmes and control area consequently. 86% had worst experienced on water over flown in the programmes area and 20% only faced same problem in the control area; 26% in the programmes area and 66% in the control area affected by drought, earthquakes affected to 42% in the programmes area and 6% in the control area whereas tsunami experienced respondents were 10% in the programmes area and 0% in the control area.

Respondents were posed to let us know how they could prepare in the pre- and post disaster period and what their perception on disaster risk reduction (DRR) and Climatic Resilience (CR) value. The observatory data

shows that 99% respondents in the programmes area whereas 66% respondents in the control areas have had Preparedness for going to cyclone centers after hearing disaster warning, 61% & 36% respondents both programmes and control area consequently preserved safe water, necessary requirements taken to safe place or put into the soil by 64% and 16% respondents both in programmes and control area respectively, 37% in the programmes area and 36% in the control area used to tree plantation, 3% in the programmes area and 2% in the control area willingly taken training on ride on tree & swimming as surviving technique during the disaster period, homestead land and latrine raised up by 39% & 43% respondents in the programmes and control areas consequently; 7% & 11% in the programmes and control areas have taken required knowledge on primary health care and 10% respondents have learnt the ways of water purification in the programmes area and it was learnt by 21% respondents in the control area.

Abbreviations And Acronyms

WaSH	<i>Water Sanitation and Hygiene</i>
DRM	<i>Disaster Risk Management</i>
FGDs	Focus Group Discussions
IDI	In-Depth Interview
INGO	<i>International Non-Governmental Organization</i>
MDGs	<i>Millennium Development Goals</i>
NGO	<i>Non-Governmental Organization</i>
PWVA	Participatory WASH Vulnerable Assessment
UPs	Union Parishads
WDMC	<i>Ward Disaster Management Committee</i>

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