

# Is Safe Water and Sanitation Access Really Impacted Due to Climate Change? - A Cross-Sectional Study in the Southwest Coastal Region of Bangladesh

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## Abstract

The intention of this paper is to explore the relation between lack of potable water and improved sanitation with the effects of climate change. In September 2014 a, cross sectional study covering 600 households with structured questionnaires that was carried out by Water-Aid Bangladesh in two Upazillas of Satkhira district. The study revealed that there were two types of climate change impact. One was severe salinity intrusion into surface water body. Another was prolonged drought. However, these two were again linked with each other as increased drought was responsible to severe salinity into surface water. In the survey, 47% of respondents mentioned that the water they access was not pure. However, increased access to pond sand filter (PSF) and other water sources justify the claim. Nearly 53% of households have access to improved drinking water sources like shallow deep tube well, in contrast to 10% just three years ago. December to August is the water crisis period with different kind of upward and downward mobility. Draught (40%), salinity (29%), lower ground water level (15%) and damage of water source (12%) were some major reasons found behind the crisis sector. The average improved sanitation facilities (84%) in the study area were at 56 percent point higher than 2011 and 30 percent point higher in compare with the average national rural Bangladesh of 54.5%. But such findings do not refer to the impact of climate change. If we consider the drought and flood impact then the safe sanitation percentage goes down. Thus, this indicates about the need of a regional focus as well while planning any future intervention.

**Keywords:** Coastal; Drought; Salinity; Satkhira

## Introduction

Lack of potable water, proper sanitation and poor hygiene behaviour and practice because a huge toll and tremendous burden among people and coastal areas of Bangladesh are one of the major victims [1]. It is clear that climate change is affecting the medium of water most of all: affecting the source of water supplies and water quality (e.g. pollution). Poor water and poor sanitation exacerbate the impact of the climate change in coastal Bangladesh. They cause and reinforce each other in a different way. The causes involve safe water crisis and resulted burden of water borne diseases. However, impacts on water resources and water-dependent services have yet to be adequately addressed in the coastal areas of Bangladesh [2]. Following the strategic process of the government, Water Aid Bangladesh is targeting the goal of improving human well-being and dignity of the people of coastal areas of Bangladesh [3]. Based on its organizational goals, a project was implemented in two Upazilas of Satkhira District in 2011. The project ended in December 2014. As there were severe water crisis and sanitation problems during the project period, an initiative to conduct a project end evaluation was carried out in July 2014. Primarily the evaluation was started with an aim to address the impact of climate change on water and sanitation services separately. It was a six months' research project carried out in two Upazilas of Satkhira District titled 'Study on Climate Resilience WASH Programming in Coastal Areas'. Thus, it is high time to explore whether the project has been able to make any contribution in identifying the Water, Sanitation problem due to climate change effects in the intervention areas or not. The evaluation was part of the implementation of project.

## Literature Review

'Water crisis' or 'water-shortage' is some of the commonly known phrases in today's world but we actually live in a 'water desperate' world, rather than in water crisis. Millions of people in developing countries are living as 'water poor' and, in fact, they are 'water desperate' [4]. In the fourth assessment report of Intergovernmental Panel on Climate

Change (IPCC) and Stern Review it is concluded that the impacts of climate change on humanity will be felt 'mainly through water' [5,6]. Water is also predicted to be the primary medium through which early climate change impacts will be felt. There is strong evidence available that freshwater resources are vulnerable, and have the potential to be strongly impacted [7]. Climate change is likely to have a significant impact on water and sanitation, and the greatest change is predicted in coastal aquifers, where it is very likely there will be significant incursion of salt water directly associated within sea-level rise [8]. India, China and Bangladesh are especially susceptible to entrance of saline sea water in coastal areas [9].

Climate change is also likely to worsen existing water quality issues. There are undoubtedly clear links between access to safe, reliable water sources and human health which could be exacerbated by greater climate variability [10]. Increased flooding affected latrines and unimproved sources could lead to a significant rise in diarrhoeal disease and infant mortality, and warmer water temperatures could lead to greater transmission of disease (ibid). Reduced functioning of water supplies during extended droughts could also increase the burden of disease as people use poorer quality, 'last resort' sources. Therefore, based on the review of available literature it can be argued that there is a relation between increasing trend of temperature, frequent flood and drought with less access to safe water and adequate sanitation facilities.

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Though there was lack of available literature of the impact of climate change on water and sanitation, researcher predicted the present research will contribute to fill-up the knowledge gap and inform policy makers for further steps.

## Methods

This was a six-month long study using both the analysis of secondary and primary data. Primary data was collected from 17 August to 10 September 2014 using both quantitative and qualitative methods. The study methodology comprises study design and approach, study area, data collection method, study population, and sampling; quality assurance during data collection; data management and analysis and limitation. With the objective of producing a blended (Quantitative and Qualitative findings) report in line with study objectives, the study was designed with both quantitative and qualitative methods which triangulated at each level of data collection and analysis considering data validity and reliability. Total sample size was 600. The study covered intervened project areas which were 6 unions from Shyamnagar and 5 unions from Assasuni upazila that means in total 11 unions were selected. Therefore, from those Unions 55 wards were selected randomly which is more than 50% of the total number of wards. Households were randomly selected from the list of Union Disaster Management Committee (UDMC). Household head or spouse was selected as the study respondent. For the quantitative survey, the study followed widely used statistical formula for calculating the sample size.

For collection of qualitative data, 2 unions from 2 Upazilas were randomly selected to triangulate data. 8 FGDs, 13 KIIs and 4 case studies were conducted to collect qualitative data. Secondary data was collected from Union Parishad, local level government office, NGO of national and international organizations. To triangulate the quality of the water, 60 samples (30 from facility level and the other 30 from households) were collected. TTC, arsenic and iron tests were done on collected samples.

## Results and Discussion

The study revealed that there were three types of climate change impact. One was severe salinity intrusion into surface water body. Another was prolonging drought. However, these two were again linked with each other as increased drought was responsible to severe salinity into surface water. The third impact was flash flood which polluted safe water sources at large extent. Almost 45% of respondents' households reported facing salinity problems. Basically, those people were totally dependent on surface water for cooking and drinking purpose. This salinity problem was severe during last summer, as mentioned by 40% percentage of respondents. According to the respondents' perception, 53% of the surveyed population mentioned that their water was pure throughout the whole year. The other 47% of respondents felt that their drinking water supply system somehow polluted during the monsoon. Among those who said that their water source was polluted, they used a Pond Sand Filter (PSF). In the case of underground water most of the STW and DTW were found labeled as green color which means to safe to drink. However, these facilities were not safe from bacteriological contamination. Nearly all households (95%) have reported suffering from water borne disease due to bacteriological contamination. This scarcity was severe during the months from December-August. As per respondent view, just 10 years ago the water scarcity was not severe like present. Most respondents have a common view about the increasing tendency of surface water crisis during the summer. Though a significant percent (83%) fetched water from PSF for domestic purposes (cooking, laundry and hand washing), none of respondents were satisfied with

the condition of PSF as those are often polluted with cow dunk, human sludge and other things.

During the monsoon, frequent flash floods were identified one of the major threats to getting safe water. 90% of respondents agreed with this. Most of the PSF and STW were not found at satisfactory level in terms of maintenance. 76% of respondents said that their drinking water sources needed to be repaired in the last year due to the high presence of salinity. High levels of salts also affected the taste of drinking water, most users mentioned (76%).

Water Tests result revealed that the acceptance level of water quality at household was better than facilities from where the people collect water except iron level. It happens that bacteria grew at the facility level due to contaminated from leaves, birds stool and different insects specifically in summer. All tube well except 29% STW in Assasuni were found free from arsenic. Iron test result showed that all PSF was out of iron contamination but no acceptance level was found in STW which indicates that people of the study area was in at high risk of illness due to drinking iron contaminated water.

In the study area, the improved sanitation facilities contain 39% of pit latrine with lid, 24% of slab latrine with water seal and 21% slab latrine without water seal. Water crisis during the summer is influencing people not to use water seal which is the third highest category of sanitation facilities. The standard distant between water source and latrine facility should 30 feet which is critically associated with land scarcity. But nearly all households own a private latrine. Cleanliness of the latrine is an important part of the hygiene practice behaviour where just half of the households are in satisfactory level which has been improved by 4% as per baseline. Due to frequent floods in monsoon season hindered the cleanliness of the latrine as reported by respondents.

The study findings suggest that there is an increased demand for safe water sources in the communities. Although due to increased salinity, drought and flash flood those hindered the improvements in access, practices and behavior of the community people, there is a challenge of maintaining the "safe water chain" [11]. All the families should have a clear understanding how a break in the chain generates a high risk of contamination.

In the survey, 47% respondent mentioned that the water they access was not pure. However, increased access to PSF and other water sources justifies the claim.

Nearly (53%) households have access to improved drinking water sources like shallow deep tube well which was 10% in 2011. The community was also found to be increasingly aware about boiling water uninterruptedly as there was high presence of bacteria in water during monsoon.

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

Although after the intervention, the quality of the water source has been improved, it is also important to remember that water shortage and flood has much more impact on the water quality and consequently on the health of a population. It is proved that vulnerable water shortage contributes to increase microbial contamination and decreased microbial quality. There is also increased risk of waterborne

infectious diseases from inadequately stored water compare to water stored in an improved vessel. Findings reflected that due to shortage of water, many of the respondents are collecting water from unsafe sources. Community friendly messages can be delivered to encourage people to take water from safe sources.

The average improved sanitation facilities (84%) in the study area are at 56 percent point higher than 2011 and 30 percent point higher in compare with the average national rural Bangladesh of 54.5% [12]. But such findings do not refer to the impact of climate change. If we consider the drought and flood impact then the safe sanitation percentage goes down. Thus, this result indicates the need for a regional focus as well while planning any future intervention.

Water crisis is influencing people not to use the water seal which is the third highest category of sanitation facilities. The standard distance between water source and latrine facility should be 30 feet, which is critically associated with land scarcity. But nearly all households own individually their latrine. Flooding of the latrine is an important part of the hygiene practice behaviour where just half of the households are in satisfactory level which has been improved 4% from 2011.

### Conclusion and Major Recommendations

The water storage system needs attention. Poor people have very few or worse options available to store water. Intervention may be taken to ensure large and safe storage system.

PSFs were found to be the most accessed source of water in the community. However, it was found that most of them are polluted. Some context specific technology should be made available. Motivational programs or incentive systems should be implemented so that the whole community can benefit together.

Community members need to be aware disasters like flood/tidal surge, etc., which destroy the dam and ultimately the whole community suffers which include the water, sanitation, and hygiene system of the

area as well. Hence, some big projects might be jointly implemented with government and NGOs through a coordinated approach so the community can be protected from big disasters.

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