

Report on
Impacts of Cyclone Sidr (15 November 2007) on Water Supply and Sanitation
Services in the coastal districts of Bangladesh

May 2009

Submitted to CapNet

Secretariat, CapNet Bangladesh



BANGLADESH CENTRE FOR ADVANCED STUDIES

House 10, Road 16A, Gulshan - 1, Dhaka - 1212, Bangladesh
Phone: 885 1237, 885 1986, 885 2217, Fax: (880-02) 885 1417
Email: info@bcas.net, Web Site: www.bcas.net

Impacts of Cyclone Sidr (15 November 2007) on Water Supply and Sanitation Services in the coastal districts of Bangladesh

1. INTRODUCTION

1.1. Background

Bangladesh is highly exposed to various natural disasters like flood, drought, cyclone, sea level rise, salinity etc. Bangladesh lies between two critical geographical region i.e. Himalayas and its tributaries in the north and east and Bay of Bengal in the south. Most of the cyclonic storms originated in the Indian Ocean move through the Bay of Bengal and cross Bangladesh coast. According to available documents at least 1009 cyclonic disturbances have been occurred over the past century in the Bay of Bengal (SMRC, 1998) excluding the devastating cyclone "Sidr" that hit Bangladesh coast on 15 November 2007. In last 40 years, most devastating cyclones were in 1970, 1991 and 2007. It appears that intensity of cyclone in Bangladesh coast marks an increasing trend. Moreover, the funnel shaped characteristics of the Bay of Bengal make the cyclone more ferocious. However, these extreme events cause huge damage of property and infrastructure in addition to death casualties. Different sectors including agriculture, fisheries, forestry, health and water supply and sanitation get seriously affected by such events.

1.2. Rationale

Cyclone Sidr known as Very Severe Cyclonic Storm hit 12 coastal district of Bangladesh on 15 November 2007. The storm formed in the central Bay of Bengal and quickly strengthened to reach peak sustained winds of 215 km/h (135 mp/h), which made it a Category-4 equivalent tropical cyclone on the Saffir-Simpson Scale (Weakipidia). The cyclone first struck at south east of Sundarband and then moved towards east north. The storm caused large-scale evacuations in Bangladesh. More than 3447 people and immeasurable livestock and wildlife have died (BUET, 2008). More than 80% areas of Sundarban (the largest delta of the world) had been damaged. In addition, embankments and roads, power supply networks, sources of safe water i.e. tube wells, ponds and reservoirs have been seriously affected.

According to the government, the country achieved over 60% sanitation coverage and more than 90% people get safe water (GoB, 2005). The same sources state that many of the upazilla (sub-districts) have achieved 100% sanitation coverage by 2005. It also reports that water supply and sanitation management in the coastal district improved a lot in last few years, some of the sub district already achieved 100% sanitation coverage. But this cyclone sidr affected the water supply and sanitation system of many of the coastal districts including Bagerhut, Barguna, Patuakhali and Barisal. The study was expected to give overviews of the impacts of the Cyclone Sidr on water supply and sanitation services in the coastal districts and identify the measures to reduce risks in future.

1.3. Objectives

The major objective of the study is to carry out impacts of cyclone Sidr on water supply and sanitation of the affected areas. The specific objectives are-

- a) To identify the sources of safe drinking water and water for sanitation (before and after the Sidr)
- b) To identify the ways and mechanism that how this event adversely affected water supply and sanitation system in the study areas (during and after the hit)
- c) To identify the consequences of cyclone sidr hit on water resources (tube-wells, ponds, reservoirs etc) in the study areas
- d) To identify measures to reduce risk in future

2. APPROACH AND METHODOLOGY

Various approach and methods have been followed to carry out the study. Detail methodologies are as follows:

2.1. Reconnaissance survey: A reconnaissance survey was carried out to identify the study areas in the affected coastal zone of the country. The cyclone didn't affect the whole region equally. A small team consisting of three members visited five of the affected districts. Three districts (most adversely affected) have been selected to meet the objective of the study.

2.2. Discussion and consultation with relevant stakeholders (DPHE, IWFM, LGI, LNGOs/CBOs and local representatives)

At the beginning of the study the BCAS study team held discussions and consultation with relevant stakeholders especially with Department of Public Health and Engineering, Institute of Water and Flood Management, local government institutes, local NGOs/CBOs and people's representatives i.e. union chairman or member. This was practically useful for planning and methodological development of the case study.

2.3. Selection of the Study Area

Identifying most affected coastal areas; three districts (Barguna, Patuakhali and Bagerhut) were selected for the study. The study covered two villages of one upazilla of the respective district. The following table provides the details of the study areas:

Table 1. Study areas to assess the impacts of Cyclone Sidr on Water supply and sanitation in coastal districts

District	Upazilla	Union	Village
Bagerhat	Soronkhola	Rainda	Soronkhola
		Southkhali	Rajeshwar
Barguna	Barguna	Dholua	Boroitola
		Bodorkhali	Baualkar
Patuakhali	Mirjagonj	Subedkhali	Charkhali
		Mirjagonj	Ghotoker andua

2.4. Collection and Review of Secondary Data/Information

A number of cyclone Sidr related documents were collected from concerned local, national, and international sources. These were collected and reviewed to meet the study objective. However, the major sources for secondary documents include DPHE, IFRCS, UNDP, CEGIS, BUET, USAID, Care Bangladesh, NGO Forum etc.

2.5. Development of Data Collection Tools

Questionnaire for sample survey and checklist for FGDs were separately developed to collect the primary data/information from the study sites. A number of issues including sources of water for drinking and other domestic purposes (before and after the SIDR), sanitation practices, health disorders especially related to water borne (before and after the Sidr), status of water and sanitation points after the Sidr and perception on the possible measures to reduce the risks in future. Details of these data collection tools are given in following primary data collection section.

2.6. Primary Data Collection

The following steps were followed accordingly to collect primary data from the study sites:

2.6.1. Recruitment and training of the field staff for primary data collection

A field team comprising one field supervisor and two field investigators were deployed in each of the three study district for primary data collection. All the field staff had a bachelor or higher degree and most of them had previous experience in field data collection through survey, FGD, etc.

A two-day long training programme was organized for the field staff at BCAS headquarters before going to fields. The training started at 10:00 am and ended at 4:00 pm in each day. The training was conducted by the experts of the study team to explain the objectives and field research methodologies including interviews and FGDs. The survey questionnaires, checklists and related issues for FGDs were discussed in detail during the training. The field staffs were encouraged to take proactive role and ask questions for a clear understanding of their task. The experts explained all the issues and questions raised by the field staff during the training. The field staff also participated in role-play on field data collection methods which were carefully observed by the participants. The training exercise was especially

fruitful in gathering field data/information by the field staff. The fieldwork was monitored by the experts of BCAS.

2.6.2 Quality control of data and information

Information and data provided by respondents was collected carefully and consciously during survey. Data assembled everyday was checked and cross checked thoroughly by field investigators at night whether any error or imperfection appears. Any limitation sensed was corrected instantly to enhance reliability of data and avoid subsequent confusion. Afterwards, data were examined by field supervisor once and the investigators were apprised of whichever existing deficiencies to reform it. In this strain quality of data was assured in every step of the survey.

2.6.3. Methods of primary data Collection

Multiple methods were used to collect the primary data. These are as follows:

- Sample survey
- Focus Group Discussion (FGD)

The sample survey was designed to gather information and data in a more structured format, the FGDs were focused on open ended opinions and views of the target study groups (**please see table-1 for summary**).

Sample Survey

The sample survey was targeted to the households of two villages from each of the three study districts. The total respondent for sample survey in each village was 50. Thus 300 respondents were surveyed in six villages of three districts. The households in each village were randomly selected. The head of the family/household was given priority to respond to the questions. In absence of the head, other senior informed person of the family/household was requested to respond. However, in many cases either elder male or female responded in presence of all members of the family. Sometime they all discussed before responding to some question particularly on health disorders issues.

The questionnaire generally focused on sources of water for drinking and other domestic purposes, sanitation practices, health disorders especially related to water borne (before and after the Sidr), status of water and sanitation points after the Sidr and perception on the possible measures to reduce the risks in future etc, as mentioned above. The questionnaires were designed in such a way that each question was accompanied by one or more answers. The respondents were allowed to choose from the given answers or he/she could give own opinion. The questions were both open and close ended.

Focus Group Discussion (FGD)

Two FGDs were conducted in each study district. One was with households (male and female together) and the other was with water and sanitation professionals in the study areas. Each FGD was comprised with 10 to 14 respondents. One of the field investigators presented the issue from the FGD checklist and the other two members of the team recorded the responses of the participants on specific issue. After the

session of FGD, the field team of each district have reviewed the issue base responses and prepared the report on each FGD of the study

2.7. Data Analysis

Data processing involved editing, coding, entering of figures and generating statistical tables required for analysis. SPSS software package was used for data analysis. Tables and Graphs were also worked as useful tools for further analysis. Qualitative information through FGDs and sample survey were also analyzed.

2.8. Draft Report

The core research team broadly analyzed the data/information and developed the draft report on proposed study. This draft report will be presented to experts and relevant stakeholders in national consultation meeting to finalize.

Workshop (National level): The findings of the research has been shared at the national level to validate and get feedback from the relevant stakeholders and experts to prepare the final report.

3. FINDINGS OF THE STUDY

Identification of Respondents and household members

The respondents of the study are relatively young. About 60 % respondents (both male and female) were between 20 and 40 years old. Only 14% of the sampled household members are over 50 years of age. The family size is only 4.0, which is less than our national household size. On the other hand, most of the household members (30 %) were found to be less than 12 years of age. About 21 % household members correspond with the age category of 19 and 30 while 22 % does the same with 31 and 50. It means, 44% household members were found to be between 19 and 50 years of age (details in Table 1 and 2).

Table-1: Percentage Distribution of Respondents by Sex

Age in yrs.	Male	Female	Both
	N=166	N=134	N=300
20-30	23.5	35.8	29.0
31-40	30.1	29.9	30.0
41-50	14.3	17.2	18.3
51-60	18.1	9.7	14.3
61+	9.0	7..5	8.3
Total	100.0	100.0	100.0

Table-2: Percentage Distribution of Household Members by Sex

Age in yrs.	Male	Female	Both
	N=166	N=134	N=300

Up to 12	29.5	30.6	30.0
13-18	13.7	12.8	13.3
19-30	17.7	23.4	20.5
31-50	23.8	20.8	22.4
50+	15.3	12.4	13.8
Total	100.0	100.0	100.0

Literacy of household members

Over two-fifths of both male and female members either illiterate or can sign only. There is very little difference between men and women in this respect. Only 9% of the male members have education up to secondary school certificate or above compared to 5% female. In general the education level of the sampled population is very low.

Occupation of household members

Like many other areas women are mostly confined to domestic chores within the boundaries of the family. It would be the areas that do not offer much non-traditional occupations that are emerging in many areas, such as shrimp fry collection, horticulture, shrimp processing etc. District and sex-wise variation of occupations of respondents don't differ much. This shows that the livelihood patterns of people of these three districts are very similar, possibly because of similar topography. However, most of the household members were found to be involved with a number of occupations including agriculture (11 %), daily labor (17% including rickshaw/van puller), business (7 %), student (21 %), service in GO/NGOs (4 %), housewives (31 %) and others (9 % including fisherman, boatman etc) (Figure-1)

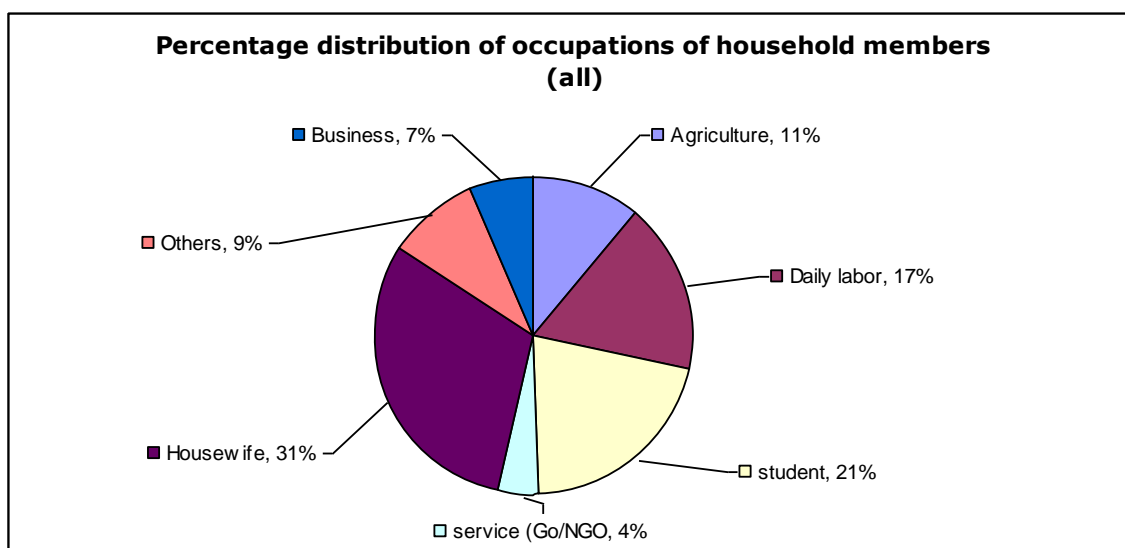


Figure 1: Percentage Distribution of Occupations of households by Sex

The division of labor between men and women are quite prevalent in the sampled areas. Almost all adult male members are engaged in some kind of occupations except about 20% students (details are in annex-3/Table-3). Over one fourth of the

male respondents are wage laborers followed by agriculture (20%) (Farmers), (13%) fishermen, business (11%), service (5%), and van and rickshaw pullers (4%). Except a negligible few women are mostly housewives (71%) or students (23%). Like many other areas women are mostly confined to domestic chores within the boundaries of the family. It would be the areas that do not offer much non-traditional occupations that are emerging in many areas, such as shrimp fry collection, horticulture, shrimp processing etc. District and sex-wise variation of occupations of respondents don't differ much. This shows that the livelihood patterns of people of these three districts are very similar, possibly because of similar topography

Sources of income (before and after Sidr)

The sources of income of household members seem to be limited primarily to wage labor (35%), agriculture (19%), fishing (14%), business (14%), service (1%), rickshaw and van pulling (5%) and other sources. No major change has occurred in the occupation of members of the family as only 7% employment has declined in agriculture and 7% has increased in wage labor in the post-Sidr period. In other occupations no significant change has occurred, District wise distributions show that some changes have taken place in agriculture, wage labor and services but nothing very drastic in any area after Sidr (details in annex-3/Table 4).

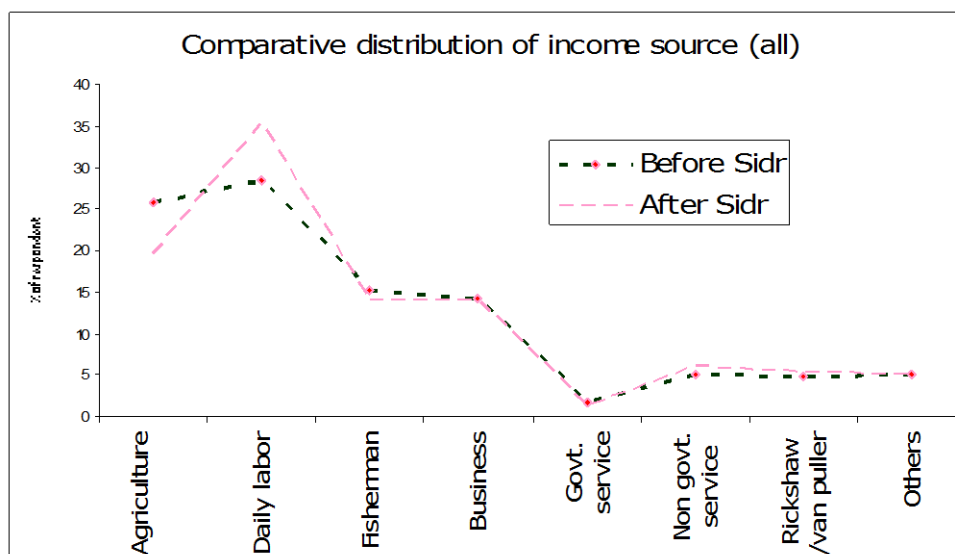


Figure 2: Percentage Distribution of income source in the study areas (before and after Sidr)

Although sources of income have not changed much the income itself has declined significantly in many Sidr affected areas. The average income of all households has fallen to Tk. 3878.0 from 5880.0, which is about 34%. District-wise decline in the post-sidr period has recorded 18% in Bagerhat, 48% in Borguna and 30% in Patuakhali. A significant number of people have lost income from agriculture while income from wage labor has increased after Sidr. Also district wise distribution shows the same trend. Business and other occupations have marked minor changes.

Water Supply and Sanitation

A number of issues including sources of water (e.g. drinking, cooking, bathing and household activities), status of the sources, availability of water, water quality and quantity, sanitation status, health condition before and after Sidr etc were covered to meet the objective of the study.

1. Sources of water for different purposes

One of the major concerns of the government in the post-Sidr period was to ensure water supply to the affected people. About 80% of all respondents used to depend upon tube well for drinking water before Sidr, which declined to 73% after Sidr. Dependency of people on other water sources like rainwater, PSF and pond was found in the pre and post-Sidr period at a lower percentage. In the post Sidr period dependency on storage rainwater had increased upto 7% while it declined on pond water. This decline is expected because pond water was polluted with saline water due to Sidr (details in Table).

Table 3 Percentage Distribution of Sources of Water for Drinking, Bathing and Household Chores before and After Sidr (All)

Source of Water	Purpose of Water Use							
	Drinking		Cooking		Bathing		Household chores	
	Before N=300	After N=300	Before N=300	After N=300	Before N=300	After N=300	Before N=300	After N=300
Tube well	80.3	72.7	6.3	18.3	4.3	15.3	7.7	17.7
PSF	9.3	16.7	1.3	7.0	0	0.3	-	0.3
Rain water storage	13.7	19.7	5.0	8.0	0	0	0	0
Wetland fresh water	1.7	3.0	1.3	1.7	0.3	0	0.3	0
Pond	10.3	8.7	60.7	48.3	62.0	53.7	60.7	52.0
Khal	0	0	14.0	11.7	16.7	18.0	16.7	17.3
Beel	0	0	0.3	-	0.7	0.3	0.3	0.3
River	1.0	3.0	22.0	20.3	24.0	23.7	21.3	21.7
Others	0	0	0	0	0.3	0.3	0	0
*Total	116.3	123.7	111.0	115.3	108.3	111.7	107.0	109.3

*Multiple responses were given.

District-wise analysis of sources of drinking water as a source of drinking water shows that in Bagerhat the use of tube well water had fallen significantly (22%) followed by pond (5%) after Sidr. The largest percentage increase of water use for drinking had taken place in PSF (22%), followed by rainwater (17%), wetland fresh water (5%), and river (5%) in the post-Sidr period. In other two districts nothing has actually changed as both of them mainly used tube well water in the pre and post-Sidr.

Table 4: Percentage Distribution of Sources of Drinking Water Before and After Sidr in Different Districts

Source of Water	Drinking					
	Bagerhat		Borguna		Patuakhali	
	Before n=100	After n=100	Before n=100	After n=100	Before n=100	After n=100
Tube well	41.0	19.0	100.0	99.0	100.0	100.0
PSF	28.0	50.0	0	0	0	0
Rain water storage	41.0	58.0	0	1.0	0	0
Wetland fresh water	5.0	9.0	0	0	0	0
Pond	31.0	26.0	0	0	0	0
River	3.0	8.0	0	0	0	1.0
*Total	149.0	170.0	100.0	100.0	100.0	101.0

*Multiple responses were given

Sources of cooking water seem to be different from drinking. Pond was the primary source (61%) for cooking water followed by river (22%), khal (14%), rainwater storage (5%) and tube well (6%) in the pre-Sidr period. The use of pond water declined by 12% while tube-well water use increased by 12% after Sidr. No other major change has taken place regarding cooking water use.

District-wise distribution shows that pond water was an important source of cooking in the pre-Sidr period which varied from 35% to 75%. The other important sources of water were rainwater and river. The use of pond water in the post-Sidr period declined in all districts while modest increase took place in PSF, rainwater, wetland fresh water in Bagerhat. The use of river water slightly declined in Bagerhat and Patuakhali while it slightly increased in Borguna in the lost-Sidr period (Table-5).

Table 5: Percentage Distribution of Sources of Water for Cooking Before and After Sidr

Source of Water	Cooking					
	Bagerhat		Borguna		Patuakhali	
	Before n=100	After n=100	Before n=100	After n=100	Before n=100	After n=100
Tube well	1.0	2.0	2.0	17.0	16.0	36.0
PSF	4.0	21.0	0	0	0	0
Rain water storage	14.0	23.0	0	0	1.0	1.0
Wetland fresh water	3.0	5.0	0	0	1.0	0
Pond	73.0	56.0	74.0	64.0	35.0	25.0
Khal	3.0	1.0	17.0	14.0	22.0	20.0
Beel	0	0	0	0	1.0	0

River	17.0	14.0	9.0	13.0	40.0	34.0
*Total	115.0	122.0	102.0	108.0	116.0	116.0

*Multiple responses were given.

The respondents of the total samples reported that pond (62%), river (24%) and khal (17%) were the major sources of water for bathing before Sidr. In the post-Sidr period the pond water use slightly declined (8%) and tube well water use increased (11%). No other change had taken place in the post-Sidr period.

District-wise distributions show that the major source of bathing water was pond in all districts before Sidr. Besides pond, river and khal were also important sources of bathing water. In all districts the use of pond water for bathing declined Sidr. Very little change took place regarding the use of river and khal water. The use of tube-well for bathing increased by 10%. The contamination of pond water and presumed safety of tube water are possible the causes of fall and rise of use of water from these two sources, respectively in the post-Sidr period.

Table 6: Percentage Distribution of Sources of Water for Bathing before and After Sidr

Source of Water	Bathing					
	Bagerhat		Borguna		Patuakhali	
	Before n=100	After n=100	Before n=100	After n=100	Before n=100	After n=100
Tube well	0	3.0	4.0	17.0	9.0	26.0
PSF	0	1.0	0	0	0	0
Pond	74.0	69.0	74.0	63.0	39.0	29.0
Khal	8.0	13.0	16.0	14.0	26.0	27.0
Beel	0	1.0	1.0	0	1.0	0
River	23.0	20.0	10.0	13.0	39.0	38.0
Others	0	0	0	0	1.0	1.0
*Total	105.0	107.0	105.0	107.0	115.0	121.0

*Multiple responses were given.

The majority of the total respondents used pond water (61%) for household chores followed by river (21%), khal (17%) and tube well (8%) before Sidr. Use of pond water for household chores declined about 7% while it increased about 10% in the post- Sidr period.

District-wise distributions show that slight decrease in pond, river and also khal water use had taken place in the post-Sidr period in Bagerhat. Almost a similar trend was found in Borguna and Patuakhali except tube-well water which slight increased in the post-Sidr period (Table-7).

Table 7: Percentage Distribution of Sources of Water for Household Chores Before and After Sidr

Source of Water	Household Chores					
	Bagerhat		Borguna		Patuakhali	
	Before n=100	After n=100	Before n=100	After n=100	Before n=100	After n=100
Tube well	0	3.0	5.0	19.0	18.0	31.0
PSF	0	1.0	0	0	0	0
Pond	73.0	70.0	75.0	63.0	34.0	23.0
Khal	9.0	14.0	17.0	14.0	24.0	24.0
Beel	0	1.0	0	0	1.0	0
River	21.0	18.0	8.0	12.0	35.0	35.0
*Total	103.0	107.0	105.0	108.0	113.0	113.0

*Multiple responses were given.

2. Condition of the sources of water

The main resources became unusable in greater proportion after Sidr are pond (78%), khal (80%) and Beel (100%). Tube-wells and PSF were also become partially unusable (about one-fourth). District-wise distributions seem to have same pattern although with some minor variations (details in Table 8a, 8b and 8c). The tube-well appears to be the least affected source of water compared to other sources.

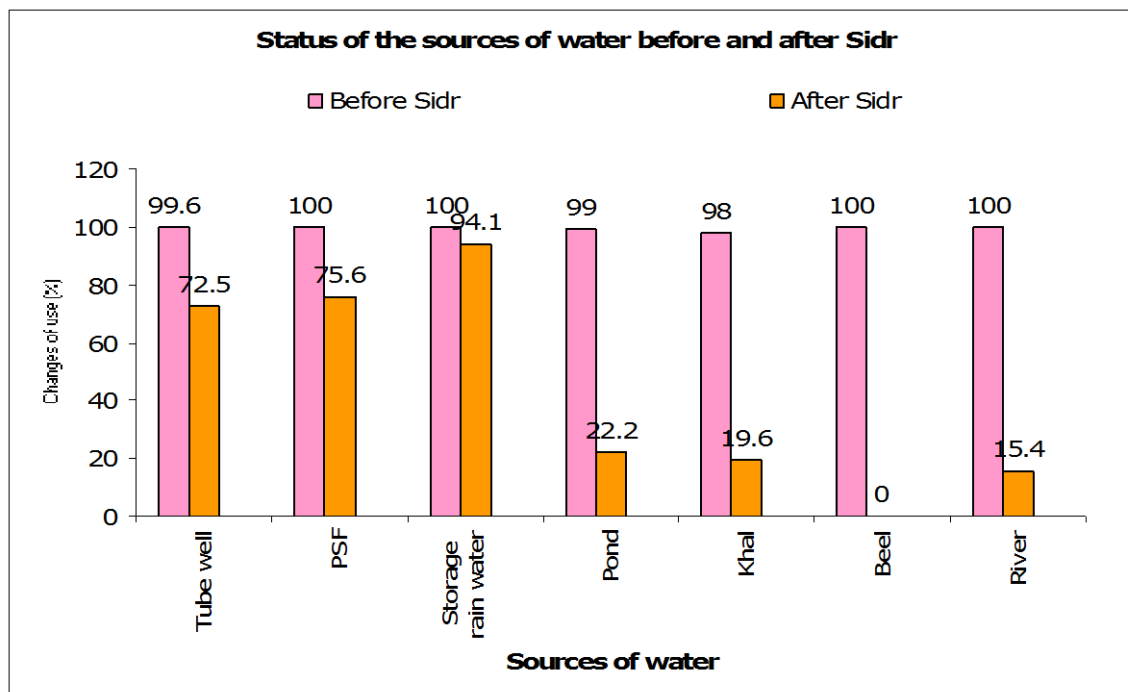


Figure 3: Percentage Distribution of Status of the sources of Before and After Sidr (All)

Table 8a: Percentage Distribution of Condition of Sources of Water After Sidr Hit (Bagerhat)

Status of Water Sources After Sidr	Sources of water					
	Tube well n*=40	PSF n*=37	Rain water storage n*=45	Pond n*=78	Khal n*=14	River n*=27
Partially useable	10.0	8.1	13.3	12.8	28.6	33.3
Totally unusable	35.0	32.4	55.6	82.1	71.4	66.7
Fully useable	55.0	59.5	31.1	5.1	0	0
Total	100.0	100.0	100.0	100.0	100.0	100.0

*Remaining respondents are excluded from % calculation for not having this source of water.

Table 8b: Percentage Distribution of Condition of Sources of Water after Sidr Hit (Borguna)

Status of water sources	Sources of water			
	Tube well n*=100	Pond n*=80	Khal n*=15	River n*=12
Partially useable	33.0	25.0	40.0	33.3
Totally unusable	23.0	71.3	53.3	58.4
Fully useable	44.0	3.7	6.7	8.3
Total	100.0	100.0	100.0	100.0

*Remaining respondents are excluded from % calculation for not having this source of water.

Table 8c: Percentage Distribution of Condition of Sources of Water after Sidr Hit (Patuakhali)

Status of Water Sources After Sidr	Sources of water				
	Tube well n*=100	Rain water storage n*=1	Pond n*=43	Khal n*=29	River n*=42
Partially useable	20.0	-	2.3	3.4	23.8
Totally unusable	13.0	-	95.4	96.6	76.2
Fully useable	67.0	100.0	2.3	-	-
Total	100.0	100.0	100.0	100.0	100.0

*Remaining respondents are excluded from % calculation for not having this source of water.

3. Availability of safe water (before and after Sidr)

About 87% of all respondents of three districts of different age groups claim that they had adequate safe drinking water before Sidr while this percentage went down to less than 70% in the post Sidr period. District-wise distributions reveal that

around 75% of respondents of all age groups of Bagerhat had safe drinking water before Sidr and it declined slightly in the post Sidr period. Near about 90% respondents of all age groups of Borguna had also safe drinking water before Sidr but it declined to 54% to 81% in different age groups in the post Sidr period. Nearly 100% of respondents of all age groups of Patuakhali enjoyed safe drinking water before Sidr which declined to 69% to 79% percent in different age group the post Sidr period.

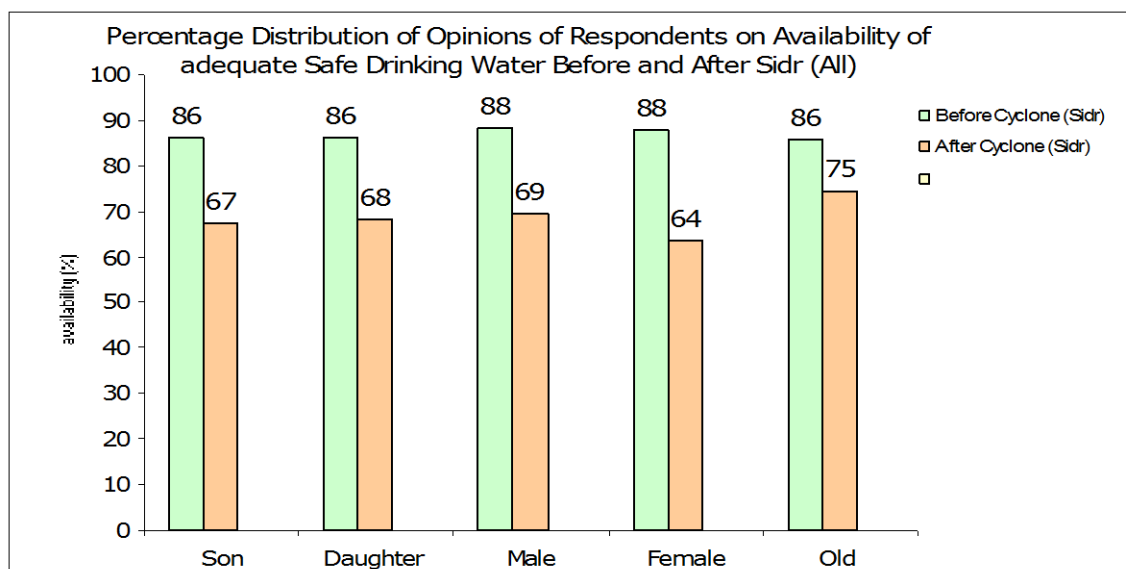


Figure 4. Percentage distribution of opinions of respondents on availability of adequate safe drinking water before and after Sidr (all)

Note: Son (below 18 years); Daughter (below 18 years); Male (19-50); Female (19-50); old (above 50 years)

The above statistics reveal that the adequate safe drinking water was available before Sidr, which declined slightly in all districts but not in an alarming rate.

Table 9a: Percentage Distribution of Opinions of Respondents on Availability of Safe Drinking Water Before and After Sidr (Bagerhat)

Family Members	Availability of Safe Drinking Water					
	Before Cyclone (Sidr)			After Cyclone (Sidr)		
	Adequate	In-adequate	Total	Adequate	In-adequate	Total
Son (below 18 years)	73.9	26.1	100.0	60.9	39.1	100.0
Daughter (below 18 years)	72.9	27.1	100.0	70.2	29.8	100.0
Male (19-59)	78.5	21.5	100.0	65.2	34.8	100.0
Female (19-59)	75.8	24.2	100.0	65.6	34.4	100.0
Old (above 60 years)	64.7	35.3	100.0	64.7	35.3	100.0

Table 9b: Percentage Distribution of Opinions of Respondents on Availability of Safe Drinking Water Before and After Sidr (Borguna)

Family Members	Availability of Safe Drinking Water					
	Before Cyclone (Sidr)			After Cyclone (Sidr)		
	Adequate	In-adequate	Total	Adequate	In-adequate	Total
Son (below 18 years)	92.0	8.0	100.0	80.8	19.2	100.0
Daughter (below 18 years)	88.7	11.3	100.0	60.8	39.2	100.0
Male (19-59)	88.7	11.3	100.0	66.7	33.3	100.0
Female (19-59)	90.9	9.1	100.0	54.1	45.9	100.0
Old (above 60 years)	94.4	5.6	100.0	77.8	22.2	100.0

Table 9c: Percentage Distribution of Opinions of Respondents on Availability of Safe Drinking Water Before and After Sidr (Patuakhali)

Family Members	Availability of Safe Drinking Water					
	Before Sidr			After Sidr		
	Adequate	In-adequate	Total	Adequate	In-adequate	Total
Son (below 18 years)	98.3	1.7	100.0	69.0	31.0	100.0
Daughter (below 18 years)	96.9	3.1	100.0	73.0	27.0	100.0
Male (19-59)	98.8	1.2	100.0	75.3	24.7	100.0
Female (19-59)	96.7	3.3	100.0	70.3	29.7	100.0
Old (above 60 years)	93.1	6.9	100.0	78.6	21.4	100.0

4. Sources of drinking water immediate after the Sidr (15 November 2007 to 15 December 2007)

Availability of safe drinking water immediately after any disaster is crucial for the survival as well as for avoiding epidemics. It is found that about 59% of total respondents received safe drinking water supply up to one month after Sidr from NGOs followed by own source (25%) and government (15%). District wise distributions show that respondents of Patuakhali received less support from NGO (50%) compared to other two districts but managed its own (39%) more than other. Bagerhat seems to have received considerable support (34%) from the Government while significant percentages of people of Borguna managed their own water (37%). The above findings indicate that NGOs are prime provider of safe drinking water during crisis period.

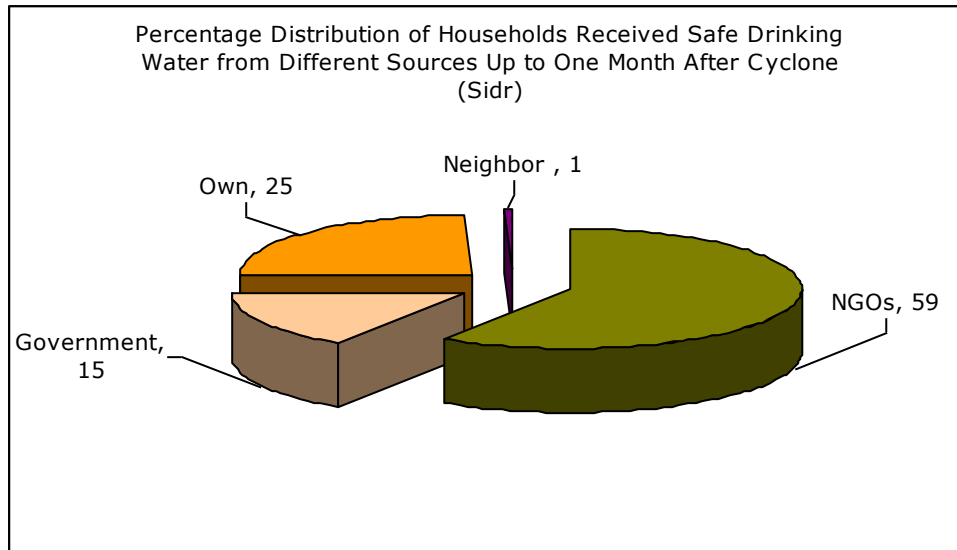


Figure 5. Percentage distribution of opinions of respondents on availability of adequate safe drinking water before and after Sidr (all)

According to FGD, it appears that those who received safe drinking water supply after Sidr the vast majority of them received it in the form of water purification tablet, purified waters, Alum (78%), bottle of water etc. But water supply in bottle was minimum. The district-wise analysis depicts the same trend with very minor variations. The above findings indicate that the safe drinking water in the post-Sidr was more or less adequate.

The repair work of sources of water was required primarily for pond and tube well as reported by all respondents of three districts. Some repair work was also required for khal and embankment of river. District-wise variation of required repairs of sources of water was significant. Most of the ponds required repair in all the districts especially in Bagergat. In both Borguna and Patuakhali, significant numbers of tube-wells required repair. Some of the respondents of Patuakhali reported the need of repairing khal and river embankments. In short, pond and tube wells seem to be most vulnerable to Sidr.

5. Use of latrine (before and after Sidr)

The overall sanitary condition deteriorated in the post-Sidr but not at an alarming rate. The user percentage of hole latrine with ring and slab were 79% before Sidr which declined to 65% in the post-Sidr period. The users of kacha latrine open defecation increased by few percentages only after Sidr (Figure 6). Thus Sidr did not inflict heavy blow to sanitary system in the area. District-wise distributions show a similar trend but Barguna seems to have experienced greater deterioration than other areas with regard to use of hole latrine with ring and slab and kacha latrine.

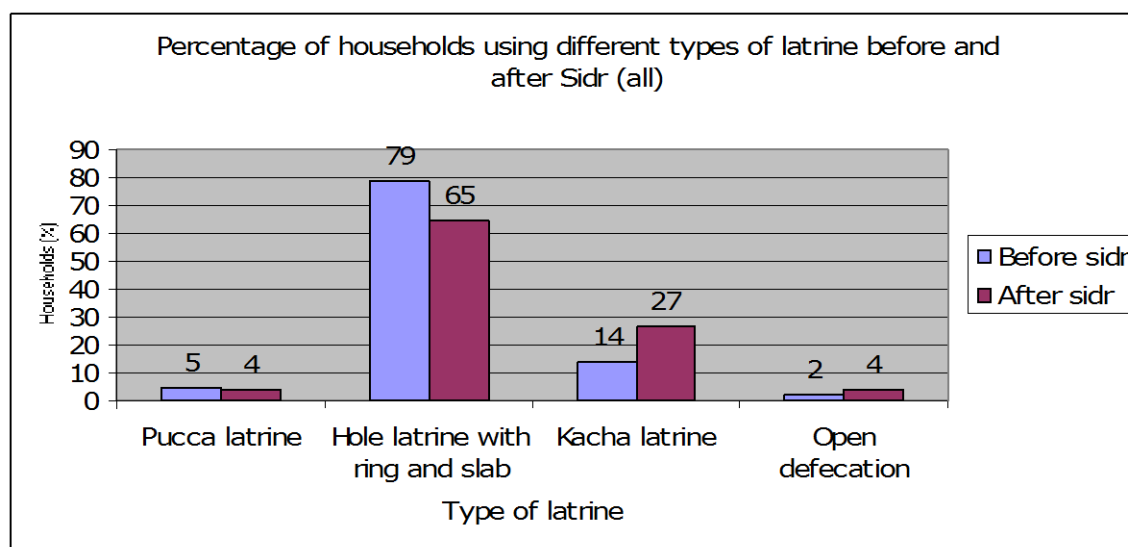


Figure 6. Percentage of households using different types of latrine before and after Sidr (all)

Table 10: Percentage distribution of condition of latrine facilities in the family before and after Sidr

Type of Latrine	Bagerhat n=100		Borguna n=100		Patuakhali n=100	
	Before sidr	After sidr	Before sidr	After sidr	Before sidr	After sidr
Pucca latrine	4.0	2.0	4.0	4.0	7.0	7.0
Hole latrine with ring and slab	75.0	64.0	74.0	47.0	87.0	83.0
Kacha latrine	6.0	27.0	21.0	45.0	5.0	9.0
Open defecation	4.0	7.0	1.0	4.0	1.0	1.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

6. Damage and repair of latrine

Almost all of the total survey respondents opined that the latrines were damaged by Sidr and 77% of them said that those were repaired. About 20% latrines were not repaired after Sidr. Nearly half of the total respondents helped themselves in repairing the latrines followed by NGOs. Almost similar trend is observed in each affected district.

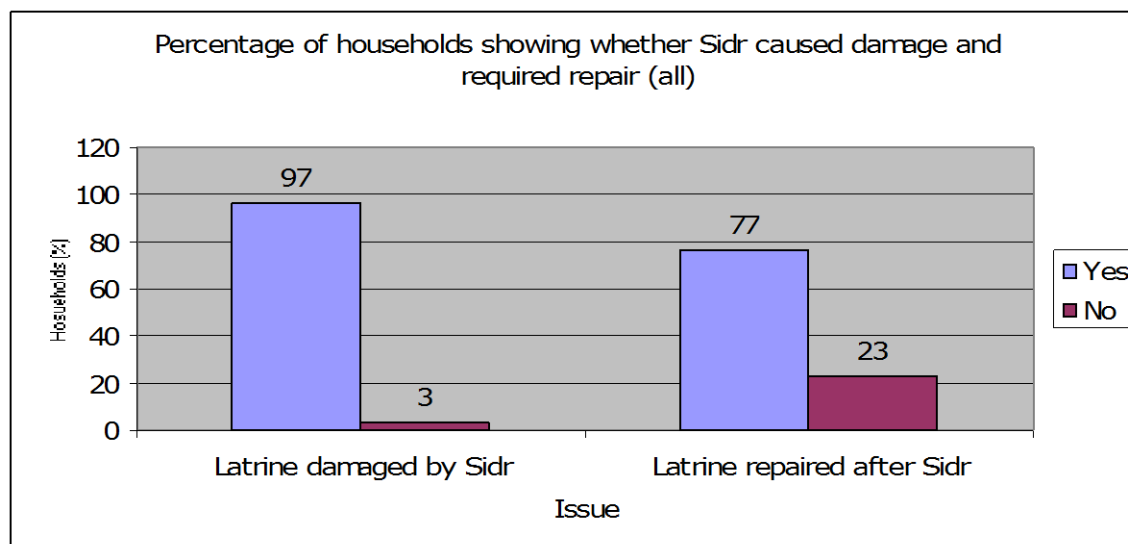


Figure 7: Percentage Distribution Showing Whether Sidr Caused Damage and Required Repair (all)

Table 11: Percentage Distribution Showing Whether Sidr Caused Damage and Required Repair (district level)

Response	Bagerhat		Borguna		Patuakhali	
	Damaged by Sidr n=100	Repaired after Sidr n=100	Damaged by Sidr n=100	Repaired after Sidr n=95	Damaged by Sidr n=100	Repaired after Sidr n=95
Yes	100.0	78.0	95.0	65.3	95.0	87.4
No	-	22.0	5.0	34.7	5.0	12.6
Total	100.0	100.0	100.0	100.0	100.0	100.0

7. Adequacy of water for sanitation before and after Sidr hit

Nearly 99% respondents of total samples reported that the water for sanitary practices was adequate before Sidr which declined to 80% after Sidr. District-wise distributions shows that inadequacy of water for sanitary practices occurred in the range of 24% to 30% in Borguna and Patuakhali for washing hands after defecating and to clean toilet regularly. It seems that there was scarcity of water for sanitary purposes after Sidr.

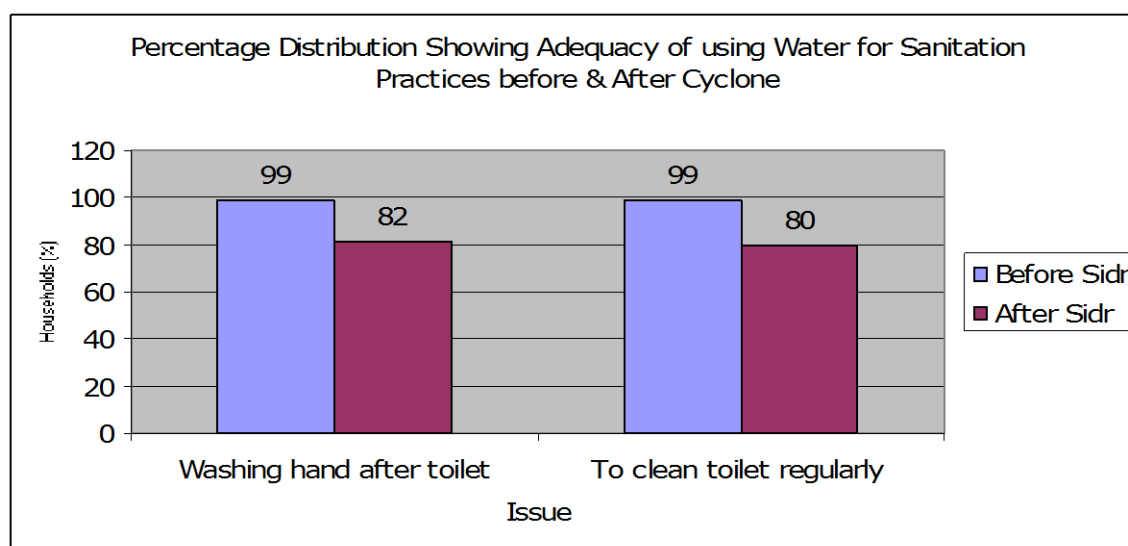


Figure 8: Percentage Distribution Showing Adequacy of using Water for Sanitation Practices before & After Cyclone (all)

Table 12: Percentage Distribution Showing Adequacy of using Water for Sanitation Practices before & After Cyclone (Sidr)

Study Area	Objects	Before Sidr			After Sidr		
		Adequate	Inadequate	Total	Adequate	Inadequate	Total
Bagerhat	Washing hand after toilet	100.0	-	100.0	99.0	1.0	100.0
	To clean toilet regularly	100.0	-	100.0	99.0	1.0	100.0
Borguna	Washing hand after toilet	100.0	-	100.0	70.0	30.0	100.0
	To clean toilet regularly	100.0	-	100.0	70.0	30.0	100.0
Patuakhali	Washing hand after toilet	96.0	4.0	100.0	75.8	24.2	100.0
	To clean toilet regularly	96.0	4.0	100.0	72.0	28.0	100.0
	To clean toilet regularly	98.6	1.4	100.0	80.1	19.9	100.0

8. Damage of home and health impairment due to Cycle Sidr

It appears that almost all homes were more or less damaged by the Sidr in the study areas. About 10 percent households had to face death case in the family while 58 % households suffered from injury in all study areas.

Table 13: Percentage Distribution of Damage of Houses, Death and Injury Caused by Sidr (All)

Opinion	Home Damaged N=300	Death in Family N=300	Injury in Family N=300
Yes	99.3	9.7	57.7
No	0.7	90.3	42.3
Total	100.0	100.0	100.0

9. Incidences of water borne diseases before and after Sidr

In response to a question on incidences of water borne diseases immediate (within 1 month) before and after Cyclone Sidr hit, most of the households mentioned that the water borne diseases have been increased in all study areas. Incidences of diarrhea, skin diseases, cold/cough/fever and eye infections were found to be more than doubled after Sidr in each of the study areas. In Pataukhali, about 60 % households suffered from cold/cough/fever after Sidr while the incidences were less than half before Sidr. Similar trend was observed in Barguna and Bagerhut. Details are shown in Figure 9 A-C)

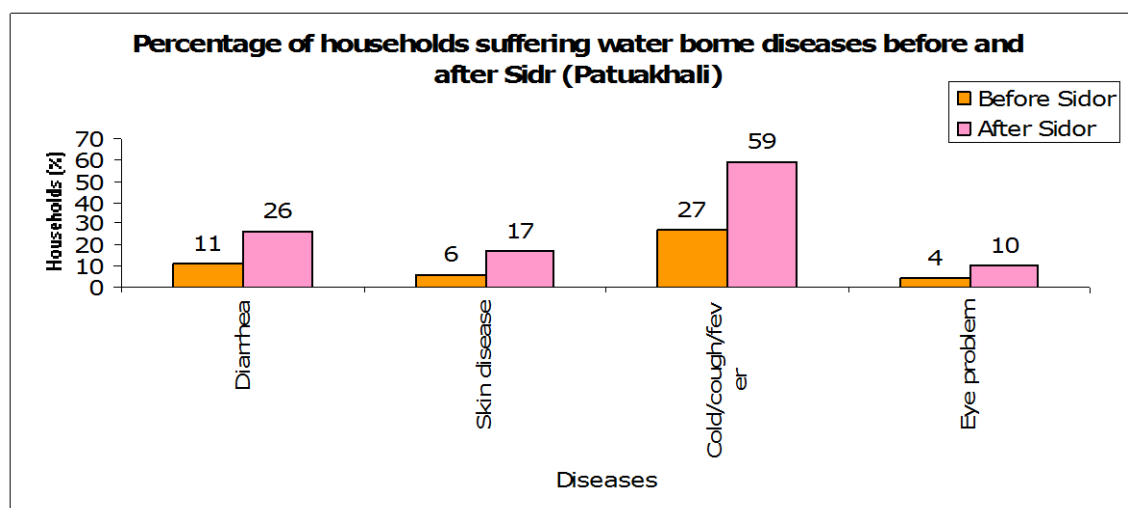


Figure 9 A: Percentage Distribution of Households Surveyed Affected Family Members by Different Diseases before and After Cyclone (Sidr) Hit (Patuakhali)

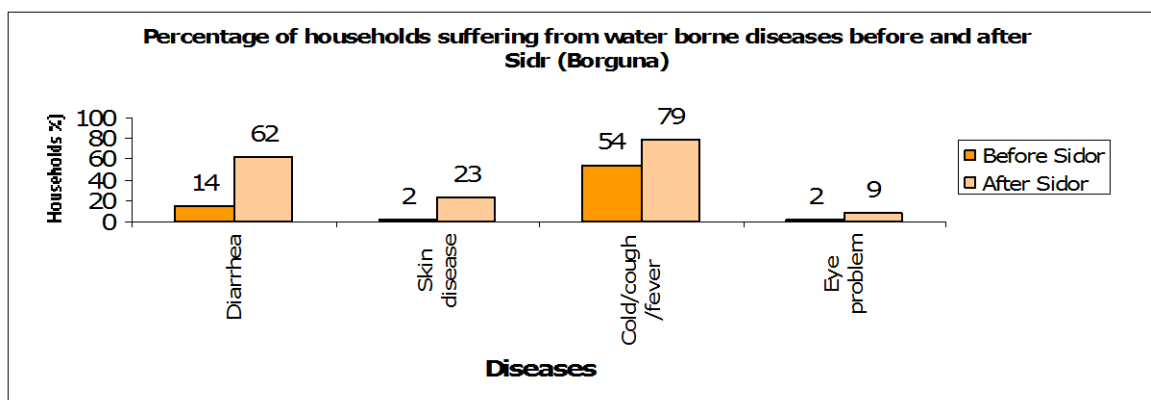


Figure 9 B: Percentage Distribution of Households Surveyed Affected Family Members by Different Diseases before and After Cyclone (Sidr) Hit (Borguna)

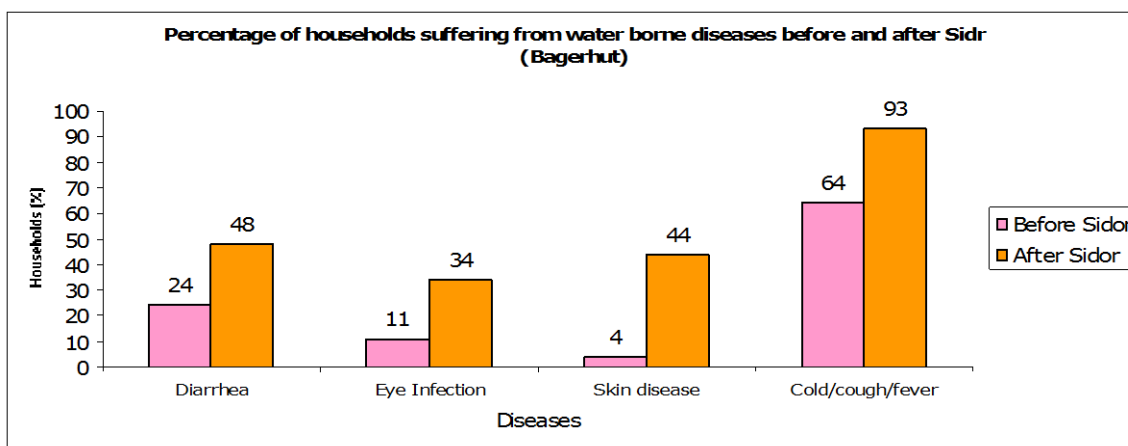


Figure 9 C: Percentage Distribution of Households Surveyed Affected Family Members by Different Diseases before and after Cyclone (Sidr) Hit (Bagerhut)

10. Perception on the status of housing, income, safe drinking water and sanitation

In response to questions on housing, income, safe drinking water and sanitation, over three-fourths of the total respondents opine that they are worst than before in terms of housing and income. With regard to drinking water majority think the condition has is as before and about one-fourth consider the situation is worst than before Sidr. However, nearly one-fourth thinks that the situation now is better than before. This is may be due to immediate intervention. Nearly half of the total respondent think the situation is now worst than before Sidr regarding sanitation.

Table 14: Percentage Distribution of Condition of Housing, Drinking Water and Sanitation (All)

Condition	Housing N=298	Income N=300	Safe drinking water N=300	Sanitation N=300
As before	9.7	15.0	57.4	24.0

Better than before	15.4	7.7	19.3	26.3
Worst than before	74.9	77.3	23.3	49.7
Total	100.0	100.0	100.0	100.0

11. Measures to be taken to reduce the risks in future

Suggestions were sought from all respondents of the study on the strategies to be taken to reduce the risk of water supply and sanitation systems in case of future cyclone. Two major suggestions are (for sanitation): to make the sanitary latrines strong and make it pucca. About 12 % also suggested to place the latrine at a high place. The same trend of suggestions is also observed in all sampled districts with some variations. Suggestions for strong latrine vary from low 40% in Patuakhali to high 73% in Bagerhat and pucca latrine from low 22% in Bagerhat to high 38% in Patuakhali. The highest percentage (14%) of suggestion for placing the latrine in high place has come from the respondents of Barguna followed by 12% from Patuakhali, and 10% from Bagerhat (Table-15).

Table 15: Percentage Distribution of Suggestions Placed by Respondents for Reducing the Risk of Sanitation System in Case of Cyclone.

Suggestions	Bagerhat	Barguna	Patuakhali	All
To make sanitary latrine strong	72.6	62.0	40.0	57.4
To make latrine with more ring slab	1.4	0.0	7.8	3.0
To make septic tank	1.4		5.6	2.3
To make high pucca latrine	21.9	24.0	37.8	28.1
To make latrine in high place strongly	9.6	14.0	12.3	12.1
Other	0.0	0.0	2.2	0.4

Nearly 80% of the respondents gave various suggestions to take initiatives to reduce water risk in case of future cyclone. Those who responded from all three districts, provided five major suggestions, which were: a) to set up tube-well in high/pucca place (36%) followed by b) to set up tube-well, c) to set up deep tube-well in right place (14%), d) to set up water tank/storage water (14%), and to make embankment/road (13%). The above data show that respondents primarily want more tube-well to set up in suitable places (Table-15).

Table-15: Percentage Distribution of Suggestion to Take Initiative to reduce Water Rise in Future.

	Bagerhat	Barguna	Patuakhali	All
To set up Tube-well	25.4	21.3	40.9	29.6
To set up tube-well in high/pucca place	12.7	60.7	28.4	36.3
To set up deep tube-well in necessary place	7.9	19.1	13.6	14.2
To set up water tank/storage water	15.9	7.4	16.9	13.8
To make high embankment/road	44.4	1.1	1.1	12.5

To excavate/re-excavate pond	4.8	1.1	2.2	2.5
To increase the height of pond embankment	0	0	9.1	3.3
To use rainwater	0	0	3.4	1.3
To manage water purification tablets	0	0	3.4	1.3
Other	3.2	3.3	2.2	3.7
Total	114.3	114.0	121.2	118.5

The suggestions came from different districts did not have similar trend. The highest percentage of respondents of Bagerhat consider high embankment/road as their top priority (44%) while Barguna respondents' top priority is tube-wells set up on high/pucca place (60%), and Patuakhali respondents give highest points to more tube-wells (41%) in their areas. In Bagerhat and Barguna the second priority is given to setting up of tube-wells (25%) and 21% respectively) while in Patuakhali on setting up tube-wells on high/pucca place. Other important suggestions given by respondents of different districts are setting up of deep tube-wells, setting up of water tank and rain water storage facilities and increasing the height of pond embankment.