



Handbook on
Climate Change and Disaster Resilient Water,
Sanitation and Hygiene Practices

Handbook on

Climate Change and Disaster Resilient Water, Sanitation and Hygiene Practices



Handbook: Climate Change and Disaster Resilient Water, Sanitation and Hygiene Practices

Publish: December, 2012

Copyright: WaterAid in Bangladesh

ISBN: 978-984-33-8020-3

Guidance

Kazi Shahidur Rahman
Arif Abdullah Khan
Hasina Akter Mita

Research & Editing

Zahid Hussain
Dr. Sheikh Tauhidul Islam
Md. Ruhul Amin
Sabbir Hussain
Safina Naznin
S. M. Shihabul Islam
Mehedi Hasan Shishir

Photograph

Zahid Hussain
Dr. Sheikh Tauhidul Islam

Design & Print

ARKA

Foreword

Geographic features, location and adverse environment made Bangladesh one of the most disaster prone countries in the world. Every year different types of disaster cause huge damages to assets and environment and that seriously disrupt life and livelihood and put people in great distress. Moreover, climate change magnifies their distresses. Bangladesh is considered to be one of those countries that have already been exposed to the negative impacts of climate change. Disaster affects the infrastructures of water and sanitation and the supply system the most. During floods or tidal surges inundate tube-wells, ponds and water bodies and contaminate the natural sources of fresh water. People in the affected communities are forced use unsafe water. Also, latrines are, generally, fragile and set up on low grounds; they collapse easily. It leaves people no other options but to go for open defecation. Such crisis in safe water supply and sanitation service severely disrupts hygiene practices. Furthermore, the observed impacts of climate change indicate higher prevalence rates of waterborne and airborne diseases. As attributed to sea level rise, salinity in coastal region has been increasing. It is contaminating the safe water sources and, subsequently, creating various health hazards. Also, accessing safe water has become a major challenge for the people.

WaterAid is an international NGO that provides assistance for safe water supply, sanitation and hygiene practice in the poor communities in the world. WaterAid works to innovate and improve technologies for safe water supply, sanitation and hygiene to make them disaster and climate change resilient and available for the affected communities. “Climate change and disaster resilient water, sanitation and hygiene practices” is written to help governmental and non-governmental agencies involved in safe water, sanitation hygiene at local level, union and ward disaster management committee, in particular, enhance their respective capacities to cope climate change and disaster risks. This handbook will be used, mainly, for the purpose of training. This handbook will give the field level workers and practitioners practical ideas about water supply, sanitation and hygiene practices in the context of climate change and disaster risk. It will also provide them the necessary information for planning and conducting WaSH training. For this reason WaterAid has taken initiative for developing a handbook, “Climate change and disaster resilient water, sanitation and hygiene practices”, as well as distributing it to the local communities for coping with the uncertainty of disaster and climate change.

Md. Khairul Islam

Country Representative, WaterAid in Bangladesh



Acknowledgment

We are grateful to WaterAid in Bangladesh for commissioning NIRAPAD for developing “Climate change and disaster resilient water, sanitation and hygiene practices” handbook to make water, sanitation and hygiene practices more resilient and sustainable in the context of adverse climate change impacts and increasing disaster in Bangladesh. We would like to thank Mr. Arif Abdullah Khan, Programme Manager, WaterAid in Bangladesh, and his colleagues Mr. Mahfuzur Rahman and Safina Naznin, Programme Officer-Social Development, WaterAid in Bangladesh for providing valuable information and suggestion for developing the handbook. We would also thank our Consultant Mr. Zahid Hussain, Dr. Sheikh Tauhidur Rahman, Md. Ruhul Amin, Ferdousur Rahman and Sabbir Hussain for their continuous assistance and support. We are grateful to all the WaterAid partner organizations (PNGOs), Rupantar, Sushilan, UST, for their effort for arranging write-shop with their field level workers for developing the handbook. A lot of information and references have been used in this handbook from various sources, i.e. modules from national and international organizations, resource papers, handbooks, publications; we would also like to thank those organizations who have developed them. We are obliged to all the WaterAid trainers and local communities who will use this handbook.

Kazi Shahidur Rahman
Chief Executive Officer, NIRAPAD



Contents

| | |
|---------------------------------------------------------------------------------------------------------------|----|
| Foreword | 03 |
| Acknowledgment | 04 |
| Objective, Scope and Structure of the Handbook | 07 |
| Chapter One: Climate Change and Disaster Vulnerability of Bangladesh | 09 |
| 1.1. Disaster: Basic Concept | 09 |
| 1.2. Climate Change: Basic Concept | 13 |
| Chapter Two: Water, Sanitation and Hygiene: Basic Concept | 17 |
| 2.1. Safe Water | 17 |
| 2.2. Sanitation | 19 |
| 2.3. Hygiene | 21 |
| Chapter Three: Regional threats of Water supply, sanitation and hygiene practices in Bangladesh | 27 |
| 3.1. Coastal Region Safe Water | 27 |
| 3.2. River Basin and Char lands | 28 |
| 3.3. Hill Tracts | 30 |
| 3.4. Haor Region | 31 |
| 3.5. Barind Tract and Madhupur Region | 32 |
| Chapter Four: Impacts of Disaster and Climate Change on Water Supply, Sanitation and Hygiene Practices | 35 |
| 4.1. Environmental Impact | 35 |
| 4.1.1 Salinity | 36 |
| 4.1.2 Desertification | 36 |
| 4.1.3 Increasing Hazard Proneness | 36 |
| 4.1.4 Water Logging | 37 |
| 4.2. Social Impact | 37 |
| 4.2.1 Deprivation | 38 |
| 4.2.2 Discrimination | 39 |
| 4.2.3 Distress | 39 |
| 4.2.4 Migration | 40 |
| 4.3. Impact on Health | 40 |
| 4.3.1 Personal health | 40 |
| 4.3.2 Public health | 40 |
| 4.3.3 Reproductive health | 41 |



| | |
|---------------------------------------------------------------------------------------------------------------------------------|----|
| Chapter Five: Considerations for Water Supply, Sanitation and Hygiene in Climate Change and Disaster Induced Uncertainty | 43 |
| 5.1. Institutional arrangement for Water supply, Sanitation and Hygiene | 43 |
| 5.1.1 Role of Governmental and Non-governmental agencies and their Participation | 44 |
| 5.1.2 Roles of DPHE and UDMC | 45 |
| 5.2. Strategies for Managing Water Supply, Sanitation and Hygiene | 48 |
| 5.2.1 Strategies to Manage Climate Change and Disaster Induced Uncertainty | 48 |
| 5.2.2 Principles in managing Uncertainty | 51 |
| 5.2.3 Considerations in Water Supply, Sanitation and Hygiene Practice | 52 |
| 5.2.4 Mobilizing Resource | 53 |
| 5.3. Accountability | 54 |
| 5.3.1 Accountability structure | 55 |
| Appendix: Glossary | 57 |
| References | 64 |



Objective, Scope and Structure of the Handbook

“Climate change and disaster resilient water, sanitation and hygiene practices” is written to help governmental and non-governmental agencies involved in safe water, sanitation hygiene at local level, union and ward disaster management committee, in particular, enhance their respective capacities to cope climate change and disaster risks. This handbook will be used, mainly, for the purpose of training. This handbook will give the field level workers and practitioners practical ideas about water supply, sanitation and hygiene practices in the context of climate change and disaster risk. It will also provide them the necessary information for planning and conducting WaSH training.

The focus of the handbook is safe water supply, sanitation and hygiene practice. Because of that, the other sectors relating climate change and disaster risk such as- livelihood, education and nutrition are not mentioned in the handbook. Also, the handbook has been developed considering the rural context of Bangladesh. Therefore only rural scenario of safe water, sanitation and hygiene and the related problems and their solutions are described in this handbook. It did not explore the urban context or scenario.

There are controversies and uncertainties about various studies, propositions and data relating climate change and disaster risk. However, this handbook does not present any analysis or discussion to end or reconcile those disputes; instead, it used information and statements from the reports and documents published by the Government of Bangladesh and the IPCC. In addition, some complicated issues about climate change and disaster risk have been deliberately simplified so that the intended users and participants of the training can understand the concepts easily – for example, global warming, inter-relation between climate change and disaster risk, geo-environmental regions in Bangladesh. The discussions in the handbook are divided in five chapters.

Chapter 1: This chapter presents the basic concepts of disaster risk and climate change. The main focus of the chapter is that: Bangladesh is a disaster prone country and disasters damage life, asset and environment; and climate change causes uncertainty as well increases the magnitude of disasters. Climate change and disaster are adversely impacting on the infrastructure of safe water supply, sanitation and hygiene practice.

Chapter 2: This chapter explains the basic concepts of safe water, sanitation and hygiene. It notes that the services regarding WaSH are perceived as human rights



although, in practice, they are applied as public health concerns. This chapter also explains how climate change and disaster disrupts safe water supply, sanitation and hygiene practice.

Chapter 3: This chapter discusses the regional variations in the effects of climate change affects and disaster risks in the context Bangladesh. The chapter also discusses how the existing natural sources of water and the current technologies fail to cope with climate change and disasters; and the current concern about safe water supply and sanitation.

Chapter 4: This chapter discusses, mainly, the adverse impacts of climate change and disaster on natural, social and health environment and how that cause crisis in safe water supply, sanitation and hygiene practices.

Chapter 5: This chapter discusses existing national policy structures and institutional system for ensuring safe water, sanitation and hygiene practice as well the strategies to cope with the climate change and disaster induced uncertainties. This chapter also includes the principal for WaSH programme and accountability issues in programme implementation.



Chapter One: Climate Change and Disaster Vulnerability of Bangladesh

Unique geographic feature and location make Bangladesh extremely prone to natural hazards.¹ Moreover, high population density and persistent poverty compel large numbers of people to live in the marginalized areas. It increases their disaster vulnerability. As a result, natural hazards, such as, cyclone, flood or drought cause huge losses, and put people into severe distresses.

Climate change, in one hand, it increases frequencies and magnitudes of natural hazards – disasters become more devastating; on the other hand, climate change directly disrupts livelihoods – communities become more vulnerable.

Furthermore, climate change in Bangladesh has become increasingly pronounced – there are abnormal changes in the seasonal pattern and weather.² It is resulting in diminishing opportunities for livelihoods and growing uncertainties in the life of the communities. In one hand, people’s vulnerability is growing; on the other hand, hazards such as cyclone, flood and riverbank erosion are becoming more recurring and severe. These elements of climate change and disaster risk seriously constrain water supply, sanitation and hygiene practices.

A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.

ISDR, Terminology: Basic terms of disaster risk reduction

1.1. Disaster: Basic Concept

Disasters damage life, asset and environment, disrupt services, economic activities and social functions and distress people physically, emotionally and socially.³

¹ DMB (2010), National Plan for Disaster Management 2010-2015

² MoEF (2009), Bangladesh Climate Change Strategy and Action Plan, Ministry of Environment and Forests, Government of Bangladesh

³ NIRAPAD (2010), World Vision Training Handout Session





Damage to life, asset and environment

- Life - Hazard such as cyclone may kill and injure many people; also, people may die during slow onset disaster – e.g. drought induced, due to malnutrition.
- Assets – Cyclone or flood destroy assets and properties such as equipment, crops, livestock, houses, roads, bridges, water and sanitation structure and other infrastructure.
- Environment – Damage manifest in the form of landslide, loss of land (riverbank erosion), siltation and sedimentation of riverbeds, salinisation of surface and ground water, water logging, disappearance of water bodies, deforestation and chemical contamination of water.

Damage

Life – Death and injuries

Asset– Infrastructure, equipment, crops, livestock and household

Environment– Deforestation, water logging, saline contamination, sand carpeting on crop land

Disruption

Services– Water supply, sanitation, power supply, communication, medical care, education

Livelihood–Agriculture, factories, market, trade and commerce

Social function– Recreation, games and sports, festivals and ceremonies

Distress

Physical– Hunger, thirst, filthy, illness, malnutrition

Emotional– Sadness, anxiety, fear, trauma, depression

Social– Paucity, disgrace, relief dependency, insecurity, shelterlessness



Disruption of services, economic activities and social function

- Service provisions – For example, health care services, water and sanitation facilities, schools, power supply and communication may cease to function;
- Economic activities– For example, plantation and other agriculture work, industries and factories and market cease to function;
- Social function – For example, recreational activities, festival, ceremonies and social network stop functioning.

Distresses of affected community

- Physical distress –Absence of services hinder meeting basic needs and people suffer from hunger, illness, thirst, filthiness, hypothermia and heat-stroke;
- Emotional distress – Exposure to violent event, displacement and resulting increase in the vulnerability to abuse, exploitation and physical harms may cause trauma, fear, anxiety and apprehension
- Social distress – Loss of assets and incomes and reduction in employment opportunities may lead to paucity and impoverishment, disgrace and relief dependency.

| Damage due to Disaster | Affected Upazila | Completely damaged houses # | Death # | Completely damaged road km | Damaged embankment km |
|------------------------|------------------|-----------------------------|---------|----------------------------|-----------------------|
| Cyclone Sidr 2007 | 200 | 56,4967 | 3,363 | 1,714 | 1,875 |
| Cyclone Aila 2009 | 64 | 24,3191 | 190 | 2,233 | 1,742 |
| Flood 2004 | 265 | 894,954 | 747 | 14,271 | 3,158 |
| Flood 2007 | 263 | 8,1817 | 970 | 3,705 | 88 |

Source: DMB, <http://www.dmb.gov.bd/>

All most every year some part of the country is affected by some hazards. During 1980 -2010 cyclone occurred 15 times; and put together it killed more than 150,000 people. During the same period, flood occurred 24 times, and completely damaged some 600, 0000 houses.⁴

In recent time, Sidr and Aila had created such situation. The affected communities were so devastatingly affected that it necessitated large scale humanitarian and recovery assistances.

Common Hazards in Bangladesh

Flood - Flood is a natural phenomenon, with most severe occurring during the months of July and August. Regular river floods affect 20% of the country, increasing up to 68% in extreme years. The floods of 1988, 1998 and 2004 were particularly catastrophic, resulting in large-scale destruction and loss of lives. The 1988 flood affected about two-third area of the country. The 1998 flood alone caused 1,100 deaths, rendered 30 million people homeless, damaged 500,000 homes and caused heavy loss to infrastructure. This devastating flood had an enormous impact on the national economy, in addition to causing hardships for people, and disrupting livelihood systems in urban and rural areas.

Drought – Bangladesh is at higher risk from droughts. Between 1949 and 1991, droughts occurred in Bangladesh 24 times. Very severe droughts hit the country in 1951, 1957, 1958,

⁴ DMB, Past Disaster Information <http://www.dmb.gov.bd/>



1961, 1972, 1975, 1979, 1981, 1982, 1984 and 1989. Past droughts have typically affected about 47% area of the country and 53% of the population (WARPO, 2005).

Cyclone - Tropical cyclones from the Bay of Bengal accompanied by storm surges are one of the major disasters in Bangladesh. The 1970 cyclone is the deadliest cyclone that has hit Bangladesh coastline. With a wind-speed of about 224 km per hour and associated storm surge of 6.1 to 9.11m, it was responsible for deaths of about 300,000 people. In 2007, cyclone Sidr severely affected in the 12 districts, it was observed that 3,363 peoples are dead and 55,282 are injured. Approximately 563,877 houses were totally destroyed and 9,55,065 houses were partly damaged. It is also reported that 186,883 hectares of crop areas are fully and 498,645-hectare area partly damaged by Sidr.

Riverbank erosion - This is an ongoing disaster and there is no specific indicator to measure the extent of damage. According to "World Disaster Report 2001" published by IFRC every year about 10,00,000 people get affected by river erosion and 9,000 hectare of cultivable lands are banished in river. Among these only a few affected people have the ability to find new shelters while others remain homeless for uncertain period.

Source: DMB (2010), National Plan for disaster Management 2010-2015.

Damage to water supply and sanitation system

Cyclone or flood seriously damage water supply and sanitation system. Cyclones always come with storm surges. Along with other infrastructure, it washes away latrines and tube-wells. Floods inundate latrines and tube-wells in the low-lying areas. Latrines collapse; tube-wells become contaminated; and they become non-functional.

Tube-wells and latrine on higher ground may not go under water; nevertheless, inundated surroundings and approach roads seriously impede people to use these facilities.

Also, cyclones or floods force people to leave their houses. Displaced households take shelter on embankments or roadside. More often they do not find enough space or sufficient resources to set latrines or tube-wells there.

Components of the atmosphere retain certain amount of heat of sun and make the earth livable. Water cycle and carbon cycle keep balances of environment. Water cycle completes through evaporation, condensation and precipitations. Environment is in balanced form due to exchange of carbon dioxide and oxygen of living being. But recent human activities are responsible for disturbing this balance of environment by increasing emission of carbon dioxide. Thus, amount of atmospheric components that retain more heat (such as, carbon), is increasing day by day and the result is increase of global temperature which is responsible for disturbing the balance of environment.



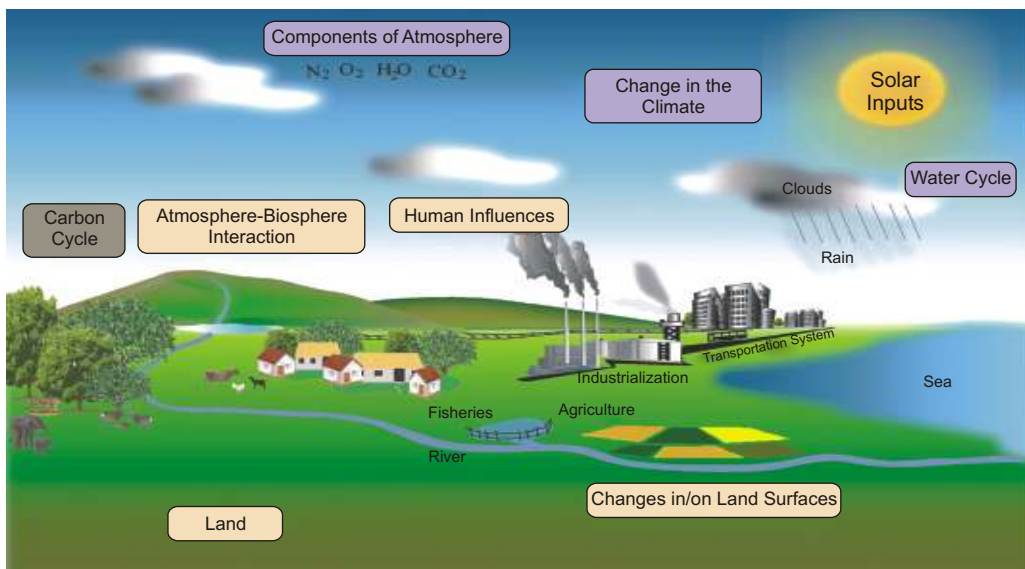
Environment degradation resulting from disaster may contaminate the main sources of water. In 2007, storm surge associated with Aila breached embankments and inundated the localities. It trapped sea water in low laying areas and increased salinity levels of both surface and ground water. Water in this area is no longer fit for human consumption; therefore, people living there have to get water from distant places.

1.2. Climate Change: Basic Concept

Climate is the average weather for a region over a long period (25-30 years). Weather refers to the average condition of atmospheric elements – e.g. temperature, wind pressure, humidity and precipitation. for few days (1-7 days). Climate describes all weather occurring over a long period.

– CDMP (2009), Durjogkosh

Climate change is a natural process; however, human activities are contributing to its acceleration. Climate change is integrally linked with the gradual increase in the atmospheric temperature known as global warming. Its impacts are felt in all geographic areas and all aspect of life, including environmental, social and economic aspects, of the communities.



Climate change in Bangladesh

Climate change related risk become increasingly evident in Bangladesh. NAPA 2009, referring to SMRC studies, noted that “the trend of the annual mean maximum temperature has shown a significant increase over the period of 1961-90. Regional variations have been observed around the average trend”.⁵ It suggests, further, that “observed data of the Rangpur Station from 1978 to 2002 indicates increase in the overall annual maximum and minimum temperature at the rate of 0.035°C and 0.027°C, respectively. Also, observed rainfall data revealed “an increasing trend in the number of days without rainfall” and there are indications that the rates salinity ingress in the coastal region has increased.”⁶

Bangladesh Climate Change Strategy and Action Plan 2009

“Climate change will exacerbate many current problems and natural hazards the country faces. It is apprehended that climate change will lead to:

- Increasingly frequent and severe cyclones, with higher wind speeds and storm surges leading to more damage in the coastal region;
- Heavier and more erratic rainfall in the Ganges-Brahmaputra system, including Bangladesh, during the monsoon resulting in:
 - Higher river flows, causing over-topping and breaching of embankments and widespread flooding in rural and urban areas;
 - Riverbank erosion resulting in loss of homes and agricultural land to the rivers;
 - Increased sedimentation in the riverbeds leading to drainage congestion and water logging;
- Melting of Himalayan glaciers, leading to higher river flows in the warmer months of the year, followed by lower river flows and increased saline intrusion after the glaciers have shrunk or disappeared;
- Lower and more erratic rainfall, resulting in increasing drought, especially in drier northern and western region of the country;
- Sea level leading to submergence of low lying coastal areas and saline water intrusion up coastal river and into ground water aquifers, reducing fresh water availability, damage to Sundarbans mangrove forest, a World Heritage site with rich biodiversity; and drainage congestion inside coastal polders, which will adversely affect agriculture;
- Warmer and more humid weather leading to increased prevalence of disease and disease vectors”.

-MoEF, 2009, Bangladesh Climate Change Strategy and Action Plan (BCCSAP), Government of Bangladesh

⁵ MoEF, 2009, National Adaptation Programme of Action (NAPA), Ministry of Environment and Forests, Government of Bangladesh

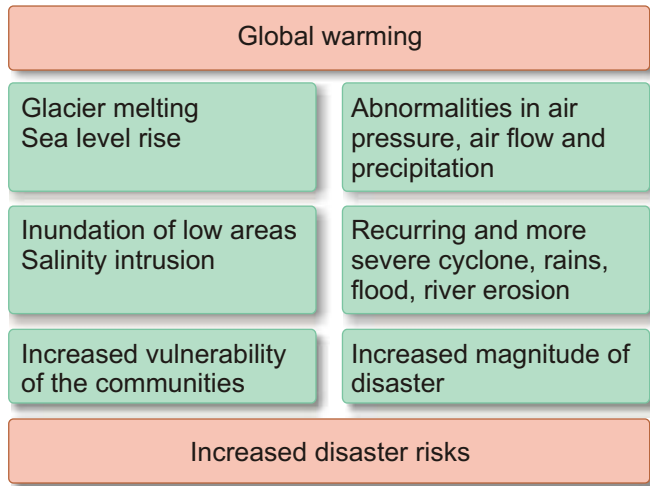
⁶ Ibid



The SMRC study on recent relative sea level rise in the Bangladesh coast suggested higher rate of sea level rise during the last 22 years is at Hiron Point and Cox's Bazar compared to the mean rate of global sea level rise over the last 100 years.”⁷

Climate change and uncertainty

Apprehensions noted in the Bangladesh Climate Change Strategy and Action Plan 2009 suggests that, on one hand, both frequencies and the magnitudes of natural hazards will increase due to climate change. These hazards will be more severe and catastrophic. Recurring and devastating cyclones, abnormal floods and severe riverbank erosion will damage water supply and sanitation



structure. On the other hand, climate change will directly disrupt livelihood. For example, salinity intrusion and water logging may constrain conventional agriculture seriously. Severity from both ends will increase disaster losses and seriously reduces ability to recover from the recurring losses.

Also, climate change has negative impact on life and livelihood, including water, sanitation and health. For example, salinity intrusion may contaminate water sources; water table in the drought prone area may go down; warm and humid weather may increase disease vectors and the rates of disease incidences.

Although climate change is a natural phenomenon and disasters contribute to that, human activities as well may accelerate the process. For example, over extraction of ground water may cause falling of the water table. Also, as it happened, water and soil in the coastal areas, where salinity intrusion rates increased due to shrimp cultivation, became permanently saline contaminated by Aila induced inundation.

⁷ Ibid



Chapter Two:

Water, Sanitation and Hygiene: Basic Concept

Safe water, sanitation and hygiene are primarily public health concern. These are essential for healthy life and sustainable livelihood. The basic needs include water and sanitation; and UN resolution '64/292', July, 2010 noted it as human rights. Also, it has an economic connotation, as deficiency in safe water, sanitation and hygiene may reduce supply of productive labour through increased prevalence of disease and illness related distresses.⁸

2.1. Safe Water

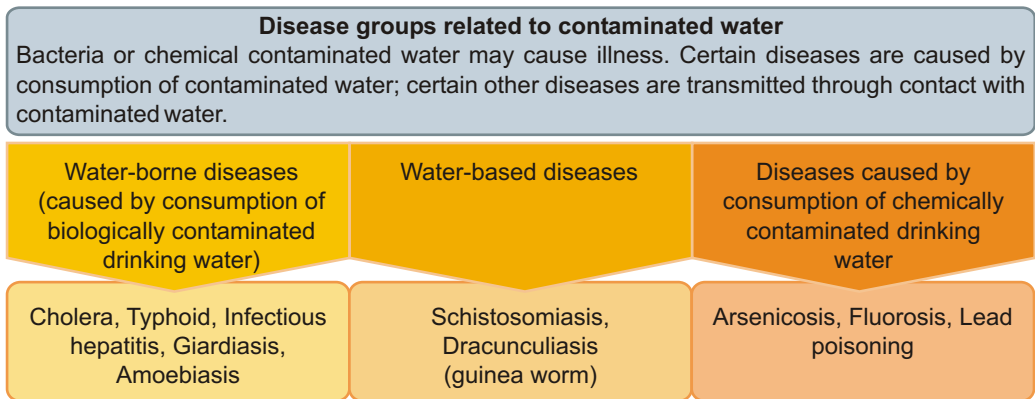
Safe water is clean and clear water free from harmful substance, mineral, chemical and microorganism. Consumption safe water does not cause illness or health problem.

Characteristics of safe water:

- Free from dirt, waste, faeces and germs
- Free from poisonous chemical compounds or the presence of chemicals (e.g Arsenic) must be below permitted level and minerals must not exceed tolerance level
- Tasteless, colourless and odorless and
- Drinkable

Source: WaterAid

Use of contaminated water may cause illness. For example, drinking bacteria contaminated water may cholera, dysentery, diarrhea, typhoid and hepatitis. Drinking chemical contaminated may cause arsenicosis, fluorosis or lead poisoning. Also, some disease are transmitted through contact with infected water – for example, Schistosomiasis, Dracunculiasis and skin infection. Therefore, it important to always use safe water for drinking, washing and cleaning.



⁸ Local Government Division (2005), National Sanitation Strategy; Ministry of MoLGRD&C, GoB

Sources of safe water

In Bangladesh, the main sources of water are ground water aquifer, surface water – e.g. river, ponds, and water bodies, springs in the hilly area and rain water during monsoon.

Ground water: Generally, it is bacteria free, and it is lifted by using tube well (deep or shallow). However, ground water could be contaminated with chemical or mineral, arsenic in particular. Process of treating chemical contaminated water is complex, as well, expensive. It may not be possible to do that at household level. Also, floods may inundate the tube wells and cause difficulties in getting safe water. By raising tube well platforms, communities could minimize this problem.

Surface water: It is available from rivers, ponds and the local water bodies. Generally, surface water is bacteria contaminated. For consumption or washing it should be treated to make it safe; and it could be done through boiling, filtering or using chemical. At community level, surface water can be filtered through PSF. It is a simple technology and could be managed by the communities. Also, to disinfect water at household level, people could fill in transparent PET bottle and keep that under direct sun light for six hours. However, neither the PSF nor the PET bottle could remove salt or chemical contamination.

Rain water: To meet the need for safe water, it could be collected and stored during the monsoon. In areas where the annual rainfall is 1,600 mm or more, people could collect enough water to meet their annual needs. Rain water is safe if used immediately. Stored rain water often gets bacteria contaminated if not taken proper measures; it should be used after filtration or de-contamination.

Spring water: It is available in the hilly areas; generally it is safe.

Understandably, use of safe water depends on its availability. Difficulties in accessing safe water often lead to consumption of unsafe water; and it increases risks of infection. It is important to take measures to prevent contamination of water. Sanitation is primarily concerned with preventing water contamination and disease spread.



How to keep water safe

| Source | Collection | Transportation | Storage | Use |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • Keep the surrounding clean; • Fix tube-well on high ground; keep latrine at least 10 meter away from the tube-well; • Do not dump garbage near the tube-well. | <ul style="list-style-type: none"> • Keep water pot clean; • Wash hands before collecting water; • Never dip fingers in the water pot. | <ul style="list-style-type: none"> • Do not use clothes to cover the water pot; • Use proper lid to cover the pot; • Lid should be little larger than the opening of the pot; • Do not dip finger in the pot. | <ul style="list-style-type: none"> • Keep the pot in a dry place; • Keep the on raised platform or ground; • Keep the pot covered with a lid. | <ul style="list-style-type: none"> • Use clean tumbler to drink water; • Use clean tumbler; • Wash hand before drinking; • Do not touch rim of the tumbler when drinking. |

Source: WaterAid in Bangladesh

2.2. Sanitation

Sanitation generally refers to the provision of facilities and services for the safe disposal of human urine and feces. The UNESCO defines sanitation as 'Maintaining clean, hygienic circumstances that help avoid disease through services such as waste collection and waste water removal'.

Open defecation cause environment pollution and water contamination. Also, using unhygienic latrine (e.g. hanging latrine) or latrine too close to water source may pollute environment and contaminate water. It spreads diseases. Therefore, strategies for sanitation should focus on promoting hygienic latrines to break the cycle of disease transmission.

Criteria for 100% Sanitation

- No open defecation
- Hygienic latrine for all
- Use of hygienic latrine by all
- Proper maintenance of latrine for continual use, and
- Improved hygienic practice

Hygienic latrine includes that-

- Confinement of feces away from the environment;
- Sealing of the passage between the squat hole and the pit to effectively block the pathways for flies and other insect vectors thereby breaking the cycle disease transmission;



- Venting out of foul gases generated in the pit through a properly positioned vent pipe to keep the latrine odor free and encourage continual use of the hygienic latrine.⁹

Presently, in Bangladesh, particularly, in the rural area, ring-slab latrine is widely used as hygienic latrine. It includes digging hole in the ground and put concrete rings to make the pit, then, place a slab with integrated ceramic or plastic pan. Depth of the pit is determined considering ground water table. This technology is hygienic and affordable.

Key Feature of Hygienic Latrine

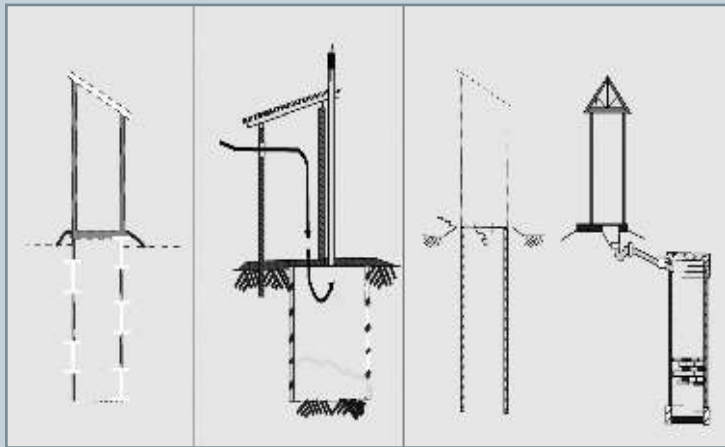
Below stated latrines may be considered as hygienic latrines based on definition given by Bangladesh National Sanitation Strategy 2005 (Reformed in 7 February, 2010):

- Pit latrine with cover
- Latrine with flip /water seal (direct or offset)
- Slab latrine with water seal
- Offset pit latrine with bend seal
- Ecosan /composting latrine
- Latrine with sewer line /septic tank

National Sanitation Strategy 2005(Reform 2010),
Government of Bangladesh

Ring-slab Latrine

Latrine can be fixed easily and at a very low cost by digging a hole in the ground and placing a slab on that. To prevent the pit collapsing, concrete rings could be used; also, slab could be fixed with water seal pan and add a ventilation pipe.



⁹ Ibid

2.3. Hygiene

Purpose of hygiene practice is to apply knowledge and wisdom to use water and sanitation in a way that helps people and communities prevent illness and the spread of disease.

Why promote hygiene?

Hygiene is the practice of keeping oneself and one's surroundings clean, especially in order to prevent illness or the spread of disease. Emergencies create an environment in which germs flourish; and reduce access to latrines and safe water and exposure to disease pathogens. It endangers people's health and survival

What is hygiene promotion?

Hygiene promotion empowers people to prevent disease. It is the process of influencing people's knowledge, attitudes and practices, and an agency's knowledge and resources which together enable family members to avoid risky behaviours related to water use, waste and excreta disposal and cleaning habits.

The key ingredients to effective hygiene promotion are:

- Mutual sharing of information and knowledge.
- Mobilising communities for concerted action.
- Providing essential supplies and facilities.

Hygiene promotion can be grouped into three categories:

- Reducing high-risk hygienic practices.
- Promoting appropriate use and maintenance of facilities.
- Promoting participation in programmes.

-UNICEF, ROSA (2008), Behaviour Change Communication In emergencies: A Toolkit

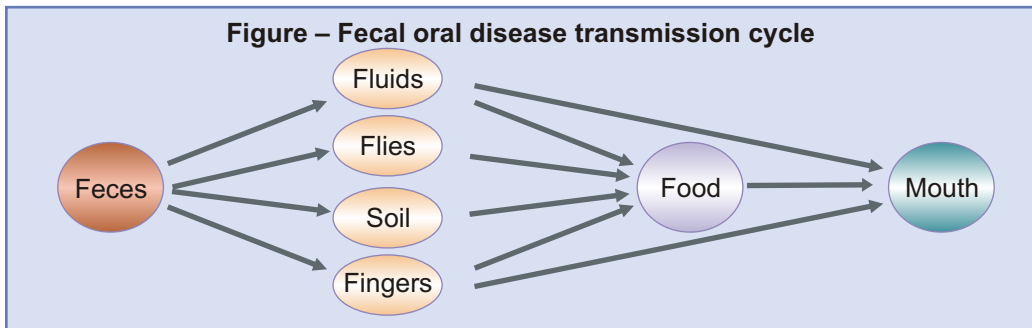
Hygiene practice prevents disease transmission and it reduces spread of water related diseases. Basically, hygiene practice is to understand how the diseases spread and how safe water and sanitation reduce that risks; and apply that knowledge in day to day practices. To ensure hygiene practice, it is crucial to understand how to get safe water, dispose faeces and household wastes safely and keep body, household and the surrounding clean. people could learn these through health education.

The most important practices to target are:

- The appropriate use and maintenance of sanitation facilities;
- The safe disposal of faeces;
- Hand washing after defecation and before food preparation;
- Use and proper storage of safe drinking-water;
- The control of flies, mosquitoes and other disease vectors

WEDC, WHO 2011, Technical Notes On Drinking- Water, Sanitation and Hygiene in Emergencies





How feces spread disease

Body waste and germs in our intestine come out through feces. All feces, including infants' excreta, contain germs. Use of unhygienic latrine or open defecation spread the germs. Mosquitoes, flies, ducks, chickens, dogs, cats or wind carry these germs to water, food and utensils. Then, germs enter in human bodies and cause diarrhoea, typhoid, hepatitis or various parasitic diseases.

Preventing disease spread requires, firstly, to use hygienic latrine so that the surrounding area and water do not get contaminated and flies and other vectors do not spread the germs.

Secondly, to wash hands properly after using latrine and before eating so that germs from hands do not enter our bodies through food. Also, food should be kept covered to prevent flies and insects contaminate the food. Furthermore, safe water should always be used for drinking and domestic purpose.



Hand Washing

| | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| How to wash hand thoroughly <ol style="list-style-type: none">1. Wet hands with water2. Apply soap to cover all surfaces of the hands3. Rub hands palm to palm4. Rub each palm over the back of the other hand5. Rub palm to palm with fingers interlaced6. Rub backs of fingers to opposing palms with fingers interlocked7. Rub each thumb clasped in opposing palm8. Clasp fingers and circular rub opposing palm9. Rinse well with water10. Allow hands to dry completely before touching anything else. | Importance of hand washing <ul style="list-style-type: none">• Breaks fecal-oral disease transmission cycle;• Protect against diarrhoeal diseases;• Prevent spread of fecal or water borne diseases |
| | When to wash hand <ul style="list-style-type: none">• After using latrine;• Before eating;• Before serving meals. |
| | Materials for hand washing <ul style="list-style-type: none">• Soap;• Safe water. |

Climate change and disaster induced disruptions

Climate change and disaster damage asset and environment and disrupt services including water supply and sanitation facilities.



Infrastructure collapse – Cyclone, tidal surge or riverbank erosion may damage tube-wells and latrines; infrastructure for water supply and sanitation service may collapse. Also, tube-wells and latrines could be inundated. It seriously reduces people’s access to safe water and sanitation.

Contamination by flood water – Faeces from inundated latrines spread in the surrounding and contaminate environment and water sources. Open defecation



also spreads contamination. Similarly, hanging unhygienic latrines contaminate water and environment. In such situation, safe water becomes very scarce.

Displacement and scarcity of safe water and sanitation service – Cyclone and flood force people to leave their houses. Also, people living in low lying area have to leave their houses during water logging. Temporary shelters rarely have arrangements for adequate supply of safe water or sanitation facilities. Moreover, displacement affects life and livelihood so severely that the people often do not enough resources to set facilities for safe water supply and sanitation.

Diminishing supply of ground water – Climate change may cause ground water table to drop; also, the volume of accumulated water could diminish. Generally, it occurs in drought prone areas. However, more often, it is induced by human actions such over extraction of ground water for agriculture. It results in serious reduction in the availability of safe water for household consumption. People could not get enough water for drinking or cooking; also, they become unable to use hygienic latrine that depends on water availability.



Salinity intrusion and water contamination – Saline contamination could make the natural sources of water totally unusable for human consumption. It happened in the cyclone Aila affected north-west region of the country. However, to large extent, human actions were responsible for that. Shrimp cultivators brought in saline water in their farms. Tidal surges during Aila breached the embankments and inundated the fields with sea water and caused water logging. Presently, fresh water is not available in the area. People in the area could not get enough safe water; and they become unable to use hygienic latrines.

Saline environment and health hazards – Saline environment and saline water adversely affect health. It causes various skin diseases. It also has harmful



Saline contamination of drinking water in Bangladesh

Increased salinity of drinking water is likely to have a range of health effects, including increased hypertension rates. Large numbers of pregnant women in the coastal areas are being diagnosed with pre-eclampsia, eclampsia, and hyper tension. We reviewed hospital records of antenatal check-ups between January and September, 2007, from the Department of Gynecology in Chalna Upazilla Health Complex—a clinic based in one of the ports in the southwestern region of Bangladesh. Of 561 women undergoing antenatal check-ups, 118 (21%) between the ages of 16 and 40 years were diagnosed with some kind of hypertensive disorder. This rate is strikingly higher than the 2.65% seen in Matuail (Sameena Chowdhury, personal communication), a non-coastal area, and the prevalences of pregnancy-induced systolic and diastolic hypertension of 6.8% and 5.4%, respectively, in another non-coastal rural community of Bangladesh.

Aneire Khan, Santosh Kumar Mojumder, Sari Kovats, Paolo Vineis; *The Lancet*, Volume 371, Issue 9610, P-385, 2 February 2008

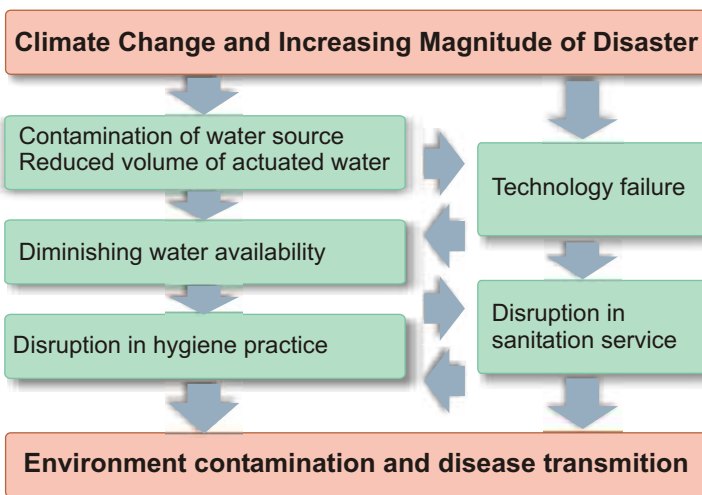
consequences on reproductive health. In particular, adolescent girls and pregnant women suffer the most. Moreover, warm and humid weather help breeding of insect vectors. So, prevalence of water borne and insect transmitted diseases such as diarrhea – including cholera, dysentery and malaria increases in the areas.

To sustain safe water supply, sanitation service and hygiene practice in the climate change disaster affected areas, it is crucial to find new sources of water – e.g. rain water instead of ground water, and new technologies – e.g. reverse osmosis instead of tube-well.



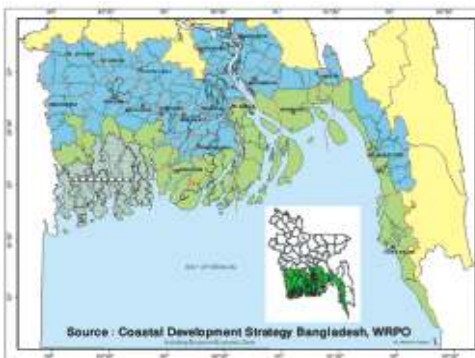
Chapter Three: Regional Threats of Water Supply, Sanitation and Hygiene Practices in Bangladesh

Climate change and increasing severity of disaster are making water supply, sanitation and hygiene practices more and more vulnerable. Excessive rainfall, lack of rainfall, recurring cyclones, extensive flood, river erosion, water logging and salinity intrusion are causing serious damages to natural water resources and water supply and sanitation systems. Water catchments are drying and ground water levels are dropping. Both surface water and ground water are getting polluted. As a result safe water and sanitation system are becoming difficult to avail. But in different regions of the country the impacts of climate change and disaster on water supply and sanitation are different.



3.1. Coastal Region Safe Water

Area and location- The areas near by the shoreline are known as the coastal region. The main three impacts of the sea are tidal impact, saline water intrusion, cyclone and tidal surge. Considering these three impacts the coastal region is defined comprising 19 districts of Bangladesh (Bagerhat, Barguna, Barisal, Bhola, Chandpur, Chittagong, Cox's bazaar, Feni, Gopalganj, Jessore, Jhalokathi, Khulna, Laxmipur, Narail, Noakhali, Patuakhali, Pirojpur, Shatkhira and Shariatpur). 12 districts among them



are very close the 710 km long shoreline of the Bay of Bengal. The structure shoreline land and the nature of water current the coastal region has been broadly divided in to three parts. From Badarmokam to Feni river is called eastern coastal region, from Feni river to Tetulia River is called the mid-coastal region and from Tetulia river to Hariavanga river in the west is called the western coastal region.¹⁰

Hazards- The main hazards for this region are cyclone, tidal surge, continuous rainfall, and tidal flooding and the main climate change impacts are temperature rise, increased humidity and increased number of overcasted days as well as water and soil salinity increase. Tube-wells, PSFs and latrines break down due to cyclone and tidal surge and besides latrines made of tine and concrete cannot sustain the saline water and salinity.

Threats of Climate Change- The main obstacle/hazard for these areas is saline pollution/ salinity, especially in the western coastal region the salinity has increased so high that potable water has become unavailable both in ground and surface water sources. As a result tube-wells and PSFs and ponds are becoming ineffective means of water supply there.

| Coastal region | | | |
|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hazards | Catalysts of Climate change | Catalysts of Water Supply | Catalysts of Sanitation |
| <ul style="list-style-type: none"> • Cyclone • Continuous Rainfall • Tidal Flooding | <ul style="list-style-type: none"> • Temperature rise • Salinity increase • Humidity increase • Increase in numbers of overcasted days | <ul style="list-style-type: none"> • Saline contaminated water sources • Tube-wells became ineffective for potable water supply • PSFs became ineffective for potable water supply | <ul style="list-style-type: none"> • Infrastructures collapse due to cyclone • Decadence of infrastructure due to salinity • Difficulties in using CI sheet made latrines due to excessive heat |

3.2. River Basin and Char lands

Area and geographical location- The areas neighboring banks of rivers including areas rain water uses as path for going back in the rivers is called the river basin area. The neighboring areas of the main rivers of Bangladesh, such as-Brahmaputra, Jamuna, Padma and Meghna including land created by the sediments from these rivers are known as the river basin and char lands of Bangladesh. These areas are widely spread in northern, central and southern regions of Bangladesh. The river basin and char land includes Lalmanirhat, Kurigram, Gaibandha, Jamalpur, Sherpur, Rajshahi, Pabna, Sirajganj, Tangail, Manikganj, Gopalganj, Shariatpur, Chandpur and Comilla.

¹⁰ Ministry of Water Resources, GoB (2005), Coastal Area Policy



Hazards- During monsoon and rainy season huge rain water flows through the main rivers of Bangladesh that causes extensive flooding in the river basin areas of Bangladesh. The increased water flow also causes severe river bank erosion. After the rainy season lack of rainfall occurs, rivers dry up as a result the tube-wells do not function properly. Due to river bank erosion, each year, many tube-wells and latrines disappear in the river as well as inundate due to flood. Latrines and tube-wells in higher places may not inundate but as the roads and low lands inundate, the latrines and tube-wells in higher places become inaccessible. On top of that due the water level rise waste disposal become very difficult and feces from inundated latrines spread in the entire areas and contaminate the environment. Therefore during flood tube-well and latrines become ineffective.



Threats of Climate Change- Traditional ring-slab latrines became ineffective to prevent environment and water contamination as well, because of the 'too-little and too-much water cycle' tube-wells fail to supply safe water except only for several months of the year.

| River basin and Char lands | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hazards | Catalysts of Climate change | Catalysts of Water Supply | Catalysts of Sanitation |
| <ul style="list-style-type: none"> Flood River bank erosion Sand carpeting Water logging Drought | <ul style="list-style-type: none"> Excessive heat Excessive rainfall Humidity rise Extended period of lack of rainfall | <ul style="list-style-type: none"> Ground water level dropping Inundation of tube-wells due to flood Damages of tube-wells due to erosion Decrease in effectiveness of tube-wells Surface water contamination due to water logging | <ul style="list-style-type: none"> Inundation of infrastructures due to flood Latrines fill up due to water level rise Infrastructural damage due to erosion Water contamination due to inundated latrines |

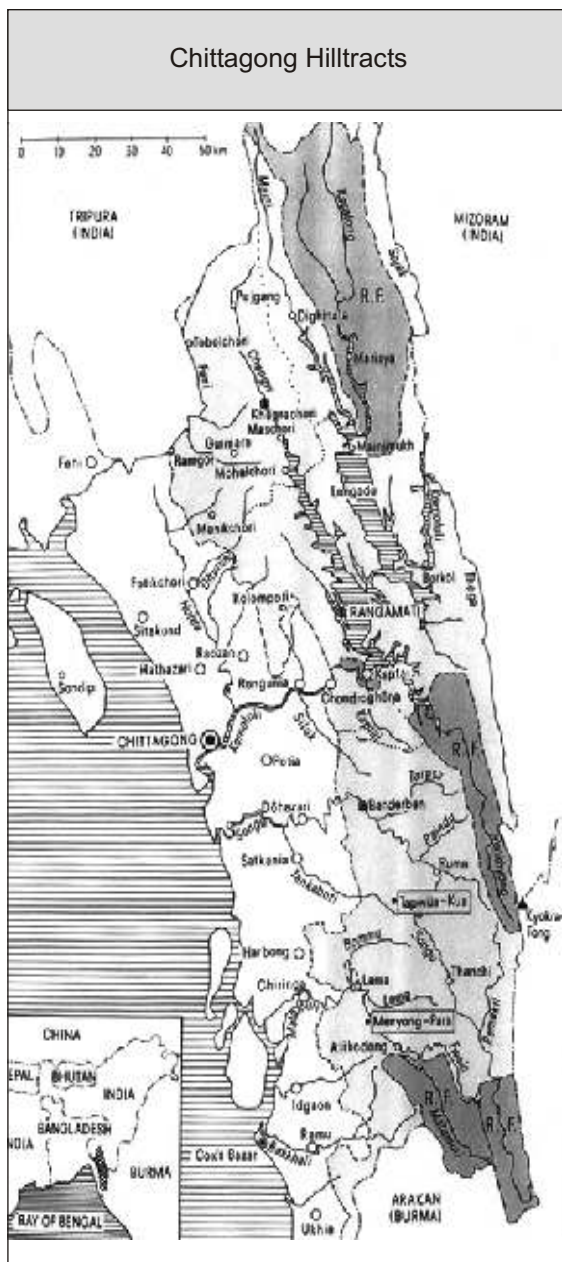


3.3. Hill Tracts

Areas and geographic location-

This region is located in the south-eastern part of Bangladesh containing 13,295 sq km. this region includes Rangamati, Bandarban and Khagrachari districts where most of the hills and mountains are located in Bangladesh. In some areas the height of the hills reach up to 4000 ft. Seven rivers mountain and their branches are flowing through this region. In addition to that this region has a lot of the region fountains and springs. The total land mass is covered with vegetation.¹¹

Hazards- Usually lack of rainfall is seen throughout the year but excessive rainfall occurs during rainy season in this region. The springs and fountains are the main sources for fresh water here. Most of the region is hilly and mountainous therefore extracting ground water is not possible through tube-well. In dry season the springs and fountains get dry and water scarcity occurs. In rainy season the mountain paths become very slippery and occasionally landslide occurs. Sometimes the remote areas of this region can become inaccessible due to landslide and extremely slippery mountain passes. Under this condition fetching water becomes very difficult for the local community. It is very difficult to



¹¹ Asiatic Society (2006), Banglapedia

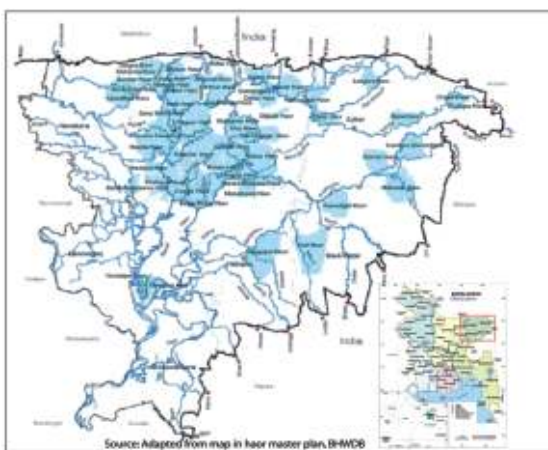
build latrines in the mountainous areas due to the rocky features of the soil. Apart from that excessive rainfall and landslide can wash away the latrines. On top of this sometimes heavy rainfall in creates sudden swell and carries feces to downhill areas that can cause health hazards for the local communities.

Threats of climate change- Springs and fountains dry due to climate change induced uncertainty and absence of latrine technologies in rainfall tolerant and mountain region.

| Hill Tracts | | | |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hazards | Catalysts of Climate change | Catalysts of Water Supply | Catalysts of Sanitation |
| <ul style="list-style-type: none"> Sudden water swelling Landslide | <ul style="list-style-type: none"> Temperature rise Excessive rainfall Prolonged period of lack of rainfall | <ul style="list-style-type: none"> Lack of natural water sources Drying of the springs and fountains Ineffectiveness of tube-wells due to rocky land features | <ul style="list-style-type: none"> Infrastructural damages due to excessive rainfall Spreading of fecal materials and environment contamination due to rainfall |

3.4. Haor Region

Area and location- The Haor areas stay dry during the dry seasons and are used as agricultural land. Sunamganj, Netrakona, Kishorganj, Sylhet, Moulavibazar and Brahmanbaria districts are known as the Haor areas in Bangladesh. The area is surrounded by the Meghalya mountain region (India) in the north, Tripura Mountains (India) in the south and Manipur (India) high lands in the east. The haor area contains about 5,025 sq km of land comprising 47 vast haors (wet land) and 6,300 bils (small wet lands). Amongst the almost 3,500 are permanent and 2,800 are seasonal wetlands. The most significant haors in Sylhet district are-Shonir haor, Hakaluki haor, Daker haor, Makar haor, Chaiyar haor, Tanguar haro and Kawa dighi haor. Some small mountain rivers joined with Surma and Kushiara rivers are connected with the haors.¹²



¹² Ministry of Water Resources, GoB (2012), Master Plan of Haor Areas

Hazards- Flash flood in early rainy season is the main hazard in this region. The haor areas fill up to the brim with water during rainy season. Strong wind, extreme current and large waves can be seen during this time of the year. Latrines and tube-wells can be damaged or completely washed away by flush flood and large waves. On the other hand during the dry season water level drops that causes water scarcity.

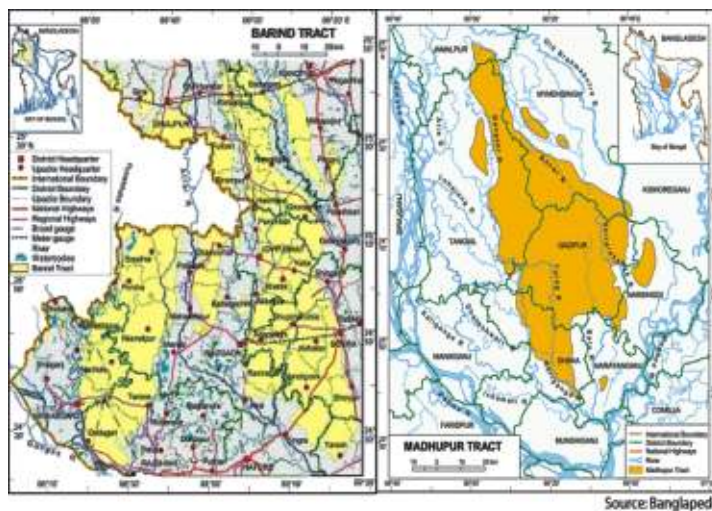
Threats of Climate change- Water level falls during dry season and lack of rainfall tolerant latrine technologies.

| Haor region | | | |
|--------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hazards | Catalysts of Climate change | Catalysts of Water Supply | Catalysts of Sanitation |
| <ul style="list-style-type: none"> Flash flood Strong current Strong wind and wave Drought | <ul style="list-style-type: none"> Excessive heat Excessive rainfall Excessive humidity | <ul style="list-style-type: none"> Damages to the tube-wells due to erosion | <ul style="list-style-type: none"> Infrastructural damage due to excessive rainfall Spreading of fecal materials and contamination due to strong current and excessive rainfall |

3.5. Barind Tract and Madhupur Region

Area and location-

Comprising of 7,770 sqr. Km of land the Barendra region includes greater Dinajpur, Rangpur, Pabna, Rajshahi and Bogra districts of Bangladesh. And Madhupur region contains 4,244 sqr. km. of land starting from the northern part of Jamalpur extending up to Fatullah, Narayangaj¹³.



Hazards- Due to lack of rainfall seasonal drought occurs in this region. During this period rivers and water catchments dry up and ground water level falls far below.

¹³ Ibid

Tube-wells cannot provide enough water during this period. The soil in this region is very hard therefore constructing ring slab latrine is very difficult. Apart from that due to the slanted nature of the land lower areas get water logged in rainy season. As a result feces spread widely and contaminate the environment.

Threats of climate change- Water scarcity and water ground level dropping during dry season.

| Barind and Madhupur region | | | |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hazards | Catalysts of Climate change | Catalysts of Water Supply | Catalysts of Sanitation |
| <ul style="list-style-type: none"> Tornado | <ul style="list-style-type: none"> Dry and hot wind Localized heat Lack of rainfall | <ul style="list-style-type: none"> Falling of ground water level Decrease in effectiveness of tube-wells Drying of the surface water sources | <ul style="list-style-type: none"> Difficulties of ring slab latrine constriction due to hard soil features Water logging and contamination in the lower lands in rainy season due to the slanted nature of the land |



Chapter Four:

Impacts of Disaster and Climate Change on Water Supply, Sanitation and Hygiene Practices

Climate change and recurring disasters region wise contaminate natural water sources; make infrastructures of water, sanitation and hygiene practice fragile and causes shortage in supply. The adverse impacts affect environment, society and health simultaneously. As a result severe shortage of accessibility to services occurs and accessing safe water and sanitation services as well as health protection become very difficult for the communities.

4.1. Environmental Impact

Losses due to disasters and climate change increasingly affecting the environment. For example water logging, salinity and desertification are increasing; ground water level is dropping. The adverse environmental impacts of Climate change on are different in different regions of Bangladesh. For example in Barendra region severe drought and extreme cold; in Haor regions excessive rainfall and flash flood; in river basin and flood plain areas flood, river bank erosion, water logging and in coastal region tidal surge, cyclone, salinity and river bank erosion are occurring with increased frequencies and higher magnitude. It is seriously affecting the environments of the respective areas and contaminating natural water sources as well as making sanitation systems ineffective.



4.1.1 Salinity

The frequencies and magnitudes of the current hazards of Khulna, Barisal and other coastal regions, such as cyclone and tidal surge have increased due to climate change. Apparently, the trend continues. Consequently, excessive saline water intrusion continues to contaminate the natural sources of water and create scarcity of potable water. Because of high levels of salinity sources of potable water, such as river, water bodies, and ponds are becoming unusable. Salinity intrusion also causing severe damages to the sanitation systems and infrastructures. As a result the existing technologies, such as PSF, tube-well, ring slab latrine are becoming ineffective and communities are being forced to use contaminated water for household chores and drinking purposes as well as apply unhygienic sanitation systems.

Visit to Gunneri, Kaminibasi and surrounding area revealed that water was everywhere, despite that, there was crisis for water. Normally, saline water is a challenge for the coastal communities; Aila, has filled the rivers, ponds and water bodies with sea water. Even the tube-well water became saline. To get potable water people have to cross Shibsra river and water that they could get are of poor quality. So, they continually suffer from diseases. Diarrhoea, cholera and chicken pox have become very common.

- Shameem Al Amin, Testimony of Journalists - Swelled sufferings of Aila hit people in one year, 2010

4.1.2 Desertification

Lack of rainfall has been considered as one of the climate change impacts in Barind regions in Bangladesh. Due to the lack of rainfall frequently severe seasonal drought occurs in this region. During this period most of the water sources, such a river, wet lands, ponds dry up at the same time the ground water level drops so low that most of the tube-well as well as deep tube-wells dry up, which cause severe potable water crisis. Apart of that as because the surface water dries up, Pond Sand Filters (PSFs) become ineffective during this season. As a result communities are forced to use unsafe water and consequently suffer various health problems.

4.1.3 Increasing Hazard Proneness

Although types of natural hazards are different in different regions of Bangladesh, such as- cyclones in coastal region, flush flood in haors regions, seasonal flood in flood plains; due to climate change impacts the hazard proneness is increasing everywhere. The frequencies and magnitude have increased noticeably in comparison to the past. Because of these natural hazards, especially, cyclone, river bank erosion and flood, water supply and sanitation system get severely affected; sometimes collapse completely. In this situation existing technologies, such as tube-well, PSF or ring slab latrines become ineffective.



4.1.4 Water Logging

In case of excessive rainfall or flooding when the water does not have sufficient channels to flow away then water logging occurs. Because of climate change impacts and recurring disasters as well as anthropogenic interventions for disaster risk reduction (building embankments) and development (building roads and high ways) several parts of the country have become prone to water logging.



Water logging causes severe distress to communities. Emergency services, especially safe water, sanitation and hygiene practices get seriously disrupted. Because of water logging severe fresh water crisis occurs and the affected communities have no other options but to use unsafe or contaminated water for household chores and drinking. As a result they suffer from various water born diseases. Apart from this, in water logged areas latrines are inundated and become ineffective. People are forced to defecate in open places, which cause environmental pollution and water born diseases to spread. Due to water logging women and adolescent females suffer the most. They cannot perform regular hygiene practices as well as reproductive health related practices properly. In addition, as they have to go in open places for defecation, risk for sexual harassment increases significantly.

Abnormally heavy rains in 2011 caused water logging in some districts (Satkhira and Khulna) in the south-west region of the country. According to the disaster Management Bureau under the Ministry of Food and Disaster Management, till 25th August 2011, estimated 800,000 people have affected by the water logging.

Emergency Capacity Project (ECB) 2011 Flooding & Prolonged Water-logging in South West Bangladesh Coordinated Assessment Report

4.2. Social Impact

Disaster and climate change impacts, not only affect lives and livelihood but also gradually making the entire social and socio-economic system of the country vulnerable. Consequently social discrimination, deprivation, unacceptability and migration are increasing significantly and its adverse impact is reflecting on safe water accessibility, sanitation services and hygiene practices.



4.2.1 Deprivation

Ensuring safe water supply and sanitation services has become increasingly difficult because of climate change and disasters. Every community members are not being able to access safe water and proper sanitation services as per requirement. As a result deprivation occurring.

First of all, due to disasters water supply and sanitation system frequently collapse. Restoration of the collapsed system takes time. During the restoration period affected people get deprived from the services. Because of the recurring disaster these state of deprivation repeatedly comes back. For example after Sidr affected people suffered the same deprivation due to Aila.

Secondly, as the sources are contaminated, people can no longer fetch safe water from neighboring place. For an instance, after Aila people no longer have the options to bore tube-wells and get sufficient safe water in every households due to salinity increase. Everyone now have to travel a fair distance for fetching safe water. It is very difficult, especially for the women, to fetch safe water from such distance.

Thirdly, due to disaster and climate change the managing safe water supply has become reasonably expensive. For example in severely saline polluted areas instead of existing technologies, such as tube-well and PSFs Reverse Osmosis Machine (desalination technology) is needed, which is very expensive compare to the existing technologies. Because of asset losses Department of Public Health Engineering or Humanitarian agencies are not being able to establish sufficient number of Reverse Osmosis Plants. As a result many people in the affected areas are being forced to use unsafe water.

Aila Assessment

NGOs and DPHE have set up about 300 tube-wells however due continued inundation ground water aquifers become contaminated. Women spend on average 4-5 hours a day for collecting water, often walking 2-3 km to reach the nearest water source. To avoid such trouble, many people use un-safe water or purchase water. Costs of purchasing water before Aila was 4-5 taka, but on average people now have to spend 15-20 taka for their families each day.

DPHE and NGOs constructed latrines at the temporary shelters on the embankments, but latrine coverage is still only 12%. On average, ten families are sharing one latrine and this has resulted in operation and maintenance challenges. People, specifically women, are waiting in long queues to use the latrine facilities. Many women and adolescent girls report that they are facing difficulty in accessing latrines, as many adolescent boys and men are in the queues ahead of them.

- ECB 2009 In-depth Recovery Needs Assessment of Cyclone Aila Affected Areas



4.2.2 Discrimination

Due to climate change and disaster when scarcity of safe water occurs then the excess demand and water scarcity create a highly competitive situation. Because of that people have to spend relatively more money than normal conditions, which may not be possible for some people under the circumstances. Only those who have the ability can ensure access to safe water. The same scenario can be seen in restoring damaged latrines and sanitation systems. Only the wealthy families can ensure safe water supply and sanitation systems during disaster. This creates social discrimination and inequity.

“How could they think of education that could not get food or water for the day?” It is very true, after Aila, people in Gabura and Ashashuni could not get fresh water. Sea water breached the embankment and inundated the area; even the tube-well water became saline. People have to buy pond water. One jar of water costs -10 taka. Only those who have boats, get supply of water.

- Pantha Rahman, Testimony of Journalist – Swelled sufferings Aila hit people in one year, 2010

4.2.3 Distress

To cope with the crisis of safe water and sanitation system due to climate change and disaster, affected communities have to make new arrangements instantaneously. For example, in case of saline contaminated areas or during flood if a family's tube-well or latrine becomes dysfunctional, family members, especially the women of the family have to fetch water from distant places instantly. In case of using the latrine they have to ask help from others or defecate in open places. These instant decisions are often socially unacceptable. As a result lack of safe water supply and sanitation cause severe distress to the affected community.

Flood 2007

About 90-100% of the sanitary latrines were submerged. Open defecation continued, few used neighbor's facilities which were not merged. Provision of secure sanitation arrangements for women and children was very limited, only in few flood centers it existed. Women and adolescent girls sometimes used plastic papers for defecation and store them until dark when they dispose them

- DER, 2007, Bangladesh Flood 2007 DER Post Disaster Needs Assessment Summary Report



4.2.4 Migration

Because of climate change and disaster a lot of affected families migrate to other places. These migrations can be short run or permanent. Either short run or permanent whatever the case may be, the displaced families tend to take refuge in slums in urban areas. It is very difficult to construct separate latrines for each family in those urban slums. As a result the migrated families cannot access basic sanitation or perform regular hygiene practices.

Internally Displaced Persons

Cyclone Aila resulted in the displacement of an estimated 76,478 families, of whom 25,928 were found to be living on damaged embankments. The precarious situation of the affected communities has resulted in increased migration to urban centres.

-Cyclone Aila Joint UN Multi sector Assessment & Response Framework, June 2010

4.3. Impact on Health

Due to climate change and disaster health related issues have been severely disrupted in the affected communities. During disaster water logging, inundation and crisis of safe water and sanitation system due to salinity occur. Because of these various diseases spread in the community. As a result personal health, public health and reproductive health gets affected in the community.

4.3.1 Personal health

Usually in the sources of safe waters in the affected areas get contaminated and safe water scarcity occurs. As a result usage of unsafe water increases in regular household chores. Under this condition people cannot perform personal hygiene practices. And because of this they suffer from various water born diseases, such as- Diarrhea, Cholera and Hepatitis.

4.3.2 Public health

During disaster sanitary latrines in the affected areas get inundated; due to salinity the sanitation infrastructures get damaged and rapidly break down. As a result the sanitation system suffers great damage and sometime become completely dysfunctional. Insufficient sanitation system and latrines communities cannot perform minimum hygiene practices and also defecates in open places that pollute water sources and environment. As a result various water borne diseases spread widely and affects overall public health.



“Within the forced displaced people by cyclone Aila, 1 latrine is used by every forty person in their settlements. As a result, vulnerable condition of sanitation for children and women remain unchanged by which they were facing in the affected areas. 58% latrines are found unsafe for personal health and hygiene. 21 percent latrines' water seals have been broken and flies found over the pan and slabs. Some of the latrines are connected with adjacent drainage line by pipe and human waste are found floating in the dirty water of adjacent places of the latrine for breaking security cover.”

- Mehedi, H., Nag, A. K., & Farhana, S. Climate Induced Displacement Case Study of Cyclone Aila - in the Southwest Coastal Region of Bangladesh. Humanitywatch. Khulna. 2010

4.3.3 Reproductive health

During disaster due to water scarcity performing periodical health related practices becomes very difficult for the women and adolescent females. Because of this they suffer various health related complications. Pregnant women cannot perform personal hygiene practices. Apart from this women suffer from skin diseases due to saline water. Besides, during disaster, due to insufficient latrines adolescent females, women, and pregnant mother have to use other's latrines or defecate in relatively unsafe and open place, which is great threat to their reproductive health and safety.

Flooding & Prolonged Water-logging in South West Bangladesh

Bathing and hygiene emerged from the assessment as a significant problem for affected populations. Almost all female community groups (60 out of a total of 63 sites) reported having a problem in being able to keep clean. Assessment teams reported that women's ability to adequately address their menstruation was very problematic because of an unavailability of materials as well as a lack of clean water and private space to bath. One team reported that 3 women were hospitalized after cleaning themselves with water at the site and contracting a serious infection.

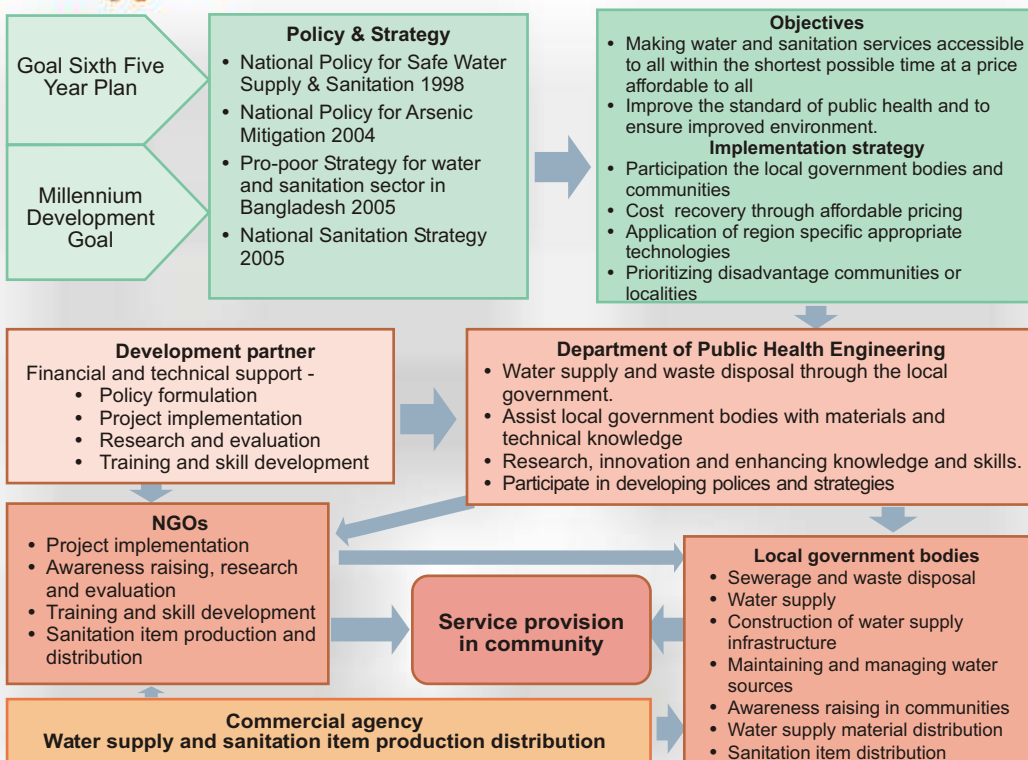
-Emergency Capacity Project (ECB) 2011 Flooding & Prolonged Water-logging in South West Bangladesh Coordinated Assessment Report



Chapter Five: Considerations for Water Supply, Sanitation and Hygiene in Climate Change and Disaster Induced Uncertainty

Constitutionally, safe water and sanitation are perceived as rights and acknowledges it as basic needs. At practice level, public health concerns determine the needs and services provisions. The Millennium Development Goals and the Sixth Five Year Plan are the main drives for formulating the related policies and strategies. However, safe water and sanitation are also economic goods. Therefore, the policies and strategies aim at bringing the provisions within the reach of the people at affordable cost. The Department of Public Health Engineering and the Local Government are the key agencies for providing the services although the private sector agencies and non-governmental organisation should be significantly involved in that.

5.1. Institutional Arrangement for Water supply, Sanitation and Hygiene



5.1.1 Role of Governmental and Non-governmental agencies and their Participation

There are several policy instruments for providing guidance to planning water supply and sanitation services; and the main drivers, as note earlier, are the Millennium Development Goal and the Sixth Five Year Plan. The national policies indicate the state's role and outline the programme interventions. The policy instruments include the National Policy for Safe Water Supply and Sanitation 1998, supplementary National Policy for Arsenic Mitigation Policy 2004 and the National Water policy. Also, to define and determine specific programme interventions and operational plans the government has drafted the Pro-poor Strategy for Water and Sanitation Sector in Bangladesh 2005 and the National Sanitation Strategy 2005

National Policy

The national policy seeks to bring safe water and sanitation within the reach of the people. Fundamentally, water and sanitation refer to the basic needs. However, because, they are as well economic goods, users should pay to recover the costs of the services. Both the government and non-government agencies will provide the services. The other element of the policy is to involve the development partners. The key partners of the Department of Public Health Engineering include the World Bank, Asian development Bank, Islamic Development Bank, DANIA, SIDA, World Health Organization, UNICEF, NGO Forum and Water Aid. These partners provide financial and technical assistances in policy formulation, project implementation, research and evaluation and capacity building. With funding supports from the donors, NGOs related to water supply and sanitation services work for project implementation, awareness raising, research and training.

The objectives of the 'National Policy for Safe Water Supply and Sanitation'

- Access of all citizens to basic level of services in water supply and sanitation;
- Behavioral changes regarding use of water and sanitation;
- Reducing incidence of water borne diseases;
- Building capacity in local governments and communities to be effectively with problems relating to water supply and sanitation;
- Promoting sustainable water and sanitation services;
- Ensuring proper storage, management and use of surface water and preventing its contamination;
- Taking necessary measures for storage and use of rain water;
- Ensuring storm-water drainage in urban areas.

Also, many NGOs manufacture and distribute sanitary items (e.g. ring and slab for latrine) commercially. Basically, nearly all items for sanitation services are produced through commercial concerns; and these are distributed in the



communities through the market system. Even the items that the NGOs, DPHE and the Local Government agencies distribute at subsidized or market rates are procured from private sector manufacturers.

Institutional Arrangements

Ministry of Local Government, Rural Development and Cooperatives is primarily responsible for implementing the policies for safe water supply and sanitation services. This role is vested on the Local Government Division under the Ministry. The Division develops overall plans relating water supply and sanitation and identifies projects for implementation; and provides user level services through Water Supply & Sewerage Authority (WASA), Dhaka, Chittagong, Khulna and Rajshahi, DPHE and the Local Government bodies.

These agencies undertake their respective allocated duties, individually; and collectively, though a forum comprised of related agencies, coordinate their activities, monitor and evaluate progress and plan for future interventions. Role of DPHE in this regard is to assist Pouroshava, City Corporation and the Local Government bodies through developing infrastructure and providing technical inputs. In addition, DPHE develop working relationship with the private sector agencies and NGOs in rural and urban areas; and for this, DPHE maintain structure and human resources up to the Upazila level. The Local Government (Union Parishad) Act 2009 made Union Parishad responsible for water supply, sanitation services and maintenance of the system. However, the Union Parishads have not gained the required skills and capacities yet; therefore, DPHE continue to take the lead role in providing water and sanitation services at union level.

5.1.2 Roles of DPHE and UDMC

It is crucial to ensure water supply and sanitation services during disaster period. Disruptions in water supply and sanitation services may cause disease outbreak and increases distresses of the affected people. The Standing Order on Disaster (SOD) has assigned some specific duties relating disaster risk to DPHE. Risk reduction, preparedness and emergency response and recovery activities of DPHE in pre-during-post disaster situation include-

Pre-disaster period- Identify the risks for water supply and sanitation services through community consultation. Jointly, with other government agencies and non-governmental organization, plan for disaster risk reduction. Take preparatory measures for likely emergency during disaster; for example, pre-positioning of tools, water purification tablets and bleaching powder, and tube wells and latrines for temporary shelters.



During disaster- On urgent basis repair tube wells, establish tube wells and latrines in temporary shelter sites and supply potable water, water purification tablets and bleaching powder.

Post disaster period- Jointly with the Disaster Management Committees, restore water supply and sanitation services. It includes, tube well repair, establish new tube wells and latrines and supply bleaching powder for cleanliness.

Department of Public Health Engineering Roles and Functions

1. Except Dhaka and Chittagong city areas and Narayanganj town, DPHE is responsible for the Water Supply and Sanitation (Human excreta & sullage disposal, drainage and solid waste management) of the whole country, both in rural and urban (City Corporation, Pourashava, Upazila HQs and growth centers) areas.
2. In Urban areas the DPHE solely or jointly with the pourashava be responsible for Water Supply & Sanitation services. Also DPHE is responsible for assisting the Pourashavas and City Corporations through infrastructure development and technical assistance.
3. Assist Local Government Institutions (City Corporations, Pourashavas, Union Parishads etc) in the Operation & Maintenance of the Water Supply & Sanitation infrastructure & services including technical assistance.
4. Ensure supply of adequate number of trained & skilled manpower in the Water Supply & Sanitation sector through HRD of the sector personnel & institutions for proper and sustainable management of infrastructure and services.
5. Strengthen water testing facilities through establishment of laboratories at different levels in order to institutionalize Water Quality Monitoring and Surveillance program throughout the country both in rural and urban areas to ensure safe water for the people.
6. Carryout Hydro-geological investigations in search of safe source (both surface & ground) of water supply.
7. Social Mobilization for Awareness raising towards proper management of water supply & sanitation infrastructure and promotion of personal hygiene practices.
8. Develop safe water supply technologies in the Arsenic affected and other hydro-geologically difficult areas (Saline belt, stone problem areas, hilly regions and areas likely to be affected by other micro-pollutants).
9. Research and Development activities in search of appropriate and affordable options including the indigenous ones of water supply and sanitation in the country.
10. Ensure water supply and sanitation services/ facilities during and after the natural disasters/ calamities.
11. Establish National Water Supply & Sanitation Information Center as a center of excellence for sectoral information management.
12. Capacity building of the community, LGIs, private entrepreneurs and NGOs with technical know-how, information, training etc. in terms of water supply and sanitation.
13. Monitoring and coordination of activities of the stakeholders including NGOs & private operators working in the Water Supply and Sanitation sector.
14. Overall management of the Water Supply & Sanitation Sector Development Programme.

Source: <http://www.dphe.gov.bd>



Roles of the Union Disaster Management Committee include both disaster risk reduction and emergency response duties. It primarily seeks to minimize loss of life, livelihood and asset, keep the essential services functioning, meet the basic needs of the affected communities and reduce distresses of the people. To perform their duties, the committee should do risk analysis and undertake risk reduction interventions; as well, should do damage assessment and take part in humanitarian assistance and recovery interventions. Water supply and sanitation service related activities of Union Disaster Management Committee, in pre-during-post disaster situation, include-

Pre-disaster period- Determine the risks for water supply and sanitation services while doing disaster risk analysis in the communities. Raise awareness in the communities about disaster risks relating water and sanitation measures for reducing these risks. Jointly with DPHE, take preparedness actions to ensure safe water supply and sanitation services during disaster.

During disaster- Assess damage and need relating water supply and sanitation while doing overall damage and need assessment. With support from DPHE, arrange for repairing tube-wells, establishing new tube-wells and latrines in temporary shelter sites and supplying potable water, water purification tablets and bleaching powder.

Post disaster period- Work jointly with DPHE to restore water supply and sanitation services; for example- tube- well repair, establish new tube wells and latrines and supply bleaching powder for cleanliness.

Water and sanitation related duties of Union Parishad

- Ensure collection, disposal and management of cow dung and garbage from the roads.
- Manage and maintain wells, tube-wells, water bodies and other sources water.
- Protect sources of drinking water against contamination, and prevent use of water from contaminated or doubtful wells, ponds or sources.
- Prevent use of wells, ponds and water source marked for drinking for bathing and washing clothes and animals.
- Prevent use of pond and source of water for processing hemp jute or other crops.

Source: Bangladesh Gazette, additional, October 15, 2009, Second Schedule, Duties of Union Parishad



5.2. Strategies for Managing Water Supply, Sanitation and Hygiene

Climate change has caused uncertainty in water, sanitation hygiene sector; and induced by climate change, disasters have become increasingly severe and recurring. Ground water became unreliable. Tube wells and the traditional ring-slab latrines are becoming less useful. Costs of water and sanitation are rising. Ensuring safe water and sanitation for all has become difficult.

The Local Government bodies have important role promoting public education and awareness rising. It is one of the main activities of Ward Disaster Management Committee (WDMC). The key issues in this regard are-

- When if a new technology becomes necessary, it is important to educate communities about the proper way of using that and its management system; for example, educate people how should they store and use rain water or the management system piped water.
- Educate people about adaptive hygiene practices in changed circumstances; for example, ensuring personal cleanliness using less water.
- Aware communities about the need for adaptation in social norms; for example, hygienic latrine system for heavily crowded location.

5.2.1 Strategies to Manage Climate Change and Disaster Induced Uncertainty

Strategies to cope with climate change induced uncertainties in safe water supply, sanitation service and hygiene practice include-

Use appropriate and effective technology- It is crucial to find appropriate and effective technology that ensures water supply, sanitation services and hygiene practices in the changing circumstances. The current sources of water and the traditional technologies should be assessed to understand whether or to what extent they could serve their purposes. If they become unreliable, alternative sources of water and new technologies should be found. Information, knowledge and research help finding new technologies. However, promotion and supply of new technologies to large extent depends on functional and economic capacities. Also, the communities should learn how to use them.

Strategies to manage uncertainty

- Appropriate and effective technology; - Cost sharing through economic pricing;
- Create demand through awareness raising; - Subsidy for the poor and disadvantaged;
- Accountability and communities' participation; -Partnership among public, private and voluntary agencies.



Cost sharing through economic pricing for services- Disaster risk and climate will inevitably increase the costs of safe water supply and sanitation services. It is unlikely to provide the services without cost sharing. Therefore, economic pricing for the services should be introduced.

Create demand through awareness raising- Rising costs for the services may influence the demand at household and personal levels, negatively. In particular, for less affluent households, demand for such services may diminish. Therefore, it is vital to encourage them use safe water and proper sanitation facilities through public education and awareness raising.

Subsidy for the poor and disadvantaged- Understandably, poor and disadvantaged households may find it difficult to bear the increasing costs of the services. Therefore, accessibility issues should be carefully assessed in promoting new technologies. It is important to ensure that the economic pricing does not deprive the poor and disadvantaged households. If necessary, the system should allow these households access the services at subsidized price or free of charge. Also, disparity in men's and women's demand and accessibility should be considered. It should ensure that technological complexity or weaknesses in distribution do not create any gap in men's and women's accessibility.

Accountability and communities' participation- The key issues in safe water supply, sanitation service and hygiene practice are:

- a) Effective technology, if required, introduce new technology;
- b) Uninterrupted supply and distribution, and
- c) Public education to raise awareness.

The Local Government bodies have a vital role in these. However, communities should be involved in both planning and implementation processes. It should be built-in at national level planning process; DPHE is primarily responsible for this. Also, the Disaster Management Committee at the local level should be aware of the weaknesses of the existing technologies and the criteria for new technologies; and to do that the Local Government bodies should consult with the communities.

Partnership among public, private and voluntary agencies- The Local Government bodies take part in supply and distribution to implement water supply and sanitation programme of DPHE. However, because of climate change and disaster risk the system became increasingly complex and expensive. Presently, it is no longer possible for a single agency to mobilize resources necessary to



Climate Change Programme Implementation approach:

The implementation modality of climate change adaptation programme is solely a community based bottom up approach, where Local Government Institutions (LGIs) play the key role. According to the existing structure of local government institute there is no formal committees at ward level. It is one of the reasons of poor representation of root level demand and challenges at proper platform. Again in most of cases community based organizations are not taking sustainable shape due to short duration of project life. In considering the context new approach emphasis on formation of committees at ward level, particularly focusing on the management of climate change consequences mainly disasters. The committee has named as Ward Disaster management Committee (WDMC), who will put in driving seat for leading the project.



Along with the WDMCs, informal community groups (mother's club, adolescent club, youth club, child club, professional club etc) will be formed where members of WDMCs will also associate with the clubs. The main role of the clubs will be rising greater awareness on climate risk, disseminate learning's on community based adaptation and promote hygiene behavior. They also assist WDMCs in identifying, selecting, implementing and monitoring project interventions. Participatory WaSH vulnerability assessment will be the entry point of community based climate change adaptation. WDMC will carry out the Participatory WaSH Vulnerability Assessment (PWVA) in association with community people as a tool to evaluate the level of WaSH service coverage at a local scale. The PWVA is based on existing assessment methods such as Participatory Rural Appraisal and Participatory Vulnerability Assessment. Combining these approaches with a specific focus on WaSH and being community led will support communities to assess their current WaSH situation as they perceive it, and not as us or local governments determine. The PWVA is a key tool to the project approach and so initial activities will support launching this. For example, this means - the approach supports communities to be able to demand WaSH services from different duty-bearers and gives them a role in identifying where resources should be targeted. The assessment process itself provides people the opportunity to share knowledge on climate change related threats to WaSH. This helps develop a sense of ownership of the process, with findings belonging to the communities, which fosters greater responsibility in the design of action planning at household and community level.

Based on this understanding of climate risk to safe water supply, sanitation and hygiene behavior, it is expected that each WDMC will prepare an action plan to adapt the risk. Capacity building will be provided to the WDMCs to support this process. Each of the Union Disaster Management committees (UDMC) will then compile the vulnerability of their nine wards to create a comprehensive union level assessment of vulnerability. At this Union level, plans will also be developed through consolidating the ward level plans. Here, the detail activities, responsibilities, resource opportunities and time frame are presented. In this way it will create space for coordination and collaboration among DMCs at union and ward level.



deliver services, undertake maintenance and manage all links of the supply chain. Therefore, it is important to arrange for partnership to share the responsibilities among public, private and voluntary agencies.

5.2.2 Principles in managing Uncertainty

Principles for developing strategies to manage climate change and disaster risk induced uncertainties in water, sanitation and hygiene practices include-

Long term perspective – It is not certain whether or to what extent the current projects and systems will continue to be reliable in the context of disaster risk and climate change. Therefore, water supply and sanitation service related activities should not be permanent or unchangeable. Plans to meet the urgent immediate needs must apply a long term perspective; and they should include element to help modification to cope with the changing circumstances.

Multiple sources and technologies – Due to climate change the existing sources of water and the current technologies are becoming less useful. For example, ground water table is gradually dropping. It is not certain how long it will be reliable. Also, it is difficult and time consuming switch from one system to another. Therefore, it is reasonable to use more than one source and depend on one source solely. For example, use rain water instead of relying solely on ground water. Similarly, use reverse osmosis machine along with tube-well; or introduce other types of hygienic latrine along with the ring-slab system.

Introduce new technology – Due to climate change some of the current technologies became ineffective; for example, the traditional tube-well and PSF in salinity prone areas. To meet the needs in such changing circumstance, it is better to introduce new technologies instead of investing more on the traditional technologies; for example, introduce reverse osmosis or rain water harvesting system to replace tube-well and PSF in saline contaminated localities.

Region specific system – Disaster risk and climate change related challenges manifest regional variations; for example, salinity in the coastal areas and ‘too much and too little water’ cycle in the char land. It is unlikely that a single technology (e.g. tube-well) or natural water source will be effective for the whole country. Therefore, options for water supply and sanitation should be region specific.

Accessible to all – Climate change and recurring disasters have been causing deficits in water supply and sanitation services; and results in increasing deprivation and discrimination. In meeting the basic needs, deprivation and discrimination are unacceptable. Therefore, technologies and distribution systems should be such that safe water and sanitation service should accessible



to all; and persons with disability, pregnant women, children or old-aged people have access to water and sanitation. Also, communities living remote and marginalized areas should have access to that.

Affordable pricing – Producing water and sanitation services incur costs although they come under the basic needs. The national policies have proposed to recover the production and delivery costs. Making the services climate change and disaster resilient will inevitably increase the costs; and the end user will have to bear the burden. Therefore, the distribution system should be set up in a way that the hardcore poor and disadvantage have access to water and sanitation service. To achieve that, if necessary, rates of service charge may vary for different economic and social groups.

Social acceptance – Some tradition or well practiced systems have become ineffective; for example, ring-slab latrine in densely populated area. It is vital to ensure social acceptance in introducing new technologies. For example, water distribution points should be set up in way that women could access them without compromising their dignity; structure and procedure for use should be such that it is acceptable to all. However, if local practices or prejudices impede d promotion of appropriate technology, effort should be made to remedy that.

Accountability – Because uncertainties caused by disaster risk and climate change it is extremely difficult to precisely predict the future benefits or losses of current investment or the existing projects. Also, needs may arise to modify the currently running projects. Therefore, it is vital to have structure and processes to determine how and to what extent individuals are responsible for adapting the operation and how they will be hold to account for the success and failure of the project.

5.2.3 Considerations in Water Supply, Sanitation and Hygiene Practice

In addition to the principles for managing uncertainties in water supply, sanitation service and hygiene practice, there are few other considerations. They are-

Safe water

- Determining the quality standard and volume of water per person and ensuring that is prime con consideration. Water must be safe – it should be free from harmful substance, mineral, chemical and microorganism; and the distribution should such that every gets enough water.
- It should be ensured that women do not have to travel long distance to collect water and fetching water does not increase women’s work burden. Also, women should be able to collect water without exposing themselves to harassment or compromising their dignity.



| Basic survival water needs | | |
|--------------------------------------------------|-----------------------|----------------------------------------------------|
| Survival needs: water intake (drinking and food) | 2.5–3 liters per day | Depends on the climate and individual physiology |
| Basic hygiene practices | 2–6 liters per day | Depends on social and cultural norms |
| Basic cooking needs | 3–6 liters per day | Depends on food type and social and cultural norms |
| Total basic water needs | 7.5–15 liters per day | |

Source: Sphere Handbook, Humanitarian Charter and Minimum Standards in Humanitarian Response, 2011

Sanitation

- Technologies and structure and their application should be such that it does not contaminate the environment; and the use of sanitation service prevents disease transmission.
- Sanitation services should be affordable for all, socially acceptable and do not compromise the dignity of the users, women, in particular.
- Technologies and structure are durable and their repair and maintenance are within the reach of the households.
- Target should be one latrine for each household; to achieve this target appropriate technology should be developed.

Hygiene

- The main concern in hygiene practice is to protect oneself against illness and prevent disease transmission through good practices. It is about learning and disseminating the institutional knowledge and change behaviour of individuals and communities to reduce disease prevalence. It may be done achieved public education and awareness raising.

5.2.4 Mobilizing Resource

Commonly resource refers to money. Essentially, resources include materials, technologies and human resource. Generally, these are obtained in exchange of money. However, sometimes, money cannot get them timely. Therefore, it is important to understand precisely what resources are required and how they could be obtained.

Main role of the local government bodies about water and sanitation is to raise awareness of the communities. It requires resources to that; and a very large part of that resource is human resource. The local government can get enough numbers of people from the communities; but these people may not have the required skills. Skills can be developed through training; and for that, it may require material resources and technologies. The local government agencies can



request the DPHE and local NGOs involved in water and sanitation for assistance. To get financial assistance, it requires specific work plan. This work plan clearly defines the activities and indicates the types and quantities of resources required for each of the activities.

Governmental and non-governmental agencies involved in water and sanitation sector may provide financial assistance. Therefore, it is important to build and maintain good relation with them. To such assistance from these agencies, local government bodies have to demonstrate-

- Specific activities relating water supply, sanitation service and hygiene practice and how the money will be spent for each of activity.
- The concerned local government body has both jurisdiction and capacity to undertake and complete the proposed activities.
- Work procedure of the local government body is adequately transparent and accountable.

5.3. Accountability

Accountability refers to using authority and power in responsible manner. Key issues of humanitarian accountability include informing people about intervention and progress, get suggestion and feedback from community and receive complaint and respond to that.

Accountability Target

Information sharing

- All information, including financial information, relating the intervention disseminated in a way that all members of the community, despite their gender and educational achievement, understand.
- All information, including direct and indirect cost, disseminate at regularly, publish progress report regularly and discuss and agree with community about the methods of information

Participatory decision making

- Local community have key role in decision making and they feel ownership
- Recognize specific needs of the poor and marginalized groups, including women
- Resolve conflicts among different groups impartially



Feedback mechanism

- Establish feedback mechanism through discussing with the community, and in way that local people, including women, can give feedback with any fear
- Local government bodies monitor communities' satisfaction level at regular basis

Behaviour

- Workers of the local organization show trust and respect in their behavior with the community members
- Regular contact and discussions with the community to find new options and opportunities

Source: The Listen First Framework: [http://www.listenfirst.org/materials/](http://www.listenfirst.org/materials;); Handout, ALNAP Training - Leadership in Action

5.3.1 Accountability structure

Ensuring accountability requires and structure and process. The local government body should do the followings to ensure accountability.

- Inform community about the current and future interventions. Community should know about the details of the interventions as well about their roles in that. Also, they should get reports on implementation and progress of the project; for example, what are the activities; what are processes and how long it would continue; what resources are required and how are the resources mobilised; what are the progresses and what are the constraints and challenges faced
- Get disaster water, sanitation and hygiene related information from the community.

| Accountability | |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inform the community | <ul style="list-style-type: none"> ▪ What are the information to be disseminated ▪ When are the information to be disseminated ▪ What are the process that apply for disseminating information ▪ Who in the community should get information |
| Know from the community | <ul style="list-style-type: none"> ▪ When should the agency seek information ▪ What are the issues that the agency should explore ▪ Whom should the agency contact to get information ▪ What are the processes that the agency apply to get information ▪ How should the agency use information received from community |
| Receive suggestions and complaints | <ul style="list-style-type: none"> ▪ When may the community lodge complaints ▪ What are issues open for lodging complaints ▪ What are process that apply to lodge complaints; ▪ How should the agency respond to the complaints ▪ What feedback should the community get |



Consult community at all stages of the programme intervention – e.g. situation analysis, problem identification, preparing plans, implementation and monitoring. To consult with the community the local government body should apply participatory tools and methodology; and should processes that ensure participation of women, disabled and disadvantaged groups.

- Establish mechanism to receive complaints and respond to that timely. Inform community how they could send their complaints and suggestions about the intervention and its progress, and how the agency responds to the complaints received.



Appendix: Glossary

Adaptation

The adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. (ISDR)

Flash Floods

Sudden flood that occurs due to excessive rainfall, a dam or levee failure, or a sudden release of water held by a debris jam. Some areas are more prone to flash flooding; often flash flood occurs in the north-east region of Bangladesh in April-May.

Hazard

A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. (ISDR)

Weather

Weather refers to the average condition of atmospheric elements for short period – 1-7 days. Atmospheric elements include temperature, wind pressure, wind flow, cloud, humidity and precipitation. (Durjogkosh)

Arsenic

Arsenic is a toxic chemical element. It occurs as compound with oxygen, sulfur, chlorine, carbon and hydrogen as well with lead, mercury, gold and iron. Arsenic can be found naturally in small concentration in soil, water, air, sea fish, food grain and vegetables. In solid state, arsenic appears white or light grey and has a garlic odor; when dissolved in water, it becomes colourless and odorless. (Durjogkosh)

Arsenic Contamination

According to WHO acceptable level of arsenic for drinking water is 0.01 mg per liter. For Bangladesh it is 0.05 mg per litre. Countries set their respective acceptable levels individually. Arsenic contamination occurs when arsenic concentration becomes greater than the acceptable level. Although there are disagreements, it is generally believed that excessive extraction of ground water is the chief cause of arsenic contamination. In contact with oxygen, arsenic is released from the sulphide minerals, and dissolves in water in the shallow aquifer. Excessive extraction of ground water creates vacuums that are filled in by air. Oxygen in the air releases arsenic from the deposited arseno-pyrite in the ground. Another view is that, industrial wastes which contain arsenic are disposed in the rivers. Therefore, water becomes contaminated with arsenic. (Durjogkosh)



Drought

Drought is a natural hazard. Long spell of dry weather and absence of rain cause drought. This situation arises from more evaporation and transpiration than precipitation. Atmosphere become dry because of development intervention, deforestation and air pollution resulting from increasing population pressure. As a result, annual rainfall has diminished which is causing droughts. British atmospheric Scientists use duration of continuous absence of rainfall to measure drought. Recently, SPARSO scientist suggested link between the cause of drought and El Nino in the polar region of the East Pacific ocean and the cause of drought. Nearly, every alternative year, drought affects the social and economic activities in the northern districts of the country. Drought affected areas become hot; it dries up the rivers, canals and water bodies and seriously reduces water availability. Crops in the fields die and fodder for domestic animals become scarce. Drought is huge problem for the communities that rely directly on rainwater for drinking water, agriculture and animal rearing.

Coping

Disaster management refers coping practice to the traditional practices enable people achieve desired results through applying available resources. People in cyclone prone areas tie roofs of their houses so that the roofs are blown away by strong wind. People living in low lying areas raise plinth of their houses. Design of houses in earthquake prone areas is different from that in other areas. Communities that face disasters learn from their experiences and develop unique strategies to minimize losses and protect themselves. They apply that as traditional practices for generations. (Durjogkosh)

Greenhouse gases

Gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation of thermal infrared radiation emitted by the Earth's surface, the atmosphere itself, and by clouds.

Greenhouse effect

In a greenhouse, energy from the sun passes through the glass as rays of light. Much of this absorbed energy is converted to heat, which warms the greenhouse. The glass helps keep the greenhouse warm by trapping this heat. The earth's atmosphere acts somewhat like the glass of a greenhouse. The earth's surface absorbs some of the incoming radiation from the sun which converted into heat. Rest of the radiation reflect back to the space. But atmosphere absorbs it and radiate some of it back to the earth's surface, causing surface temperatures to be higher than they would otherwise be. The particular gases in the atmosphere that act like the glass of a greenhouse, preventing the heat from escaping, includes carbon dioxide, methane, nitrous oxide, and ozone. Following the industrial



revolution, during the last 200 years, due to human action, ratio of greenhouse in the atmosphere has increased; and it has accelerated rates of temperature rise of the earth surface. (Dujogkosh).

Cyclone

Cyclone is an atmospheric closed circulation rotating counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere. Tropical Cyclone is a warm-core non-frontal synoptic-scale cyclone, originating over tropical or subtropical waters, with organized deep convection and a closed surface wind circulation about a well-defined center. Once formed, a tropical cyclone is maintained by the extraction of heat energy from the ocean at high temperature and heat export at the low temperatures of the upper troposphere. In this they differ from extra tropical cyclones, which derive their energy from horizontal temperature contrasts in the atmosphere (baroclinic effects).

Climate

Climate is the average weather for a region over a long period (25-30 years). Elements of weather are temperature, humidity, wind, cloud, rainfall, snowfall and wind pressure etc. Geographic location and physical feature of country determine the country's weather. Based on the analysis of atmospheric elements, climate describes all weather occurring over a long period (30 years or more). (Durjogkosh)

Emergency Situation

It is a situation that requires immediate and urgent intervention. Emergency situation affects the poor more, compared to the less poor; and poor become poorer. Emergency situation arises when the magnitude of disaster overwhelms the capacities of the community and the local coping mechanism fails to deal with the situation. (Durjogkosh)

Emergency Response

Despite the efforts to reduce the identified risks relating to the hazards, sometimes, it may not be possible to avoid disaster. Disaster management system acknowledges that refers emergency response to making arrangements to provide assistance and engage the institutions, communities and the system to provide effective support to the affected communities. (Durjogkosh)

Storm Surge

Where cyclone forms in that centre or the eye of the cyclone, wind pressure remains low. As a result, sea water rises near around that area. Waves caused by the wind force gravitational tide hit the shore line. Storm surges are much higher and stronger than normal gravitational tide. During full moon or no moon periods



storm surges could be excessively high and devastating. 45 feet high has been noted during severe cyclone. (Durjogkosh)

High tide and Low tide

Tides are rhythmic rise and fall of sea water caused by the combined effects of the rotation of the earth and the gravitational forces exerted by the moon and the sun. The earth has two high tides and two low tides every day. High tide takes place when moon's gravity pulls water from away from the earth – sea water rises; low tide occurs as the earth turn, part of the sea moves away from the moon's gravity – the water sinks back. In high sea, difference between the heights of the high and low tides is about two feet; however, shallow areas it could be 20 feet or more. (Durjogkosh)

Risk

The probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions. Conventionally risk is expressed by the notation

$$\text{Risk} = \text{Hazards} \times \text{Vulnerability}$$

Some disciplines also include the concept of exposure to refer particularly to the physical aspects of vulnerability.

Beyond expressing a possibility of physical harm, it is crucial to recognize that risks are inherent or can be created or exist within social systems. It is important to consider the social contexts in which risks occur and that people therefore do not necessarily share the same perceptions of risk and their underlying causes.

Disaster

A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources. Disasters are often described as a result of the combination of: the exposure to a hazard; the conditions of vulnerability that are present; and insufficient capacity or measures to reduce or cope with the potential negative consequences.

Safe water

Safe water is potable water free from harmful microorganisms and does not contain greater than tolerable level of concentration of minerals, even if it may have colour, odour or taste.



Environment

Environment means totality of surrounding that affect and influence the growth, development, and survival of organisms. Elements of the surrounding include physical condition, climate, other organism and organic elements. Bangladesh has enacted environment protection act in 1995. However, because of population increase, deforestation and weak control over industry and transportation system environment is rapidly reaching to a critical stage. (Durjogkosh)

Early warning system

The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss.

Preparedness

The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions. Preparedness action is carried out within the context of disaster risk management and aims to build the capacities needed to efficiently manage all types of emergencies and achieve orderly transitions from response through to sustained recovery. Preparedness is based on a sound analysis of disaster risks and good linkages with early warning systems, and includes such activities as contingency planning, stockpiling of equipment and supplies, the development of arrangements for coordination, evacuation and public information, and associated training and field exercises. These must be supported by formal institutional, legal and budgetary capacities.

Flood

A temporary condition caused by the accumulation of runoff from any source, which exceeds the capacity of a natural or man-made drainage system and results in inundation of normally dry land areas.

Vulnerability

The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard.

Global warming

Global warming refers to climate change related gradual increase in the overall temperature of the earth's atmosphere. Rates of temperature rise have been accelerated. Already, communities in many counties and their people are experiencing severe impacts of climate change induced disasters. Climate



change induced abnormalities in the weather and seasonal patterns in many regions, including Bangladesh. Because it, probability of occurrence of catastrophic natural hazards and extent of damage due to that have increased. Such disasters cause large scale human casualties, extensive damage to assets and widespread disruption of livelihoods. During the last century, among the greenhouse gases, proportions of carbon dioxide in the atmosphere have increased by 25%, nitrous oxide by 19% and methane by 100%.

Earthquake

The shaking or vibrating of the ground caused by the sudden release of energy stored in rock beneath the earth's surface. The release of stored elastic energy is caused by sudden fracture and movement of rocks inside the Earth.

Salinity

Salinity is the presence of salt in soil that degrades the land. Salts dissolve and move around with water. When the water evaporates, the salts are left behind. Over extraction of ground water aids sea water enter into land surface; and it accelerates sodification or accumulation sodium in the soil. Degradation land through salinisation has emerged as a major natural hazard in Bangladesh.

Sea level

It refer to level of the ocean's surface – especially, halfway between mean high and low tide, which is used as a standard in reckoning land elevation or sea depth. It is assumed as horizontally spread surface of the sea. However, in reality it does not remain level and always moves up and down. Because of the gravitational tides, temperature and salinity concentration of seas water, season change and discharge from the rivers continuously changes the level. Sea level rise could severely affect large numbers of people in many countries. In particular, the low lying delta will be inundated. Bangladesh tops list of the affected countries. Impacts on demography, land utilization and national income based on the projected scenario have been developed. 144-209 cm rise of the level will submerge 16-18% of the land area; severely affect 13-15 % of the current total population and 13% loss of the GDP. (Durjogkosh)

Capacity

The combination of all the strengths, attributes and resources available within a community, society or organization that can be used to achieve agreed goals. Capacity may include infrastructure and physical means, institutions, societal coping abilities, as well as human knowledge, skills and collective attributes such as social relationships, leadership and management.



Hygiene

Hygiene refers to the set of practices perceived by a community to be associated with the preservation of health and healthy living. While in modern medical sciences there is a set of standards of hygiene recommended for different situations, what is considered hygienic or not can vary between different cultures, genders and ethnic groups. (Wikipedia)

Sanitation

Sanitation generally refers to the provision of facilities and services for the safe disposal of human urine and feces. Inadequate sanitation is a major cause of disease world-wide and improving sanitation is known to have a significant beneficial impact on health both in households and across communities. The word 'sanitation' also refers to the maintenance of hygienic conditions, through services such as garbage collection and wastewater disposal. (WHO)



References

Ahmed, S., (2008), An Assessment of the Impacts of Floods on Sanitation in Rural Bangladesh, BRAC

DER, 2007, Bangladesh Flood 2007 DER Post Disaster Needs Assessment Summary Report

DMB (2010), National Plan for disaster Management 2010-2015

DMB, Past Disaster Information <http://www.dmb.gov.bd/>

ECB (2011), Flooding & Prolonged Water-logging in South West Bangladesh Coordinated Assessment Report

ISDR, Terminology, Basic terms of disaster risk reduction Local Government Division (1998), National Policy for Safe Water Supply & Sanitation; MoLGRD&C, Government of Bangladesh.

Local Government Division (2005), National Sanitation Strategy; Ministry MoLGRD&C, GoB

Mehedi, H., Nag, A. K., & Farhana, S. Climate Induced Displacement Case Study of Cyclone Aila in the Southwest Coastal Region of Bangladesh. Humanitywatch. Khulna. 2010

MoEF (2009), Bangladesh Climate Change Strategy and Action Plan, Government of Bangladesh

MoEF (2009), National Adaptation Programme of Action (NAPA), Government of Bangladesh

MoFDM, GoB (2010), Standing Order on Disaster

Ministry of Water Resources, 2012, Master Plan of Haor Areas, Government of Bangladesh

NIRAPAD (2010), World Vision Training Handout Session 5.

The Listen First Framework: <http://www.listenfirst.org/materials>; Handout, ALNAP Training - Leadership in Action

UNDP (2010), Cyclone Aila Joint UN Multi-sector Assessment & Response Framework

UNICEF ROSA (2008), Behaviour Change Communication In emergencies: A Toolkit

WaterAid, Technology notes, www.wateraid.org

WEDC, WHO (2011), Technical Notes on Drinking-Water, Sanitation and Hygiene in Emergencies

Asiatic Society (2006), Banglapedia

Department of Public Health Engineering, <http://www.dphe.gov.bd>

Ministry of Water Resources (2005), GoB, Coastal Area Policy

Rahman, P. (2010), Testimony of Journalist – Swelled sufferings Aila hit people in one year

AlAmin, S. (2010), Testimony of Journalists - Swelled sufferings of Aila hit people in one year

Sphere Handbook (2011), Humanitarian Charter and Minimum Standards in Humanitarian Response

Bangladesh Gazette, additional (October 15, 2009), Second Schedule, Duties of Union Parishad

CDMP (2009), Durjogkosh





For more information please contact-

WaterAid in Bangladesh

H# 97/B, R# 25, Block-A, Banani,
Dhaka-1213, Bangladesh.
Phone +880 2 8815757
Email: info@wateraidbd.org
www.wateraid.org/bangladesh

NIRAPAD

19/13, Babar Road, Block-B,
Mohammadpur, Dhaka-1207,
Bangladesh.
Phone: +880 2 8143729
Email: nirapad@nirapad.org
www.nirapad.org