

# Reaching the Hard-to-Reach

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First Published June 2010  
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## ABBREVIATIONS

ADB	:	Asian Development Bank
AIRP	:	Arsenic Iron Removal Plant
BRAC	:	Bangladesh Rural Advancement Committee
CBO	:	Community Based Organization
CDS	:	Community Development Services
DC	:	Deputy Commissioner
DPHE	:	Department of Public Health Engineering
DRO	:	Development and Rehabilitation Organization
DTWs	:	Deep Tubewells
DS	:	Deputy Secretary
ED	:	Executive Director
FGD	:	Focus Group Discussion
GPS	:	Global Positioning System
HHs	:	Households
IEC	:	Information, Education and Communication
KII	:	Key Informant Interviews
LGED	:	Local Government Engineering Department
LGI	:	Local Government Institutes
MHSCGWAPB	:	Mitigation of Health and Social Consequences of Groundwater Arsenic Poisoning in Bangladesh
MoU	:	Memorandum of Understanding
NGO Forum	:	NGO Forum for Drinking Water Supply and Sanitation
NGO	:	Non-government Organization
PMC	:	Pipeline Management Committee
PSOs	:	Private Sector Operators
PSF	:	Pond Sand Filter
R&D	:	Research and Development
RRF	:	Rural Reconstruction Foundation
RWHS	:	Rain-water Harvesting Systems
UN	:	United Nations
UP	:	Union Parishad (Council)
VAMC	:	Village Arsenic Mitigation Committee
WASH	:	Water, Sanitation and Hygiene

# Foreword

The WatSan sector in Bangladesh recently faces a new facet with the rising impacts of climate change visible in the country's different regions. The change impacts are the most strong in the hard-to-reach areas. The climate change impacts have further intensified these areas' vulnerability in relation to the availability of safe WatSan facilities. NGO Forum has been working as the apex networking and service delivery agency of NGOs, CBOs, private sector and civil society in WatSan sector for the last 28 years. Throughout this period it has acknowledged the changing scenarios of water resources and its management and designed its programmes to address these changes. NGO Forum has developed vast experiences while working for people's WatSan rights which have been well-documented for further analysis and research. The best practices are documented regularly and shared with all its stakeholders for coming up with replicable models in WatSan promotion.

NGO Forum is always in place extending its support towards the hard-to-reach people who are unidentified and out of government figures and support. In addressing WatSan needs and priorities of these areas, NGO Forum has introduced alternative WatSan technologies that are adaptive to the geographical features of the areas. As said earlier, the hard-to-reach areas are also mostly facing the stern climatic impacts that needed to be taken into consideration. New approach such as the Community-managed Approach has been adopted in addressing poverty, transferring knowledge to the beneficiaries and developing ownership on water options. Introducing new approaches and tools to remote and marginalized communities are quite challenging considering the poor socio-economic demographics, people's awareness level, cultural and indigenous beliefs & practices. Introducing cost-sharing mechanism in line with the *National Policy for Safe Water Supply and Sanitation* is one such challenging task for NGO Forum and its partners who are directly implementing the programmes. While selecting alternative technologies NGO Forum considers not only the geographical features but also the socio-economic conditions and cultural practices. Despite some difficulties most communities have become accustomed with the new water technologies in adaptation to climate change. Throughout the implementation process NGO Forum has found that different water options are suitable for not only different hydrogeological regions but as well as different indigenous and marginalized communities. Besides, community support and participation, women's active participation have also varied from one community to the other.

NGO Forum's implemented programmes carried out in the hard-to-reach areas have been addressing the increasing challenges of climate change impacts to a great extent. NGO Forum has made the effort to accumulate all these experiences and learning from all its partners engaged in the implementation of countrywide WatSan programmes. The *publication* upholds the identified best practices of NGO Forum's WatSan promotion in hard-to-reach areas combating the climate change challenges. We hope that the analysis and examples of best practices shall be helpful for all our development partners to come up with a more pragmatic approach in the hard-to-reach areas and contribute in sustaining the water supply, sanitation and hygiene promotion in Bangladesh, the front line victim of climate change.

**S.M.A. Rashid**

June 2010

## Preface

NGO Forum believes that it is quite impossible to ensure water and sanitation for all keeping any particular area deprived of these facilities. But the reality is that millions of people still living in dire necessity of water and sanitation facilities in the hard-to-reach areas of Bangladesh. Climate change has put their lives once again under enormous risk of disaster and vulnerability. As we know that water related impacts of climate change are the most critical globally, being parts of Bangladesh which is the frontline country feeling the pain of climate change, these hard-to-reach areas have become the most vulnerable due to its spatial locations, communication facilities, moderate civil amenities and administrative barrier. On the other hand, arsenic contamination in groundwater has created severe threat to the Public Health situation in Bangladesh while the coverage for safe water has dropped from its previous coverage due to arsenic contamination. To cope with these entire situations and for the promotion of sustainable Public Health situation in these hard-to-reach areas, NGO Forum being the apex networking & service delivery body in the WatSan sector, upholds a special commitment to ensure these disadvantaged people's right to safe water supply, environmental sanitation and health hygiene habits. Considering the geophysical characteristics and adverse impacts of climate change, various supports and services have been provided by NGO Forum to ensure safe water facilities to these areas. These broadly cover different types of hardware supports and software services. In addition, advocacy campaign has been conducted for policy formulation and revision in line with national goal of respective sector. The Forum has always taken special initiatives like invention and promotion of new area-specific, situation-specific, environment-specific feasible technologies in the hard-to-reach areas instead of all-fits-one modern technology. This *Publication* is a documentary having a compilation of a series of success-cases while it reflects the facts how the people of hard-to-reach areas have been able to reduce their plight lot being guided and directed by the supports & services of NGO Forum.

Chapter 1 provides a description of the background of the WatSan sector's journey on how the water and sanitation component has become international agenda by crossing the geopolitical boundary. Now WatSan has become one of the development agenda of the Government of Bangladesh as well as the development partners and it is looked into from the perspectives of health, economics, human productivity and poverty eradication as a whole. On the other hand, chapter 2 highlights socio-cultural, economics and political dynamics, instead of contemplating water and sanitation simply as a development agenda in broad-based perspective. Social, cultural, religious belief and economic ability of people are considerable phenomena in making WatSan success. This chapter also describes how the general feature of hard-to-reach areas such as poverty, lack of education, lack of awareness on development issues and content, traditional values and traditional practices of rituals and habits should take into consideration in WatSan programme implementation.

Chapter 3, 4 & 5 describes about the hard to-reach areas, its WatSan situation, NGO Forum's initiatives in the hard-to-reach areas, WatSan technologies & accomplishments.

Despite being a tremendous development potential area, the people of coastal belt, one of the hard-to-reach areas usually lead their life fighting against cyclone, tidal surge, flood and so on. There are rivers, pond and other water sources but people have no safe source of drinking

water due to intrusion of saline water in both surface and groundwater, and they very commonly face scarcity of safe water. Climate change has worsened the situation. To cope with the vulnerability, NGO Forum has introduced various alternative water supply options like Pond Sand Filter, Rain-water Harvesting System, Deep Tubewell, etc benefiting the coastal people. Rain-water has become a major source of drinking water as described 'Rain-water Redeems Khadija's Plight' by a character of this *Publication*.

On the other hand, CHT is resourceful with its natural beauty and cultural diversity; but the people of this hard-to-reach region are experiencing a severe scarcity of safe water and lack of sanitation facilities. The indigenous hilly people in rural areas normally depend on the natural sources i.e. rivers, canals, hilly holes, lakes and springs for their drinking water. But the people have no idea with the risk of using surface sources untreated. Hence, the people of CHT used to suffer from various water-borne diseases as the study depicted "Healthy Life on the Hilltop" described by a character. Alongside they have to cross arduous hilly paths and the soil condition of this hilly areas force them walking for miles to reach the sources to collect water for their daily chores. Considering the soil texture, NGO Forum has promoted Spring-water Capping System, Infiltration Gravity, Plastic Ring Slab, Ring-well, etc.

Water and sanitation situation in *Haor* area is appalling, with little coverage of hygienic latrines and open defecation is still widespread. The hard-to-reach people of this area lead their lives fighting against recurrent floods, river erosion, etc. They depend on Tubewell for safe drinking water. But the problem is for a long span of time the area remains inundated and the Tubewells go under flood-water leaving safe drinking water under threat.

*Chars* (sandy islands) in Bangladesh can be considered a 'by-product' of the hydro-morphological dynamics of its rivers. Each year a large percentage of the *chars* get flooded. The hard-to-reach riverside *chars* are home of the poorest and most vulnerable communities in the country where water & sanitation coverage is far below standard. The groundwater table is shallow, soil is fragile in nature and flood is a recurrent phenomena that washes away all the movable properties and leaving water & sanitation facilities at risk.

Deteriorating water situation has become one of the major concerns and development issues of the drought-prone region. The overall WatSan situation has been hard hit with the increasing impacts of climate change in the region. The water system in the region mostly depended on the rivers. The drying up of the rivers sharply hampers the region's water situation. As the rivers in Rajshahi division have dried to great extent, they are no longer contributing in the recharging of the groundwater. This has also triggered to the desertification of the region. Environmental disaster are also becoming evident in this region hit by drought. With Deep-set Pumps extracting groundwater everyday for irrigation purpose, the dependency on groundwater is rising with each drought season. The summers are prolonging and each year mercury is rising higher. Various negative impacts of climate change triggering untimely and shortfall of rain, drying up of rivers, temperature increase, declining of groundwater table, etc are directly affecting and worsening the WatSan situation in drought-prone Rajshahi division. NGO Forum is in position to cope with this situation providing some feasible options in relation to safe water and sanitation facilities.

The tea gardens are regulated by their own regulations and principles. It is sometimes stated that 'tea garden is a state within the state'. Here the authorities are not keen to meet the labour laws to provide the labourers with proper education, health, water and sanitation facilities. Due to the lack of awareness on safe water, sanitation and required facilities, the people in tea gardens suffer from different water-borne diseases like diarrhoea, dysentery, typhoid, jaundice, etc. Sometimes it turns into the serious outbreak of water-borne diseases that tolls a remarkable

death every year. Different networking events organized by NGO Forum have opened up a new possibility to work more closely with the tea garden workers along with the garden authorities.

Under this development process, NGO Forum has had its satisfaction as a remarkable number of the poor people have been able to get rid of leading a sub-human life by the Community-managed Water & Sanitation Approach of NGO Forum. There are many more references among the Forum beneficiaries who have become the examples of success in the society being guided under various hardware & software development drives of NGO Forum. The publication *Reaching the Hard-to-Reach* is a compilation of case studies on those who have achieved success in improving Public Health situation. The characters of this Book represent the thousands who have been able to improve their lives by the Forum's support of water and sanitation. Once these people were lagging behind due to frequent water-borne diseases like diarrhoea, dysentery, skin diseases, etc. The hard-to-reach groups did not have any idea about safe water, sanitation and hygiene. They were not also oriented to the necessity of using safe water, sanitary latrines and maintaining hygiene behaviours. They used to suffer from many water-borne diseases but they did not know the link between the diseases and lack of knowledge and practices of using safe water, sanitary latrines and maintaining hygiene principles.

The different 18 success stories contained in this Book echo the same spirit of the characters while the hard-to-reach people make it clear about their sufferings and finally became aware and made their lives more comfortable, sound and meaningful being provided with the development assistance of NGO Forum. Differences between previous and present awareness level, expenditure for treatment, saving of time & energy, etc highlighted in the Book while the Book also reflects light on these issues very vividly which it also has become a documentary of the fact how these characters have become morally high enough to speak out their basic human rights to the concerned authorities. This Book has also presented the potential benefits of introducing a Community-managed WatSan Programme into the hard-to-reach areas.

We sincerely wish this Book will be a rich document to share and exchange experiences with other relevant stakeholders, sector professionals, and individuals. We hope, development activists, researchers, sociologists, academicians and planners will find this publication of some use for guiding towards a pragmatic change in the hard-to-reach areas in terms of water & sanitation facilities, especially in adaptation to climate change.

**Joseph Halder**

June 2010

# Chapter 1: Water and Sanitation: An Overview

## 1.1 Introduction and Background

Though water and sanitation movement got a momentum in last two decades, but it is not new phenomena in development sector of Bangladesh. It is evident from the role and responsibilities of Union Parishad—the lowest tier of Local Government Institution (LGI)—that water and sanitation programme is one of the inbuilt development sectors of Bangladesh. Among the Union Parishad's by-laws promulgated 10 mandatory and 28 voluntary responsibilities, and promotion of water and sanitation is one of the 10 mandatory responsibilities. Despite, water and sanitation promotion remained continue in slothful manner for its constant functional traits. As a result, non-government organizations had to come forward to implement water and sanitation programme alongside the government institutions and local government bodies. Earlier, local government institutions had limited opportunities to create a momentum of sanitation as movement in Bangladesh but it geared up with initiatives and actions of international development agencies and followed by government actions to respond to needs and priorities of international communities. Now WatSan is one of the development agenda of the Government of Bangladesh as well as the development partners and it is looked into from the perspectives of health, economics, human productivity and poverty eradication as a whole. Geographical location and climatic conditions of Bangladesh put the country under enormous risk of disaster and vulnerability to climate change. So, WatSan is gradually being integrated to other development actions, and policies that are formulated and put them into actions to address the risks and reduction of livelihood vulnerabilities of mass people. The interrelationship between water and sanitation and Public Health issue has got utmost priority in analyzing and taking any actions in this regard.

The WatSan component is more relevant to Public Health that is being analyzed from different levels. Unhygienic WatSan practice is the cause for water-borne diseases like diarrhoea, cholera, etc. Poor hygiene practices, unsafe water use and unhygienic latrine use are determinant factors that intensify transmission of diarrhoea and other epidemic diseases. These environmental factors contribute to approximately 94% of the 4 billion cases of diarrhoea that the World Health Organization (WHO) estimates to occur globally each year. Children under the age of 5 in developing countries bear the greatest burden and account for the majority of the 1.5 million deaths attributed to diarrhoea annually. The impact of climatologic fluctuations on water quality & supply must be examined to ensure continued reduction in diarrhoeal diseases that caused for higher maternal and child mortality rate in developing countries like Bangladesh. Ensuring hygiene practice through increasing access to safe water and sanitation is not panacea of reducing mortality rate but it contributes tremendously in reduction of health hazard, health care cost and sustaining livelihood of the poor and marginalized people. Diarrhoea can cause severe dehydration and poor absorption of nutrients, which, in turn, make affected individuals more susceptible to infectious diseases. In most cases, it reduces productivity of human being and put them in income loses that ultimately put them into poverty cycle. Diarrhoea in early childhood is associated with impaired growth, physical fitness, and cognitive development, which can lead to diminished future school performance and lower economic earning power. Severe diarrhoea that is not cared for appropriately can also lead to death. Safe drinking water and improved sanitation play a significant role in reducing the risk of such diseases. The child

and maternal mortality rate is flux with change of water-borne diseases. Unsafe water sources are vulnerable to contamination and are a major source of disease transmission; unimproved sanitation is a major source of contamination for clean water sources. According to WHO, diarrhoea morbidity could decrease by 32% percent with improved sanitation such as pit latrines, septic tanks, and composting toilets; and by 6 to 25% with improved water supply such as protected Dug-wells, public taps, and Tubewells.

Safe water and hygienic sanitation practices contribute tremendously in reducing health hazard as well as child and woman mortality. However, NGO Forum was emerged to ensure water and sanitation facilities and services at the door-steps of community people with the aim to contribute in poverty reduction of the poor and marginalized. The accessibility to safe water and sanitation of them in hard-to-reach areas is difficult. So NGO Forum has always been in position taking special initiatives like invention and promotion of new and area-specific feasible technologies in the hard-to-reach areas. The coverage of the programme is wide with varied geographical characteristics as well as the people's culture. Climate change and its impact on increasing vulnerability of water and sanitation has also been taken into account for betterment of the hard-to-reach people of the better off areas as well as the hard-to-reach areas as a whole. The newly innovated and renovated WatSan technologies are developed considering the geo-hydrological feature of the respective areas based on the changing context. It also has covered specific areas and pockets where poverty is widespread and intensity of destitution is high. It has increasingly been addressing the populations of certain difficult and hard-to-reach areas that are geographically, culturally, economically and administratively isolated and distinct like *chars, haors*, the off-shore islands and the remote coastal, hills and the teagardens. NGO Forum is always in process to change its approach and strategies in accordance with the needs and priorities of respective areas. As a result, to address the geophysical challenges it has been providing the demand-based services as per needs and priorities of the community considering the criteria of appropriateness, effectiveness and sustainability of WatSan technologies in line with the existing and apprehended challenges including climate change.

Innovative means and ways are developed by NGO Forum from lessons learnt from its long and wide experiences of working in different hard-to-reach areas. In turn, the learnt lessons have stirred it innovating climate-resilient, strategies, modus operandi and technologies for the heard-to-reach areas. These actions have geared up and contributed in ensuring a sustainable success in water and sanitation sector of Bangladesh.

## **1.2 Global Initiatives in WatSan**

The water and sanitation component has become international agenda by crossing the geopolitical boundary. 191 member states of the United Nations (UN) General Assembly pledged in September 2000 to meet their eight priority needs by the year 2015. 'This attention has resulted in the adoption of the Millennium Development Goals (MDGs) of the UN. While global concerns and attentions were put in common into eradication of extreme poverty and hunger, achievement of universal primary education, promotion of gender equality and empowerment of women, reduction in child mortality, improvement of maternal health, combating of HIV/AIDS, malaria and other diseases, and development of a common platform towards global partnership for development, environmental sustainability has come to fore as a priority need of the developing nations. Throughout the process, the notion of "environmental

sustainability” is transcribed as a means of securing universal environmental sanitation for all inhabitants of the world. Environmental sanitation has also been considered to have greater implication for reducing child mortality – the other millennium development goal of the United Nations.’

The environmental sanitation component of the MDG of developing countries has set two specific targets: 1) reduction of under-five mortality rate to two-thirds by the year 2015, and 2) improvement of livelihood of at least 100 million people all over the world through ensuring their access to safe and hygienic sanitation. With the intension of enhancing the spirit of environmental sustainability, the UN has declared the first decade of this millennium as “water decade”. It inspired developing countries including Bangladesh to take initiative to declare an intensive sanitation movement with a target to achieve “Sanitation for All.”

The World Summit on Sustainable Development (WSSD) that took place in 2002 – two years after the MDG adoption, propelled this need once again. The implementation plan of the WSSD put forward a specific sanitation target for the developing countries. This plan was built upon background information that at least 2.4 billion people of this universe lacked access to proper sanitation. Thus, the participating countries agreed to halve the number of people having no access to basic hygienic sanitation by 2015. ‘In general, two specific goals were devised out as universal sanitation target. The goals are: 1) to halve, by the year 2015, the proportion of people who are unable to reach or afford safe drinking water, and 2) to halve, by the year 2015, the proportion of people who do not have access to basic sanitation. Member countries that were more lagged behind in establishing hygienic sanitation practices compared to their relative progress in securing safe drinking water put major attention to meeting the sanitation goal of the WSSD’ (Mohiuddin & Ali: 2005). As well, the participating countries envisioned hygienic sanitation movement not only as an implementation issue, rather they have taken into consideration the notions of differential impact of needs and accessibility between classes and gender, sustainability, affordability, maintenance, effectiveness, supportiveness and compatibility in terms of diversities in political, economic, geo-physical, environmental and social contexts. This leads to initiate actions in regional and national level to meet the global needs.

### **1.3 Regional Action towards WatSan Movement**

The South-Asian Conference on Sanitation (SACOSAN) in 2003 held in Dhaka tremendously boosted up water and sanitation movement in South Asian Countries, especially in Bangladesh. The heads of delegation of nine countries participating in the Conference ratified and adopted the Dhaka Declaration – a landmark regional policy toward sustainable sanitation. The Conference produced consensus and unanimous agreement among the participating states to assure on adoption of all out efforts to uproot the practice of open defecation, to save one million children under the age of 5 from dyeing each year of water and sanitation related diseases. They also reached a common definition of sanitation, and decision to pay adequate attention to the sanitation needs of vulnerable and marginalized population in urban and rural areas.

Remarkable decisions emerged out of the Conference. One of the significant outcomes of the Conference was adoption of a people-centered approach of sanitation. The member states

recognized that conventional, top-down approach in earlier sanitation strategies were counterproductive in nature. The second important development was observed in the process of rigorous and unbiased evaluation of earlier attempts of sanitation development. In a fact-finding manner, the delegation spoke aloud of the flaws attached with subsidized sanitation, rationing and relief. According to them, hardware subsidy policies and provisions have failed to bring expected development in sanitation practice of the target people. It has not been ruled out the yet persisting need of indirect subsidy for hardware, the software services were considered to be a “must” to accomplish desired sustainability of the sanitation movement. Progress was also made through the declaration that further focused on the notion of household-level sanitation coverage, and prioritized the needs of collaboration of government organizations (GOs) with non-government organizations (NGOs). The importance of establishing basic sanitation was reiterated, and it was agreed upon that small-scale private initiatives to produce cost-effective sanitation hardware be strengthened, demand be generated, and delivery services be ensured at door steps of the community people.

The second SACOSAN also emphasized the incentives and support to be provided for the poor and people in vulnerable areas; and technologies (e.g. which require less water and/or no water) and the practice of “reuse and recycle” of human wastes, and solid and liquid wastes (including conversion into energy), will be promoted. The actions were emphasized to a) develop and implement approaches, methodologies, technologies and systems for emergencies, and disaster situations, and for areas, with special characteristics/terrains or groups suffering temporary displacement; b) advocate globally the recognition of climate change impacts on sanitation provision in South Asia, and develop and implement strategies and technologies that adapt to and mitigate impacts; and c) enable flexibility and variety in options and practical solutions to suit local conditions, preferences, and resources.

The model of water, sanitation and hygiene movement was declared in the regional context as “people-centered, community-led, gender-sensitive and demand-driven” (UN: 262). A further extension of this approach led to the inclusion of the resolution in the declaration that hardware subsidies should go only to the “poorest of the poor” (UN: 262). It was also spelt out that the community subsidies would go for “promotion, awareness, capacity building and the creation of funding mechanisms for scaling up sanitation and hygiene programmes” (UN: 262). The wide array of sanitation movement considerations also entailed research and development paradigm in it. It was promulgated that hardware of sanitation technology options would be viable, locally appropriate and available at affordable costs. This policy decisions indicated to take initiative for innovation of appropriate and adaptive technologies for hard-to-reach areas. Throughout the process of determination, the ideas of “strategic partnership” between the local government and supportive community-based organizations (CBOs) and partner NGOs, as well as grassroots-level community sanitation and hygiene education in schools have also gained considerable momentum in this policy declaration. Following the course of action, there were two meetings held in Islamabad and Delhi to share the progress updates directed toward a viable and sustainable regional cooperation for sanitation.

## **1.4 National Responses to Meet Global and Regional Needs**

The chronological development exchange and translation of global development needs and priorities into regional and local goals has paved the way to national sanitation plans and

strategies at government level. By taking into consideration of the MDGs and SACOSAN policies, national level response of Bangladesh Government was declaration of an ambitious sanitation movement “Sanitation for All by 2010”. Though this is the ending year of that declaration but yet long way to go, because it has not been able to reach its goal, and the goal has been reset to the year 2013. On the other hand, the United Nations had declared the decade as the *International Decade for Action “Water for Life” 2005-2015*. As consequences, the strategic partnership between different layers of the local government, stakeholders including intervening NGOs, CBOs, women, school-children, influential community people, cultural activists, monitoring bodies and hardware support-service delivery people have appended a new dimension to the sanitation movement. Accordingly, all the stakeholders are in track to meet the goals. But natural disasters and other vulnerabilities have been tarnishing the accomplishment.

In concurrence with the SACOSAN agreed upon target, the Government has taken initiatives to implement programme in “people centered, community-led, gender-sensitive and demand driven” approach and the following principles should facilitate this new paradigm, wherein the thrust should be:

- on the elimination of open defecation and other unhygienic practices, as well as the promotion of good hygiene practice;
- on providing hardware subsidies only to the poorest of the poor, who have no means of helping themselves, to be given under appropriate and effective monitoring and evaluation arrangements; and
- on recognizing the need for community subsidies for promotion, awareness, capacity-building and the creation of funding mechanisms for scaling up sanitation and hygiene programmes.

Achieving universal sanitation coverage by the end of 2010 was the major goal of the National Sanitation Programme (NSP). GoB has taken several policy decisions in order to keep the pace of the achievements against the target. The roles of the key actors of the sector have been set to achieve the goals of the NSP. The Ministry of Local Government, Rural Development, and Cooperatives (MoLGRD&C), as the statutory body is responsible for policy decisions, sectoral allocation and funding, as well as project appraisals, approval, evaluation and monitoring. The government allocated 20% ADP grant of upazila for sanitation and placed it at the disposal of Upazila and Union Parishad. It further allocated 25% of the sanitation allocation to conduct motivational activities and the rest 75% for the ‘hardware’ subsidy for the hardcore poor to benefit the hardcore poor alone. In this way, it was expected that the hardcore poor in the country would be covered by the ‘least cost feasible option’ of hygienic latrines, by the year 2010. NGO Forum alongside other non-government organizations has been following the same strategy in water and sanitation coverage.

After the first SACOSAN in Dhaka- 2003, the Government declared October of each year as the “Sanitation Month” which is being observed throughout the country. The local government institutions, the Union Parishads (UPs) have been bestowed with the coordination and leadership role in implementation of union-based sanitation programmes. In 2004, the Government also declared a special monetary award for the UPs on way to successfully reaching the target of hundred percent sanitation coverage and maintaining their sustainability. Accordingly, a *National Sanitation Strategy* has also been developed and adopted. Initiative has

also been taken focused on improvising indigenous sanitation technologies using available and affordable resources in order to meet local demand. However, the traditional technologies of water and sanitation are not always adaptable in hard-to-reach areas. So, the organizations like NGO Forum have introduced feasible technological options in accordance with geophysical condition and community people's culturally acceptable options.

As part of actions, upon several policy discussions with various stakeholders in seminars, fora and workshops, the LGD of the GoB has adopted a national sanitation work-plan in 2003 and that is being updated and monitored on a regular basis. The work-plan is based on the principles that sanitation is a human right and is primarily about health. It also covers the issues of privacy, dignity, safety and security of community people. The intensive national plan to accomplish hundred percent national sanitation coverage has gained immense priority and added currency in the *National Strategy for Accelerated Poverty Reduction*, widely known as PRSP. The strategy has clearly envisioned the correlation of infant mortality and lack of access of poor people to sanitation. Thus, the Strategy "envisages reducing mortality rate from the 200 benchmark value of 66 to 37 by 2010 and 22 by 2015" (GoB 2005:2). With the aim to supplement the government actions, various non-government organizations have been in actions in this sector. As apex body of this sector, NGO Forum is in action of making coverage of water and sanitation with special focus to hard-to-reach areas of different geophysical condition of Bangladesh.

## 1.5. Outcome of Actions

The outcomes of global, regional and national level actions are encapsulated from the perspective of policy formulation, decision-making, allocation of fund for implementation of water and sanitation programme in Bangladesh for higher coverage though increasing access to supports and services especially in hard-to-reach areas. This exercises looked into the evils of low sanitation status, also analyzed in line with the positive impact of the sanitation movement on people's livelihood. The sanitation component of the MDG was principled on the grounds that diarrhoea used to cause untimely death of more than one hundred thousand under-five children. Millions of children lack adequate nutrition due to diarrhoea, and subsequently fall victims to arrested physical growth, loss of eyesight and resistance to other type of diseases like typhoid, dysentery and hepatitis. Alongside, diseases make adult people unproductive and under productive that perpetuates livelihood vulnerability and finally put those households in vicious cycle of poverty. At present, about 88% people use hygienic latrine and 97.6% drink water from Tap, Tubewell and Ring-well. Despite that about 110,000 under 5 years of children die due to diarrhoea each year. This rate is much higher in hard-to-reach areas where water and sanitation coverage is much less than the national average. It is to be mentioned that in Bangladesh context, the 2003 statistics presented the fact that 71% rural and 40% urban households were practicing open defecation causing water pollution related widespread water-borne diseases, and that treatment of these diseases cost approximately Taka 5,000 million of Bangladesh. It was also analyzed that "the cost would be much higher if the loss of income, time spent and patient care and effect of child development are factored in" (GoB 2005:2).

A GoB study (GoB 2005:3) conducted on unions that reached hundred percent coverage reflects that proper sanitation could positively lead to poverty eradication and improvement of quality of life of people. Proper sanitation also adds much in disease control and overall well-being of

people. According to the finding of that study, total sanitation reduced diarrhoea in those areas by 99%, dysentery by 90%, and other stomach-related problems such as intestinal worms by 51%. “As a result, monthly medical costs for common illnesses decreased by 55% in rural areas and 26% in urban areas. Working days lost due to illness fell from 77 to 35 days per year, and school days lost due to illness fell from 16 to 7 days per year in rural areas” (GoB 2003:3). In areas having total sanitation, people’s expenditure on food and clothing increased by 6% and 2% respectively (GoB 2003:3). Though achievement is comparatively less in hard-to-reach areas, but community people believe that the frequency of water-borne diseases has substantially reduced in those areas. The technological adoption has created scope of people to get access to WatSan facilities on the one hand and also has impacted positively to the life. From the perspective of optimistic outcome, this Book has recorded an analyzed fact-based efficiency of implementation approaches, technological options and its adaptation in the context of respective geophysical condition and thereby the community motivation processes. Since the NGO Forum is in position to deliver a complete motivation and mobilization services along with its hardware provision, the effectiveness and processes of software services provisions have been analyzed from an evaluative perspective.

## Chapter-2: Socio-cultural, Economic and Political Dynamics

Instead of contemplating water and sanitation simply as a development agenda in broad-based perspective, it needs to look into socio-cultural and economic standpoints and relate to the political dynamics. The cultural phenomena need to keenly consider for specific community level actions because the socio-religious connotation upholds the purity and pollution notion. The issue “pure water” in *Sanatan* religion is different from the generalist and scientific viewpoints. For an example, the water of Ganges is pure to devotees though it may not be safe for human health. So the acceptance of supports and services are determined by cultural factors and religious belief. Until and unless, respective culture endorsed any actions and/or provided support and service, accomplishment of success remained unachievable. At the same time, it has an economic connotation like ability to pay for actions/supports and services, putting the needs in priorities, etc. The achievement may remain beyond the target due to inaccessibility in spite of cultural endorsement. However, social, cultural, religious belief and economic ability of community people are considerable phenomena in making success. As water and sanitation is behavioural phenomena inertia of those factor may cause of failure of the water and sanitation programme.

Socio-economic factorial analysis covered issues of social, economic, institutional and cultural aspects, which are substantially linked to community participation in actions. The general feature of rural Bangladesh, especially in hard-to-reach areas are poverty, lack of education, lack of awareness on development issues and content, traditional values and traditional practices of rituals and habits. It sometimes settled on the magnitude of people's participation in actions. The socio-economic condition of the people in rural community is divergent; high illiteracy, poverty, lack of awareness on development issues are common. They maintain families in hardship due to seasonal employment, quasi employment, and having no alternative income opportunities round the year. The people have limited access to development messages and they remained confined within traditional knowledge that sometime is counterproductive of development actions. The social structure, power structure and economic relations among the community people play the deterministic role in prioritization of development issues and concerns, involvement of people in activity process and nature of appreciation and rejection of actions. The institutional and cultural factors of respective communities play effective role in any development process. However, aspects that are indispensable part need to be accounted in designing, planning and implementing of activities in reaching goals set in the design. The impact/outcomes of actions are assessed by taking into account of socio-economic and cultural factors and institutional arrangements in project implementation.

The interaction and common consensus of key actors determine smooth operation and expected success of any intervention. The interactions between stakeholders and beneficiaries are important in WatSan intervention because perceptions of them propel actions in set direction and generate potential results. However, there is much debate on participation and its SMART (specific, measurable, attainable, and time bound) indicators. The participation is an area where quite considerable experiment has been taken place to identify the issue as an indicator of social development. Without making certain level of interaction, the highest level of participation cannot be ensured in development actions. It is true that the notion of participation has currently become prominent in development thinking and practice because of its wide range of coverage of socio-economic and cultural concerns including belief, values, habits, etc of the

community people. The participation is not an inflexible issue, so it has to be understood as a process of activities that leads to the empowerment of people. Participation is defined as a socially vibrant grassroots process whereby people identify the process as their own, with occasional help from facilitators. The process is inherently educative, leading progressively to a higher level of consciousness which evolves through newer experiences of facing reality. They are then able to participate as active subjects in the development process rather than passive objects. The interaction can generate consensus and put forward the actors to the realm of participation. The water and sanitation programme of NGO Forum is designed to make the community people active through different strategies and techniques that perpetuate in making them aware and in enabling them to understand the reality through experiences. The community participation is needed to address diversified social, economic and cultural matter for their inter-linked nature.

The changes in people's lives, their perceptions and practices of WatSan behaviours are to be analyzed by taking into account of their participation and cultural endorsement. The building of community level organization and strengthening the existing ones, community capacity building, ensuring participation and mobility of women, self-confidence and changes of values on their relationship and their activities are substantial. The sustainability of people's institutions and achievement level are also indicators of success. The sense of ownership of technologies as well as the programme itself by of the people, their willingness and capacity to share costs and attitude towards maintenance of the technologies are measurable indicators of the success. These socio-cultural and economic factors are substantial components in relation to water and sanitation coverage and behavioural change of people.

## 2.1 WatSan in Cultural Perspective

Prevailed cultural diversity, religious norms, traditional practices, and social norms & values play crucial role in water and sanitation coverage as well as in behavioural change. The community composition, ethnicity, religious and natural environment, geo-physical traits are determinant factors in achieving success in water and sanitation coverage and behavioural change. The people of different hard-to-reach areas are used to traditional hygiene practices. For example, the tea garden workers are used to defecate in garden and generally use a clod of earth for sweeping after defecation. In the morning everyone goes to tea garden in call of nature. This is a tradition of the people of this area and large majority still maintain this open defecation practice. Some NGOs have run the motivational work to use sanitary latrine. Some of the garden workers are ready to change the tradition of using garden as a toilet, especially for the sake of their children. Still, they believe that it is their socio-cultural-religious tradition: children can't use the same toilet as used by their parents, which is treated as 'insulting' elders! Similarly a daughter-in-law will not defecate on top of the excreta left by her father-in-law. The hygiene practices are determined by cultural beliefs that do not permit to use the same latrine which is used by their elders! Regarding hand washing, they never even heard about the work of NGOs, although the level of awareness varied from garden to garden. Few workers wash hands after toilet and before food, still just with plain water. Huge open places are available in *char* areas and people normally defecate there and use water from river and canal. The hilly people are also used to in their own practices. These are the part of their culture. The dwellers of respective areas have their long traditional practices which is difficult to change in a shorter span of time.

As the hygiene practices are different in communities and areas, the notion of hygiene and cleanliness differs from person to person, locality to locality, by religion and groups. The ideas of cleanliness differs from community to community and these might have affirmative or negative impact on health, but when these are culturally acceptable and socially endorsed then these influence hygienic behavioural practices of people. The culture, tradition, habit and behavioural practice of different religious and ethnic groups determine their role in participation in development programmes. The supportive activities to culture and tradition of particular community may contribute in easy implementation through use of learnt knowledge and experiences. Conversely, actions meet head-on existing culture of people of religious and/or ethnic communities may keep them away from participation and sometime become counterproductive. In such case, actions are to be designed by accommodating issues and concerns of respective actors.

Water use and sanitation practices are dependent on and correlated with geophysical condition. Plain land dwellers in shallow-water zone are used to use Tubewell-water due to its availability. Pond or river water is considered as dirty water. It is part of their culture so it would be hard to make PSF or RWHS popular; it needs cultural adaptation and massive awareness campaign. As these technologies are not culturally accepted so participation might be quite difficult in promoting such technologies. In such case institutions can play strong role in receiving, accepting and adopting new technologies for safe sources of water and ensuring participation. The *Tabiz*, *Muntro* (amulet and incantation) still exist for water purification in the hard-to-reach areas. This superstition get priority to a section of people, who may not participate in water and sanitation promotion actions, but due to social pressure they may buy and install sanitary latrine at home while its usage cannot be ensured without changing their traditional belief and cultural adaptation.

Culture, social institutions and social system of Bangladesh are male-dominated as well as male biased, where women have very little say. Women are generally responsible for water collection and maintaining hygiene practices but those are rarely socially recognized and valued economically. The women are the potential victims of unhygienic practices but culturally they remain away from any decision-making and participation. However, in designing any actions these cultural issues need extra effort to accommodate them in action and to make congenial and supportive environment for their participation through cultural endorsement of the respective society.

It is believed that when *Ula Devi* (the Goddess) becomes cruel and aggressive to the people then *Ula Uttha* (diarrhoea) breaks out. Similarly, a section of rural people believes that sweet or sweetened food is cause of worm infestation. The excreta of babies is considered as harmless and open defecation by children is an acceptable common practice. These perceptions and cultural practices are harmful for human health but culturally accepted and endorsed. The perception about causes of water-borne diseases varies between different groups like, man-woman, rich-poor, old-young, educated-uneducated, and so on. These dynamics need to be considered for the success of development intervention and promotion of any new technology aiming for behavioural change.

## 2.2 WatSan in Social Structural Analysis

Social structural and functional characteristics have roles in determining socio-economic activities in society. Every society has its own system, norms and values that originated from social structure and functions. People maintain such systems, norms and values for keeping social harmony, peace and coexistence. However, the social norms and values are guiding principle of participation in actions. Social factors determine involvement and participation of people in relevant activities and on the other hand, some of them restraints people from taking part in activities. The traditional norms and values sometime become a hindrance in promoting water and sanitation programme. In the hard-to-reach areas, facilities and amenities in availing themselves of information and knowledge are very limited that the people living there remain confined within the traditional knowledge and practices.

Power structure, social faction and conflict, social stratification, relationship, gender and other interpersonal relations and other socio-cultural aspects emerged from the social structure. Normally the interactions between different actors are absent whatever exists that are within the structural-functional dilemma. The people's participation can minimize socio-cultural distance among actors and strengthen their participation. The structure and functions of community institutions and organizations are to be taken care of in designing and planning of programme for community-based activities.

Traditionally, women mainly get involved in household chores. The women having education and family supports take part in actions outside the household. The rural women are still in traditional actions. Nowadays, participation of women in development activities has been gradually increasing due to supportive policies (provision of women members in UPs, preference in employing women as school teachers, formation of women group in programme implementation, etc) of government and non-government organizations and their practices. The women living on subsistence level are involving themselves in income generating activities supported by national and international non-government organizations as well as government bodies. However, still it is not well-accepted by the rural society. The participation of women in development activities including the water supply and sanitation programme is gradually increasing day by day.

As the people of hard-to-reach areas have been suffering from acute drinking water crisis and facing water-borne diseases recurrently, social conflict might be less especially on the ground of water sources installation. The geophysical condition and acuteness of community level programme bring them on united stand. The united efforts of social groups and factors become influential in increasing participation and making success of the programme. The united efforts of rural elite and the community people as a whole bear some significance to the community people. The joint decisions of community people serve community purpose and get more impetus to them. In such case, community participation issues become forefront as a community initiative to people and lead effective implementation of programme.

The social power and prestige are inter-linked. The power forms social capital that leads to an economic emancipation. The poor people are taking part in different development activities and non-government organizations implement integrated development programmes with beneficiaries' participation. The participation in relevant interventions makes people aware

about sound health and hygiene behaviour that perpetuate installation of sanitary latrine in their house and safe water sources. Nowadays, without having a sanitary latrine in the household is a prestige concern for the elite and the well off. The people of the rural area were basically used to traditional practices of open defecation, so they did not have sanitary latrine in their houses. Now the awareness and increase of knowledge base through participation in different development activities have inspired them to install sanitary latrines.

### 2.3 WatSan and Economic Perspective

Economic imperative of water and sanitation is important in higher sanitation and safe water coverage, and change of hygiene behaviour of people. About 40% households are hardcore poor who maintains livelihood in hand to mouth. The economic status in hard-to-reach areas is more critical than that of other areas. The poor people cannot afford sanitation facilities and water technologies due to economic crisis. Another dimension of hard-to-reach areas is scarcity of land for installation of WatSan technologies because they live on small piece of land or they live on others' land. In some hard-to-reach areas like *haors* and tea garden land crisis is more acute. In such case, despite of having willingness, people cannot ensure safe water and sanitation for themselves. The community-based approach is economically more viable option for them.

The economic solvency facilitates the people to take active part in installation of water and sanitation technologies. The factors like entitlement, ownership, market value of respective materials, land system, distribution and land use system, etc, are influential characteristics. The household economic status is determinant factor, which dominates social and economic activities. The central focus of peoples' activities is fulfillment of basic needs and sustenance for better lives. According to the economic deterministic approach, it is the supreme controlling factor of society and its dynamics. The basic structural factors determine the change of the super structural and functional dynamics. The financial ability makes the people capable to participate in social and cultural functionalities and the poor people are unable to participate in actions owing to financial crisis. The economic and financial aspects influence the adaptive technological options of water and sanitation.

As the poor people are unable to have access to welfare related services and facilities due to financial crisis, so the policy safeguard of government and non-government organizations allow them to act accordingly. It is the scenario that people who are not participating in water and sanitation programme are very poor. They are unable to manage the cost for water and sanitation technologies. However, the government has taken actions to respond to the needs and allocated a budget for them through local government institutions. According to the *National Policy for Safe Water Supply & Sanitation*, every participant is to share the cost equally for water technology, but someone or few of them are providing the total cost and the water technology. The community actions are somehow being effective, especially in case of water technologies, but not in case of sanitation.

The willingness to participate in development activities depends on economic capacity and knowledge about the issue. As the poor people are economically vulnerable so ensuring participation of them sometimes become difficult. The implementing organizations have developed an alternative mechanism that unable people will pay in kind rather than cash. In most cases, hardcore poor people share the cost through physical labor during construction or

installation of water technologies. The approach works well and ensures participation of all sections of people in actions. In the hard-to-reach areas this approach makes more effective results. In the supply-driven approach of water and sanitation programme a huge funding was provided for water supply and sanitation construction, where the operation and maintenance issue was neglected. Through that programme the poorer sections of the people had been least benefited and many facilities installed were not functioning. In response to this crisis the government and donor agencies are adopting integrated WatSan programme in demand-responsive approach. In this system the cost-sharing for beneficiaries is essential as well as operation and maintenance cost is to be borne by the beneficiaries. The economic viewpoints of water and sanitation, especially for hard-to-reach areas focus the actions to ensure participation. The government safeguard, NGOs' subsidized options for water technologies are pre-requisites for success of the programme. Otherwise, the aim of sanitation coverage may face challenge in reaching the target.

## Chapter-3: Hard-to-Reach Areas: Geophysical and WatSan Context Analysis

By taking into consideration of economic, geophysical and social context, the terminology 'hard-to-reach' can be defined from two separate perspectives like hard-to-reach areas and hard-to-reach people. In the context of local government, 'hard-to-reach' is a term sometimes used to describe those sections of the community that are difficult to involve in public participation. It is useful to take a step back and look at the usage of the term in the literature. There is a lack of clarity about what exactly is meant by 'hard-to-reach'. The term is employed inconsistently; sometimes it is used to refer to minority groups, such as ethnic people, gays and lesbians, or homeless people; it can be used to refer to 'hidden populations' i.e. groups of people who do not wish to be found or contacted (Jones & Newburn 2001: vi). In the service context, 'hard-to-reach' often refers to the 'underserved', namely minority groups, those slipping through the net, and the service resistant (Doherty et al. 2004). Hard-to-reach is often used in the context of social marketing (Beder 1980). The aim of many social marketing initiatives, especially in the field of health, is to affect change in behaviour using marketing tools and techniques adopted from the private sector (Walsh et al. 1993). Social marketing is a consumer focused approach that believes nobody is impossible to reach; it just depends on the approach taken. Paul Vittles commented that 'no-one is hard to reach, just more expensive to reach. It is important to put more effort and creativity in reaching these groups' (Wilson 2001: 1). However, the terminology is defined from the perspective of actions intended to perform. It is used from service delivery perspective with location-wise characteristics. This investigation focused to make service and technological provision available to the respective communities so here by firstly 'hard-to-reach' means difficult physical communication with these areas. Another option is population slipping from the development actions of both government and non-government organizations who have been living in accessible area but could not be reached due to other factors. However, the terminology is defined by taking into account of both hard-to-reach in terms of communication and slipped population from development actions. Indeed, the communication is given more emphasis in the context of Bangladesh. The hard-to-reach areas in Bangladesh like *chars*, *haors*, coastal region, hills, tea gardens are not easily accessible due to communication. At the same time the proposition of slipped population is also possibly higher in those areas in comparison to that other plain land areas.

### 3.1 Geophysical and WatSan Context

The geophysical context of *char*, *haor*, coastal region, drought-prone areas, hills, and tea garden are diverse and it is distinctive from location to location. The hard-to-reach in terms of communication as well as service delivery to a section of people is considered as criteria. Each of this area has distinct characteristics and livelihood pattern of the people. In such a diverse socio-economic condition the hard-to-reach people of hard-to-reach areas suffer the most and have little service and facilities including water and sanitation. It is worth mentioning, special characteristics influence programme's ability to address certain plain land areas. *Char*, *haor*, hill, coastal region, drought prone areas and teagardens are distinctive by context and water and sanitation in these areas need special attention. NGO Forum covers areas that are inaccessible with special attention. It is presumed, people of hard-to-reach areas would be the most vulnerable due to climate change and sea level rise. Responding to such vulnerabilities, NGO

Forum has been providing supports with special attention to climate change impact on water and sanitation like climate-resilient and sustainable technologies innovation and promotion through community participation and exploitation of their indigenous knowledge.

The hard-to-reach particularly the *char*, *haor*, hill, tea garden and coastal areas are extremely disadvantaged in terms of accessibilities. The economic opportunities are less due to physical environment and the poor people of these areas are the most vulnerable. It is, therefore, highly significant that NGO Forum has been running its programme in all the hard-to-reach areas. The challenges include access to and within the communities (transportation is often very difficult, involving water transport as well as land, and is also expensive), finding suitable technical solutions (e.g. affordable latrines are often vulnerable to damage during frequent floods), dealing with land issues (loss of land due to river erosion, complicated land ownership issues and influence of powerful land-grabbers). Poverty and vulnerability is also very high among the tea garden population. Moreover, influence of the tea estate administration, as well as some unusual beliefs and practices of the teagarden workers regarding water use and sanitation limits their livelihood options. Again, there are also some technical issues/challenges that make provision of water supply and sanitation even more challenging.

### **3.1.1 Coastal Belt**

The coastal belt of Bangladesh are spread over to 86 upazilas. As compared to other parts of the country, the coastal belt has been identified as a problem area due to complex hydrogeological conditions and adverse water quality which make safe water supply difficult. Like other areas in the coastal belt, Chittagong, Cox's Bazar, Khulna, Bagerhat, Satkhira, Barguna, Patuakhali districts are also associated with an acute drinking water crisis. In comparison to other coastal areas water supply situation of these districts has different characteristics. In major parts of these districts, the groundwater cannot be abstracted for drinking purpose due to failure of Tubewells to discharge water of satisfactory quality because of excessive salinity in groundwater. The common impediments towards safe water supply are unavailability of neat and clean ponds to be preserved for drinking purpose, unavailability of feasible water technologies, etc. Scattered settlement pattern especially in the exposed zone of these districts also make adequate safe water supply very difficult. On the other side, the common scenario of the area is major portion of agricultural lands is being used for shrimp culture, which is contributing to increasing salinity in surface water. Ultimately the shrimp culture nearby a pond affects the pond water and other surface water sources. Gradually surface water is also losing its drinking quality. Due to declination of pond water during the dry season people's sufferings increases naturally to the maximum extent. All these phenomena have been working as the driving force among the people for using contaminated water from unprotected rivers, ponds and shallow wells leading to a high risk of health problem.

The variation or extent of hazards depends on seasons and geographical location. Clearly, some people may be more vulnerable than others because of where they live, who they are or what resources they possess or have access to. In this context, coastal belt is one of the most hazard-prone areas in Bangladesh. Despite being a tremendous development potential area, the people of its 14 districts usually lead their life fighting against cyclone, tidal surge, flood, water logging and so on. Therefore, this region has been remaining as the hard-to-reach area.

Climate change has resulted in increased frequency and intensity of cyclones. The pattern of cyclone is changing. If the trend of the last 20 years is taken, the pattern just does not match, there is an anomaly. Whenever there is high tide, water flows inland and the original inhabitants of the area cannot live there permanently. They cannot use the Tubewells and even the ponds are regularly submerged by saline water. As a result, in many areas the scarcity of drinking water remains at alarming proportions. In many coastal villages, people have to walk for miles to get access to drinking water. Similarly frequent cyclone and tidal surge destroy the permanent sanitation options.

It is predicted that the sea level rise may lead to displacement and resettlement of approximately 10 million people by 2050 in the coastal region as climate refugees. This refugee issue will pose a serious threat to the country's total WatSan sector. On the other hand, sea level rise and salinity intrusion will reduce freshwater options and environmental sanitation remarkably where already 53% of the area has been affected by salinity. This changed physical environment will affect Public Health issues and livelihoods.

The World Health Organization (WHO) has reported that 150,000 people die every year as a direct result of climate change. Those who survive climate shocks are often driven deeper into poverty because of the impacts of their livelihoods, health and security. The poor are the most vulnerable to climate change impacts because of their lack of capacity to cope with the changing situation and reduce its risks. Cyclone *Aila* hit the coastal belt in May in 2009. Thousands of people are still living on the broken embankments without much food, water, improved shelters and in various social insecurities even after 1-year of the cyclone. The poor have become extremely poor and many non-poor have been thrown into poverty and food insecurity by the destructions of *Aila* which is considered as a result of climate change.

The hydrogeological conditions of the coastal areas vary greatly even within short distances. Unlike other areas of Bangladesh, groundwater of acceptable quality is not available in most part of the coastal region at relatively shallow depth for easy withdrawal by conventional hand pump Tubewells. In general the Shallow Tubewells are deep from 20m to 75m and Deep Tubewells are deep from 75m to 350m. The most popular technology- Tubewell is also not feasible in many coastal areas due to excessive salinity intrusion and arsenic contamination and excessive presence of iron in groundwater source. In some places saline water has been found in deep aquifers.

Besides Tubewell in some cases, only few alternate water supply technologies like Pond Sand Filter (PSF), Rain-water Harvesting System (RWHS), etc are feasible in the coastal areas. But these water options are not that much affordable to most of the community people. The community people also feel the technical aspects of these technologies are complicated like their installation, proper operation and maintenance, etc. Though Pond Sand Filter has a huge demand among the community, but neat and clean ponds are not that available in the area to be preserved for drinking water purpose. Alongside, the gradual increase of salinity area, shrimp culture in the adjacent reservoirs, environmental degradation, etc are affecting pond water. Indiscriminate use of pesticides and chemical fertilizers in fish cultivation has been aggravating the deterioration of water quality. The presence of chlorides, and dissolved iron in excess of acceptable limits are also causing the problems in safe drinking water supply. However, based on the satisfactory annual rainfall in the coastal areas, the community people have been using

rain-water for drinking purpose. Since time immemorial the community people have been harvesting rain-water as well as using it for domestic purposes as safe water especially in the coastal belt. But the way they harvest rain-water is not scientific. They harvest in a traditional way, which is not hygienic. Harvesting of rain-water by using traditional methods is not safe and bacteria-free. Apart from this the community people cannot preserve sufficient water for dry season by using traditional methods. Due to prevalence of these existing realities water supply crisis in coastal areas is still acute.

The presence of arsenic and saline in groundwater is the main problem in the coastal belt. Besides, surface water is also polluted with microbiological contaminants. In this situation, the main options to provide safe water are either to remove arsenic and saline from the contaminated sources or to find a new safe source of water supply. Bangladesh is a tropical country. The annual monsoon rainfall is about 2200-2500 mm that represents a generous seasonal supply for safe drinking water all over the country. Considering the rainfall pattern, duration, and settlement pattern of the people, rain-water is feasible for arsenic and saline-affected coastal areas.

The people of this hard-to-reach area do not have any shortage of water but they commonly face scarcity of safe water. Most of the traditional water technologies do not work in this region because of its different geographical characteristics and generally people depend on rain-water for drinking purpose. Using pond/river water for cooking purpose is a common practice in the coastal belt. Ensuring sanitary latrine for the region is also a very challenging issue. Intensity & intrusion of salinity and regular cyclone and tidal surge destroy the facilities forcing the people to practice open defecation and at the same time decreases their motivation to install a new sanitary latrine. This has a direct impact on the hygiene practice. This region is also often considered as one of the most diarrhoea-prone areas of the country.

This is the classic scenario of coastal belt in regard to water supply, environmental sanitation and health hygiene habits. NGO Forum has been being beside the hard-to-reach people of this coastal belt and striving to ensure these disadvantaged people's rights to safe water supply, environmental sanitation and hygiene habits. But now climate change has created a whole new level of crisis for the region. It has added fuel to the flame. Already, the coastal belt, its ecosystem and people are suffering from its impacts. Its impacts on water supply and sanitation directly affect sustainable development of the country and put at risk regarding poverty reduction, overall public health as well as existing ecosystems.

Climate change manifests itself in natural disasters of various types. Water related impacts of climate change are likely the most critical. It is influencing the availability of water for human consumption and for food production which certainly pose a serious threat to environmental sanitation and hygiene practice issues as well. Efforts have been made to consolidate the climate effects so far at various geographical locations by the government and NGOs including NGO Forum, especially focusing on the hard-to-reach areas' water, sanitation & hygiene issues in relation to climate change.

### 3.1.2 *Char* Area

*Char* is a tract of land surrounded by the waters of an ocean, sea, lake, or stream; it usually means any accretion in a river course or estuary. It includes all types of bars including both lateral (point-bars) and medial (braid-bars). In the dynamics of erosion and accretion in the rivers of Bangladesh, the sand bars emerging as islands within the river channel (island *chars*) or as attached land to the riverbanks (attached *chars*), often create new opportunities to establish settlements and pursue agricultural activities on them. A distinction should be made between island *chars*, which are surrounded by water year-round and attached *chars*, which are connected to the mainland under normal flow. Once it is vegetated such lands are commonly called *chars* in Bangladesh.

The enormous delta of the Ganges-Brahmaputra River in Bangladesh, and surrounding areas of India, is the life-blood for one of the largest populations on Earth. Descending from the Himalayan plateau to a lowland upper delta plain, the rivers experience rapid lateral migration, producing a patchwork of flood plains of various ages. In the eastern lower (tidal) delta plain, the rivers enter the sea through the Meghna estuary, a 100-km-wide zone of multiple distributary channels and migrating islands. Coalescing subaqueous sand shoals in the river mouths form a delta front clinoform that is prograding seaward over the top-set beds of a muddy subaqueous delta on the continental shelf. West of the river mouths, the lower delta plain is covered by a mangrove forest (the Sunderbans), drained by a network of river distributary and secondary tidal channels and formed in an earlier phase of Holocene delta progradation. The Ganges-Brahmaputra delta is under increasing environmental pressure today in response to the needs of a rapidly growing and modernizing population.

Although not as densely populated as other parts of Bangladesh, the five riverine districts of the Northern Jamuna are home to approximately 3.5 million people. One million of these inhabitants live on riverine islands and bars, commonly known as *chars*. The *chars* are formed as a result of river erosion and silt deposition, and are surrounded by water throughout the year. Near-annual flooding of the Jamuna region regularly forms and re-forms these *chars*, making them highly prone to acute erosion. These floods can force thousands of families to move their households each year, as flood water either submerges their homes or erodes the land on which they live. It is estimated that *char* households often relocate between five to seven times in a generation, with poorer *char* households invariably moving many more times due to the inferior quality and location of the land they move to and from. Over the last 35 years, the Jamuna river has been gradually moving westwards, creating and destroying *chars* and people's lives in its wake. The majority of the Jamuna *chars* are both inhabited and cultivated, with many *char* dwellers earning a meager subsistence living from the land. Although *chars* can have life-spans of 40 years, the *chars* in the Jamuna are young and only tend to last about a decade. This impermanence leads to a highly vulnerable life and livelihood insecurity for *char* dwellers. Given that these *char* families are some of the most food-insecure and poorest people in Bangladesh.

*Chars* in Bangladesh can be considered a 'by-product' of the hydro-morphological dynamics of its rivers. However, the island and attached *chars* appear to be less productive than adjacent mainland areas. The major reasons for this are the relatively less favorable soil conditions in some of the *chars*, uncertainties caused by erosion and frequent floods. Although both river water and groundwater are abundantly available in *chars*, irrigated crops are scarce in many of the *chars* except for the ones within the upper Meghna river. Forestry has also been successful in some of the *chars*. The perennial availability of water in the rivers provides year-round opportunities for fishing to many of the *char* communities. *Chars* in Bangladesh have been divided into five sub-areas: the Jamuna, the Ganges, the Padma, the Upper Meghna and the Lower Meghna rivers. There are other areas of riverine *chars* in Bangladesh, along the Old Brahmaputra and the Tista rivers. But compared to the *chars* in the major rivers, these constitute much less land area. It is estimated that in 1993 the total area covered by *chars* in Bangladesh was 1,722 sq km.

The *chars* are extremely vulnerable to both erosion and flood hazards. Recent analysis of time series satellite images indicates that over 99% of the area within the riverbanks of the Jamuna had been *char* at one time or another during the 27-year period of 1973 to 2000. The same analysis shows that about 75% of the *chars* persisted between one and nine years, while only about 10% lasted for 18 years or more. In certain areas, however, the *chars* can be quite stable (for example, in the Upper Meghna area). During the period of 1984 to 1993, *char* areas increased in all rivers, except in the Upper Meghna. The net increase of *chars* during this period amounted to 36,000 ha. The effects of riverbank erosion and widening of the river channel on the people living in *chars* have been significant. During 1981 to 1993, a total of about 729,000 people were displaced by riverbank erosion. More than half of the displacement was along the Jamuna.

Each year a large percentage of the *chars* get flooded. The flooding, if it comes early, can damage the crops in the fields. People in *chars* build their homesteads on the highest available land and, if they stay there for any length of time, they further elevate their homesteads on built-up plinths to avoid annual inundation. The island *chars* are found to be flooded more extensively than the attached *chars*. Among the *chars* within different river reaches, those within the Ganges are found to be most extensively flooded. The riverside *chars* (sandy islands) are home of the poorest and most vulnerable communities in the country. The severe physical, social, economic and political vulnerabilities of the *char*-dwellers arise from a combination of isolation and the extreme patterns of erosion, drought and flood to which the *chars* are subjected to. Livelihood opportunities are restricted by physical location, weak institutions and a lack of urban centers, meaning that, once living in the *chars*, people have very little access to effective infrastructure and services. As the people and houses are not settled for long time so permanent structure is rarely constructed or installed in the areas. The groundwater table is shallow, soil is fragile in nature and flood is a recurrent phenomena that washes away all the movable properties. The water and sanitation activities need special attention in such hard-to-reach geophysical location.

Like disasters and environmental degradation, climate change is also responsible for the tremendous suffering of the people of the island *chars* of north-west Bangladesh. As an impact of climate change, the hot and dry summer season is becoming prolonged, rate of rainfall is decreasing while frequency of storm is increasing in the area. These storms directly hit the *chars* before hitting the mainland because of their geophysical location. Because of high frequency of

storm and as the *chars* have very short lifetime, there are few big or medium size trees in there. The strong and devastating wind of the storm hits directly and destroys everything including Tubewells and latrines. Every year huge number of Tubewells and latrines are also destroyed by river erosion.

Because of extreme hot weather and less or no rainfall, the rivers become dry and Tubewells become inoperative as groundwater level declines. Scarcity of water becomes a great reality for the *char* inhabitants. People suffer from Jaundice and other skin diseases since they become unable to maintain proper sanitation and correct hygiene behaviour. On the other hand, because of sudden heavy rainfall in the rainy season, *chars* become inundated and disconnected from the mainland. All Tubewells and latrines go under water. Diarrhoea and other water-borne diseases break out because of scarcity of pure water and sanitation facilities. As the water and sanitation crisis continues all around the year 12% population including 26.4% under 5 children become diarrhoea infected once in a while in a year.

*Char* women are the worst sufferers of the climate change related calamities. At the time of heavy rainfall and flood they cannot go to any open place like the male for defecation. On the other hand, in the dry season they have to go a long way to collect water from another place where the Tubewells are in function. Most of the *char* women drink very little water and store it for family members in time of water crisis. As they become bound not to go for defecation because of lack of proper place and water crisis, they suffer from many diseases at the crisis period.

As very few number of government and non-government organizations are working in the *chars* of north-west Bangladesh, recovery activities taken after floods or storm are very little especially for the improvement of water and sanitation facilities. Without having any facilities including water supply and sanitation, people are fighting with both man-made and natural disasters, trying to cope with climate change.

### **3.1.3 Haor Area**

The north-east Bangladesh is characterized by central depressions or basins, known as *haor*. These are very large and deep floodplains with no natural surface drainage. The *haor* floodplain receives large volumes of surface water during the monsoon rains, when water enters into Bangladesh from the hills of India, forming huge lakes or inland seas and flooding large areas with average depth of around 3m. The inundation may last upto seven months in every calendar year. 'A *haor* is a wetland ecosystem in the north-eastern part of Bangladesh which physically is a bowl or saucer shaped shallow depression, also known as a backswamp. In a country where one third of all area can be termed as wetlands, the *haor* basin is an internationally important wetland ecosystem, which is situated in Sunamganj, Habiganj and Moulvibazar districts and Sylhet Sadar upazila, as well as Kishoreganj and Netrokona districts outside the core *haor* area. It is a mosaic of wetland habitats, including rivers, streams and irrigation canals, large areas of seasonally flooded cultivated plains, and hundreds of *haors* and *beels*. This zone contains about 400 *haors* and *beels*, varying in size from a few hectares to several thousand hectares. In Bangladesh, which lies in the floodplain of three great rivers, Bengali language has several terms to differentiate between lakes, including *baor*, *haor*, *jheel* and *beel*. All four are types of similar freshwater wetlands'(Banglapedia).

The core *haor* area, alternatively referred to as the *haor* basin or the Sylhet basin, is estimated to spread over an area between 4,450 kms and 25,000 square kms. The total area of *haor*-type wetland ecosystem in Bangladesh is 80,000 square kms. The *haor* basin is bounded by the hill ranges of India - *Meghalaya* on the north, *Tripura* and *Mizoram* on the south, and *Assam* and *Manipur* on the east. The basin extends north to the foot of the Garo and Khasia Hills, and east along the upper Surma Valley to the Indian border. The Tippera Surface lies directly to the south of the *haor* basin, and is partly low and deltaic and partly higher ground with a piedmont fringe to the east. It includes about 47 major *haors* and some 6,300 *beels* of varying size, of which about 3,500 are permanent and 2,800 are seasonal. In the geological depression of the *haor* basin, subsidence is continuing at an estimated rate of 20 mm per year. In some places it has sunk by around 10m in the last few hundred years. The area, by some experts, is further divided into three zones such as the piedmont area, the floodplain area and the deeply flooded area by standards of morphology and hydrology.

Soil within the same *haor* system can vary in texture, drainage class, fertility, and other parameters. This transition from the most wet to the most dry areas in the floodplains occurs over distances varying from several kilometres to several metres. People live here for generations, building their houses on large earthen mounds that remain above flood levels. Extreme livelihood insecurity is manifested in several ways and is characterized by several causes and effects. Water and sanitation situation is appalling, with little coverage of hygienic latrines and open defecation is still widespread. The settlement pattern in the *haor* areas is clustered because for a long span of time the area remains inundated and after a certain depth soil is rocky in nature. Groundwater supply technology is very hard to make successful and it is not a cost-effective one. Among technologies, Deep Tubewell is operating in the areas. These technologies are costly but feasible and sustainable in *haor* areas. The development organization have been promoting such technologies considering geophysical and hydrological feature.

In the *haor* area, struggle goes on to protect homestead from the sting of water. People strive to safe their habitat with the help of stone and water hyacinth. Day by day the increasing of recurrence of flashfloods in the *haor* area, living conditions of local people are deteriorating as livelihoods, socio-economic institutions and cultural values are demolishing. In this area, daily life is conducted in intimate contact with the surrounding water. Children swim in it, emitting a stream of water from their mouths as they surface. The same ponds and streams are used for garbage disposal, or, when it rains, become a sewer for excreta deposited in surrounding bushes. Dishes and kitchen utensils are washed away on their banks, banks from which bamboo walkways lead to 'hanging latrines'. Economic hardship of the *haor* people dissipates their awareness.

Water logging and river erosion is a very common phenomenon in *haor* area. The *haor* people are burdened with this kind of problems. Their main problem is deplorable state of safe water supply and sanitation. Most of the people usually drink Tubewell water during the dry season. But they use water of adjacent canals and rivers for cooking and other domestic purposes. Streams of water run down along the slope, causing rise in the water level. Sources of safe water go under water. People run here and there in search of safe water. A family has to meet their water thirst with only one pitcher of water. Thus scarcity of safe water causes fatality. Finding no alternative sources almost all the *haor* people drink polluted water of *haor*, moreover they

perform all household tasks with this water. So various water-borne diseases become part of their daily life.

People often face difficulties in case of safe water collection. During dry season the situation becomes worse as mentioned by most of the people living in different types of flood-prone village. Usually, the communication system in the *haor* areas is very bad and it becomes worse in the dry season both in terms of time and cost. Moreover, contaminated water bodies during flood still are an unavoidable part of these localities.

Sanitation system is extremely poor here. Most of the people use unhygienic latrine. With the rise of water level, the hygienic latrines are destroyed. When places are at premium building latrines is out of the question. The people in *haor* area can not afford to build latrines as they buckle under the constant struggle for existence. For this reason hanging latrines are very common in *haor* areas, built very close to the houses. Women especially face problems for this. The whole sanitation system cremated under the strong current of polluted water. There is no engineered Public Health system to hygienically confine the water supply in pipes and faucets, and to remove waste liquid.

### **3.1.4 Drought-prone Area**

Drought is one of the many impacts that climate change has been triggering in Bangladesh. The whole north-western region of the country is hardly hit by draught worsening the prevailing water scarcity situation in the region. Rajshahi division is situated at the northeast of Bangladesh with 54 rivers and its tributaries flowing within this region. The Padma and the Jamuna- two of the major among the country's three major rivers flow downstream from the Himalayas entering Rajshahi. During the late 70s rivers started drying up especially following the Farakka barrage controlling the currents of the mighty Padma river. Later in the eighties, the water table declination accelerated in this region causing to desertification. The situation has since worsened with the impacts of climate change as the increased amount of glacier melting in the Himalayas has turned out the river streams to become narrower with time. Moreover, the increase in temperature during this period also intensified the declination of the water table. Annual rainfall has also significantly decreased in the region. The whole region has been termed as 'drought-prone' by the country's hydrogeologists. The acclamation is made over the scientists' observation of a period of over 30 years. Deteriorating water situation has become one of the major concerns and development issues of the region. The overall WatSan situation has been hard hit with the increasing impacts of climate change in the region.

Generally, rainfall is related to the amount of water vapor in the atmosphere, combined with the upward forcing of the air mass containing that water vapor. If either of these are reduced, the result is a drought. This can be triggered by behaviours which prevent or restrict the developing of thunderstorm activity or rainfall over one certain region. Human activity can directly trigger exacerbating factors such as over farming, excessive irrigation, deforestation, and erosion adversely that impact the ability of the land to capture and hold water. Scientists are arguing that activities resulting in global climate change are expected to trigger droughts. In Bangladesh, Rajshahi division has been seeing these similar geophysical conditions with gradual increase. Extreme weather conditions, sharp declining in ground water table and decreasing rate of rainfall has turned the entire region to be drought-prone.

Rajshahi division has 8 districts namely, Rajshahi, Naogaon, Joypurhat, Natore, Chapai Nawabganj, Pabna and Sirajganj. In comparison to the national safe water average (97.6%), it is quite remarkable in Rajshahi division (99.1%). However the division's hygienic sanitation coverage is found to be still significantly low; among a population of 163 million, the coverage is only 38%. However, the concern in this part of the country is the unavailability of water during a long period of the year which is the drought period. Water can only be extracted through Deep Tubewells that turn out to be insufficient to provide people with even drinking water.

The water system in the region is mostly depended on the rivers. The drying up of the rivers sharply hampered the region's water situation. The Padma, the Jamuna and their dominant tributaries the Mahananda flowing through Chapai Nawabganj & Rajshahi district, the Baral flowing through Rajshahi, Natore & Pabna districts, the Korotoya flowing through Bogra district, the Atrai flowing through Naogaon district are also either dead or have turned into canals. The Baral receives water from the Padma only in the monsoon season. But it maintains its flow throughout the year with local runoff water and water from *Chalan Beel*. Once the country's biggest *beel* (swamp) was situated in this region namely the *Chalan Beel*. The *beel* extends over four adjacent districts, Rajshahi, Pabna, Sirajganj and Natore. During the recent period, its land area (containing water) decreased many thousands kms. from 1,088 sq kms to just 25.9 to 31.08 sq kms in the dry season. In some areas of the Barind Tract, water table has gone down as to 105 feet. The picture is horrifying as according to hydro-geologists water is available only up to 130 feet from the surface. Almost all of the hand pumps (no. 6 pump) and Tara pumps remain inoperative during the long summer season which is the drought period of the year. The noteworthy fact is that this particular period is lingering with each year. Besides quantity, the quality of water also deteriorated with the entrance of arsenic especially in Bagha upazila under Rajshahi district and also in areas of Pabna district.

Recharging of groundwater is essential for the water aquifers. Naturally the rivers contribute to the recharging of groundwater tables. As the rivers in Rajshahi division have dried up to a great extent, they are no longer contributing in the recharging of the groundwater. This has also triggered the desertification of the region. Moreover, the river depth has gone down below the ground water table; as a result, the rivers are instead taking in water from the groundwater aquifer further pushing down the groundwater table.

*Char* lands are also increasing within the Padma and Jamuna river channels as a result of erosion and accretion; *chars* in Bangladesh is considered a 'by-product' of the hydromorphological dynamics of its rivers. Many of the comparatively stable *Chars* turn out to be the habitat of a section of the population living below the poverty line. This *char* life is another aspect of the drought-prone Rajshahi division. The life is extremely hard and uncertain and out of reach from all civil amenities. The *char* people suffer from all kinds of water & air-borne as well as skin diseases. Often these take turn as chronic. The children are the worst victims of these chronic diseases. Lack of safe water, sanitation and health facilities are the main reason behind this situation. Difficult communication worsens the scenario. Again, the island *chars* are found to be flooded more extensively than the attached *chars*. Among the *chars* within different river reaches, those within the Padma are found to be most extensively flooded.

Erosion and flood hazards increase the vulnerabilities of these people. Climate change impacts have further accelerated erosion and floods & flash floods in overall Bangladesh.

Periods of drought can have significant environmental, agricultural, health, economic and social consequences. According to scientists drought can also reduce water quality, because lower water flows reduce dilution of pollutants and increase contamination of remaining water sources. This has already become visible in areas of Rajshahi division where arsenic and iron contamination is increasing (mentioned above). The common consequences of drought such as dust storms due to desertification and erosion, eroding landscapes, less crop growth due to lack of water for irrigation, malnutrition, dehydration, habitat damage etc are now being observed in the drought-prone Rajshahi division as well. Environmental disaster are also becoming evident in this region hit by drought. There has been reports of 5-7 ft deep and half-km long cracks in the ground in Shapahar upazila under Naogaon district. Experts in geology have identified the conditions with environmental disaster in connection to declining of groundwater. Experts fear that the cracks may even lead to land slides and even earthquakes. With 12,000 Deep-set Pumps extracting groundwater everyday for irrigation purpose, the dependency on groundwater is rising with each drought season. The summers are prolonging and each year mercury is rising higher.

Extreme temperature during the summer and winter seasons and the sandiness of the soil due to drying up of rivers have also increased the rate of certain diseases related to safe water, sanitation and hygiene such as diarrhoea, cholera, dysentery, hepatitis, asthma, headache, etc. Number of arsenicosis patients has also increased. Skin diseases have also increased among the people. Hygienic sanitation is severely hampered during the drought period and women are the worst sufferers in these areas also. Lack of sufficient and safe water creates difficulties for the women and adolescent girls to preserve their reproductive health.

The drying rivers have also impacted livelihood of the people as agriculture happens to be the chief occupation of people in this region. Food production is directly related with access to water. As the water table is seriously affected in the region, the impact is high on the food production. The northern part of Bangladesh is known for high production of various types of paddy, grains and vegetables. The cultivation cost is also increasing due to lack of water supply. Excessive use of ground water in irrigation is also contaminating the surface soil level with iron and other chemical materials. Again, some of the region's large scale irrigation projects have stumbled due to the lack of water. Fishery is also hampered due to the water factor. Many fishermen have gave up fishing occupation as a result. There was a time when most of the trading was done through river ways and it was not very long ago. Even in the seventies this was observed. Nowadays the large water vessels cannot move across the narrow water streams. This has also lessened the trade to some extent. For example, once the Mahananda was a wide and deep river allowing big cargo boats of 500 maund capacity (1 maund equals to 37.65 kg) to ply. Significant number of native species of fishes is extinct as a result of environmental disaster caused by drought conditions in the region. Very recently the 'Borendro Bohumukhi Unnayan Prokolpo' has urged the farmers especially in the hard-affected Tanore upazila of Rajshahi district to cultivate crops that can be produced using less water. As the *Boro* crops require more amount of water, it is being discouraged by the officials here. Local farmers are also complaining of some newly emerged diseases attacking the crops which they believe is related with shortfall of rain.

Various negative impacts of climate change triggering untimely and shortfall of rain, drying up of rivers, temperature increase, declining of groundwater table, etc are directly affecting and worsening the WatSan situation in drought-prone Rajshahi division. The entire region which is heavily depended on agro-based economy is facing threat today.

### 3.1.5 Hill Tracts

The Hill Tracts is quite different in terms of geophysical, ethnic people's concentration, livelihood options and cultural diversities from other parts of the country. The Chittagong Hill Tracts is geologically of recent origin comprising old Pleistocene sediment deposits. The general land feature comprises of a series of anticline ridge lying parallel to one another and trending in roughly NW-SE direction. They are composed largely of consolidated sand stone's, sandy shale's and shale's of tertiary geological age. These have been subjected to considerable folding, faulting, tilting and dissection. The ridge crests reach heights of 100-3,000 feet (300-1,000 m) MSL. In the synclines between these main ridges, there are hills of lower height which are below 250 m generally; the height ranges between 42m to 80m and are formed mainly over unconsolidated sandstone of late Tertiary age. Some of these hills are leveled or of rounded summits, but most of them are closely dissected and have sharp ridges. Almost everywhere in the CHT, slope is very steep. Soil patterns often are complex due to rapid changes in the underlying lithology, differences in relief and the varying extent of soil erosion. The most extensive hill soils are brown, loamy and strongly acid, with rapid permeability and low moisture-holding capacity. Except over hard rocks, they are generally deep. Valleys' soils include brown, loamy soils on well-drained terraces, Grey and clays on poor valley-bottom sites. Eleven soil series were identified. One extensive series was divided into deep and shallow phases. Gently, moderately and steeply sloping phases were also identified.

The annual rainfall in the CHT areas ranges from 80 inches (2,000 mm) in the central north to about 150 inches (3,750mm) in the south-eastern border over 80% rainfall occurs between May and September. The pre-monsoon and monsoon rainfall occurs typically in torrent downpours and flash of flood in the valleys. The hilly areas faced scarce of water and it becomes acute in dry winter and summer seasons. The fresh water sources are springs, canal and rain-water for them. The new innovation Spring-water Capping, Dug-wells have become acquainted to the hill dwellers.

The entire CHT areas have typical vegetation and tropical evergreen and deciduous forest. The total area is concentrated with 11 indigenous communities along with Bangali people. The indigenous people traditionally practice *Jhum* cultivation by clearing the natural vegetation and burning it during the dry season. These practices destroy the existing natural vegetation pattern in the reserved forest. By tradition, village Headman allocates land to *Jhum* cultivation. The *Jhum* cultivators do not have own land. Permanently settled cultivators have allotted land in which they have heritable rights but they cannot transfer the land outside their family without government's approval. When population density was lower, the successive cultivation periods were 12 years or longer. Now, with greater pressure on the land, especially following the creation of Kaptai Lake, which submerged most valuable floodplain the period may be less than five years. As a result, the soil fertility is increasing and reversible degradation of the environment is taking place.

The Chittagong Hill Tracts (CHT) still remains in the stage where the WatSan situation is far below than the national average. Over the decades, like many other drawbacks, this part of Bangladesh has been experiencing the scarcity of safe water and lack of sanitation facilities. The people have very limited sources of safe water. The knowledge on proper sanitation and hygiene situation is also very poor. Hence, the health situation in this region is deplorable.

The use of safe water in the CHT is around 43% with higher concentration in the urban areas. Safe water coverage in the rural areas is far lower. The indigenous hilly people in rural areas normally depend on the natural water sources i.e. rivers, canals, hilly holes, lakes and springs for their drinking water. But with time being the population has increased and with the climate change & man-made disturbances to the nature, most of the surface water sources are becoming dryer and contaminated. Nowadays, water scarcity is steadily increasing in the CHT areas. On the otherhand, these people have no idea about the risk of using surface sources untreated. Alongside they have to cross arduous hilly paths walking for miles to reach the sources to collect water for their daily chores. And walking in the hilly roads is immensely difficult. Therefore, the region has been remaining as one of the hard-to-reach area.

The overall sanitation coverage is very vulnerable in the CHT. This backwardness of the CHT is mostly caused by the lack of appropriate (e.g. socio-economic and culturally conducive) and sustainable technical solution regarding sanitation. This has failed due to incompatibility of the induced technical options to the local knowledge, poverty, natural calamities, culture, practices and social beliefs of the CHT communities, water scarcity, communication problem, etc. This has ultimately caused extreme backwardness in sanitation coverage in the region; the sanitation coverage in Khagrachari, Rangamati, and Bandarban is 57%, 54% and 14% respectively which is lower than the national coverage. The percentage of people practicing safe hygiene behaviour, especially washing after defecation is 7% in Rangamati, 2% in Khagrachari and a mere 1% in Bandarban districts.

The indigenous community people of the CHT have never witnessed raising demand for safe water and sanitation facilities. It is because they have fewer ideas on safe water and sanitation, the necessity of those and their rights to safe water and sanitation facilities. Like other areas, government tried to provide safe water options in some areas in the CHT through hand-pumped shallow Tubewells, but adverse rocky ground hindered the process. Later they tried Ring-well in a few localities but improper installation and lack of orientation have left the technology unused. On the other hand, the NGOs those were allowed to anchor their programmes in the CHT after signing the Peace Accord, did not pay due emphasis on addressing WatSan issues in the CHT. NGO Forum has been implementing the programme with a target to support the development of sustainable community-managed and community-owned water and sanitation programmes strengthening the capacity of the local NGOs and member of the community groups in order to provide and maintain safe water supply and sanitation facilities and encourage behavioural change in hygiene practices in the underserved rural area of the CHT.

### 3.1.6 Tea Garden

The tea gardens are regulated by their own regulations and principles. It is sometimes stated that 'tea garden is a state within the state'. The proprietors of the gardens have an association, namely Bangladesh Cha Sangsad (BCS). The Sangsad collectively works for the interest of the garden proprietors. The tea garden workers live in congested colonies ('lines') and are extremely poor. They are detached from the mainstream community. Unprotected Hand Dug-wells are their source of drinking water; tea bushes and plantation fields are their defecating sites. They have some particularly complicated issues to deal with, including the influence of the tea estate administration, as well as some unusual beliefs and practices around water use and sanitation. There are 168 tea gardens in Bangladesh. Tea is cultivated in 7 districts acquiring 115,757 hectares land. Moulvibazar, Sylhet, Hobiganj, Chittagong, Rangamati, Brahmanbaria and Panchagarh are the tea producing districts in Bangladesh. A total of 374,500 people depend on the tea industry. The tea gardens in Bangladesh have two types of management and ownership patterns- Sterling Company and Bangladeshi ownership. The tea garden people are leading their lives in an inhuman condition. They are not fulfilled with their basic needs. They are deprived of safe water, sanitation and hygiene facilities. Due to this it is very often experienced that outbreak of water-borne or diarrhoeal diseases have been the common phenomena in tea garden. The tea garden authorities cannot meet up the need of creating working windows for the increasing population in the tea gardens. The authorities are not keen to meet the labour laws to provide the labourers with proper education, health, water and sanitation facilities. Due to the lack of awareness on safe water, sanitation and required facilities, the people in tea gardens suffer from different water-borne diseases like diarrhoea, dysentery, typhoid, jaundice, etc. Sometimes it turns into serious outbreak of water-borne diseases that tolls a remarkable death every year.

It is found that Well is the major source of drinking water in the tea gardens. There are some Tubewells in some particular tea gardens which are very few in number. These two sources have been becoming inoperative due to the groundwater declining while decrease of rain due to climate change has been significantly contributing to the reduction of tea production. The people in the gardens also use *chhara* water in washing dishes, food stuffs, clothes, cooking and bathing. This source is also drying-up gradually. The garden authorities constructed the Wells or Tubewells for the labourers' families. The Wells were constructed many years ago. These Wells are also getting dry day by day.

Sanitation coverage in the tea gardens is very low. People are habituated to the defecation in jungle, garden or beside the *chharas*. A very few families have latrine facilities. Among the existing facilities, most are unhygienic. Some garden authorities once upon a time constructed latrine facilities for the labourers' families. Those are totally unused and non-functioning now. The tea labourers are not aware about the necessity of safe water and hygienic sanitation facilities. They argue that it goes beyond their capacity to install latrine by their own accord. According to the agreement the garden authorities are responsible for ensuring water supply and sanitation facilities for the labourers' families.

The hygiene situation in the tea gardens is also a matter of great concern. Population is increasing rapidly in the tea gardens. But safe water, hygiene and sanitation facilities are not created to meet up the increasing demand. People are not aware of keeping the houses,

surroundings, water sources, etc clean and tidy. People are habituated to washing their dishes, hands, vegetables in Well or *chhara* water which is not safe. The practice of washing hands properly with soap or ash is not yet established in the gardens among the labourers' families.

The people in the tea gardens are not aware about the linkages between water-borne diseases and the lack of safe water, sanitation and hygiene practices. They do not have clear ideas about the necessity of washing hands properly with soap or ash before eating and after defecation. Due to the circumstances, health situation in the tea gardens is very pitiable. Suffering from diarrhoeal diseases many times a year is the common event in a tea gardens. Every year many people die suffering from these diseases.

## Chapter-4: NGO Forum: An Overview of Actions

Since inception, NGO Forum, as an apex networking & service delivery body of NGOs working in the water and sanitation sector, has been implementing WatSan programmes with objectives to promote hygiene practices & sanitation and safe water use for sound health and sustainable hygiene behavioural change of the rural people in participatory approach. Water supply and sanitation is not core programme of most of the non-government organizations. They implement it as part of their socio-economic development and health programmes. NGO Forum is the only organization in Bangladesh that implement water and sanitation programme through its about 850 local, national and international partner NGOs, community-based organizations (CBOs) and private sector actors of Bangladesh.

The Forum is promoting WatSan facilities and services by making those available, accessible, and acceptable to the people with special focus to the country's hard-to-reach areas – the most potential vulnerable areas as well as people – through its partner organizations. Alongside, it provides management and capacity building support to implementing agencies, capacitate people through orientation & training, experience sharing and different promotional activities. The capacity building and information communication are taken into account considering the geophysical feature and climate change vulnerability issues for taking adaptive initiatives and measures by the community. Climate change is recent phenomena in development sector including water and sanitation. It is presumed that water supply and sanitation would be the worst affected sectors due to climate change impact and vulnerability of people would be mounted in tropical areas like Bangladesh. By taking the issue into mind, NGO Forum has been innovating and promoting alternative WatSan technologies for the hard-to-reach areas.

NGO Forum's goal is to ensure safe water supply and sanitation facilities at the doorsteps of the rural and urban people. It is not only committed to reach the facilities but also to ensure the safe use and sustainability of achievements on hygiene behaviour irrespective of age, sex, and social class. Community participation is very important and determinant factor of sustainability of the WatSan programme and its success as for which it designed its activities in participatory process and implemented programmes in participatory approach. As a result, it has been implementing a comprehensively designed programme on water supply and sanitation that contains integrated support of hardware and software. The design has accommodated the challenges and potential of hard-to-reach areas through involving community people in decision-making process. The Forum has been facilitating the WatSan activities by responding to the national urge and following the *National Policy for Safe Water Supply and Sanitation*.

The participation of stakeholders is an important factor in case of water and sanitation programme because without their active participation the accomplishment as per target and sustainability of accomplishment cannot be ensured. Bearing in mind of this issue, NGO Forum's approach created an opportunity to involve cross-sectional people including the community allies, religious leaders, and elected representatives of local government with the programme fold. It facilitates its partner organizations to implement programmes through community level organization development. It is a process of democratization of development programme implementation at the grassroots, i.e. handing over the responsibilities to the village-based organizations. The village level institution building process is a consequential way to ensure community participation. NGO Forum facilitates the partner organizations to

form committees as the community-based institutions and provide them with necessary promotional programme support that sensitize community people on the issue and help them to develop self-esteem to create demand for safe WatSan facilities.

NGO Forum follows participatory approach and process in programme planning, implementation and monitoring. It facilitates to integrate participatory approach within the partners' implementation process that guide to select underserved or unserved areas. Accordingly, partners conduct baseline survey and based on the findings they select the most unserved or underserved ones for intervention. By considering problems and prospects to implement water supply and sanitation programme, partners prepare a WatSan plan for supporting the respective areas by targeting cent percent coverage within the stipulated time-frame; then support and services are provided to the community people. In case of hard-to-reach areas, appropriate technologies and motivational actions are designed in line with the social, economic and cultural issues of respective communities.

NGO Forum as networking body provides package of activities comprising hardware support and software services that also ensure information sharing through exchange of views with policy-makers at different levels. The approach of providing supports and services are detailed out in the following sections:

#### **4.1 Hardware Support**

NGO Forum provides Hardware Supports consisting of water supply technologies like Deep-set Pump, Shallow Pump, Rain-water Harvesting System, Pond Sand Filter, Arsenic-Iron Removal Plant, Ring-well, etc. All these technologies are not feasible in all areas especially in the hard-to-reach areas. There are some technologies (PSF, and Deep Tubewell) feasible in coastal belt but due to natural disasters like cyclone *Sidr* and *Aila* as a result of climate change it has been found that some modifications like raise of bank of pond and raising platform of Deep Tubewell is required. However, it was found almost all technologies are remaining functional in those areas. Technologies are provided by taking into account of feasibility and successfulness in respective geophysical variations. In the low-water table areas the Deep-set Pump, in the shallow-water table areas No. 6 Tubewell, in the coastal areas Rain-water Harvesting System and Pond Sand Filter have been proven as the effective technologies. The Ring-well, Arsenic-Iron Removal Plants and Arsenic Removal Bucket are the feasible technologies for the rocky soil texture, for areas with iron density in groundwater, and for areas with arsenic contamination in the groundwater table respectively. In response to the demand of people of different geophysical conditions, NGO Forum has been providing these technological supports to the community people through the partner organizations. Alongside the technological supports in water supply sector, the Forum also provides support to the partner organizations to establish and run Village Sanitation Centre (VSC) to reach the low-cost sanitary latrine facilities to the community people. To increase the high quality support and services and higher level of production, private latrine producers are also aided by NGO Forum as its partners who contribute to the sanitation promotion as well as in building capacity of the WatSan private sector.

The technologies provided in different geophysical areas are effectively functioning and people are getting benefit from those technologies. In making technologies climate-resilient and long-

term sustainable, the organization has been taking initiatives for modification of technological options in the respective areas.

## 4.2 Software Services

Software Services are inevitable in changing long traditional behavioural practices. The people have their traditional belief, cultural practice, knowledge and cultural orientation. No behavioural change is possible without the change of people's mind-set. Only Software Services can increase modern knowledge, increase awareness about negative impact on health and hygiene because of the traditional cultural practices and misconceptions, etc. The realization of safe water and hygienic sanitation facilities as an important human need can do optimum behavioural change and have positive impact on the Public Health of people. NGO Forum believes that such realization is possible through raising awareness and building people's capacity. The innovative Software Services package of NGO Forum play effective role to capacitate people and organizations and make them aware of the importance of personal hygiene and proper utilization of WatSan facilities. Software Services are provided to partners for social mobilization, capacity building of community people and staffs of partner organizations. NGO Forum facilitates quality software programmes to mobilize people at various levels including policy-makers, implementers, religious leaders and community people. The Software Services also ensure capacity building of the partner organizations that confirms people's participation and bring water supply and sanitation facilities towards a sustainable stage.

Under the Software Services of the organization the Advocacy & Information Services maintain effective coordination and cooperation among partners and different stakeholders. It formulates sectoral policy environment, need analysis, planning and assessment of status and success in this sector. It maintains collaboration with sectoral and trans-sectoral stakeholders, private sector, opinion leaders and mass media at the national, regional and local levels for smooth operation of the programme and for achieving the target coverage. Alongside, printed and audio-visual media, it also disseminates information through workshop, seminar, symposium and other information services among the target audience ranging from the policy-planners to grassroots civil society. Such information services and exchange of views and learning of actors of the sectors make them updated and create needs among them.

The training is one of the key software components of NGO Forum's action. The training package consists of Human Skill Development and Technical Skill Development courses. The trainings impart to implementers and the community people relevant and appropriate issues. The Human Skill Development trainings are offered to the staffs of partner organizations to improve their basic knowledge and capacity on WatSan programme planning and management, effective communication with different stakeholders and community people, building leaderships, monitoring and evaluation of the programme. This training ultimately strengthens capacity of partners that contribute to increase people's participation in safe and hygienic WatSan promotion. The community people are trained on technical skill development to make them capable and efficient and also to make them technically sound enough to handle the technical issues at the local level. Low-cost Latrine Production, Tubewell Sinking, Caretakers' Training on Tubewell, Arsenic-Iron Removal Plant, Rain-water Harvesting System and Pond Sand Filter are some notable TSD training. The community people become efficient

and capable to create opportunities to involve themselves in income generation. These trainings also ensure people's participation in sanitation materials' production and maintenance of WatSan technologies and finally contributing to poverty alleviation.

Aiming to two broad objectives such as a) capacity building of the partners, and b) capacity building of the community allies, the promotional activities are conducted. The awareness building activities under promotional activity package like Courtyard Meeting, Rally, Miking & Mobile Film-show and Observance of National and International Days, etc are performed in the programme areas. The actions of school sanitation programme build the capacity of local allies and religious leaders through its School WatSan Programme. On the other hand the capacity building of the partners is confirmed through PNGO Staff Orientation, community level WatSan Committee Formation & Orientation, and facilitating effective collaboration with the private sector. Diversified promotional activities lead the water supply and sanitation programme to success by ensuring effective participation of the community people.

The Development Communication Services of NGO Forum develop and distribute various IEC & BCC materials to help promotional activities in participation of community groups. Finally, they get involved in WatSan promotion at the community level. Both printed and audio-visual materials are developed that contribute to transfer knowledge to change attitudes and ensure safe WatSan practices at the grassroots level. BCC materials also help to sensitize the community people towards gender sensitivity and create easy, instant and long-lasting learning for ensuring people's participation in safe water supply, sanitation and hygiene promotion.

Effective coordination and network with the government and NGO sector and trans-sectoral organizations contribute directly or indirectly towards safe WatSan promotion. Under its networking banner NGO Forum maintains collaboration with the United Nations organizations, donors, national and international policy formulating bodies and other sectoral agencies including mass media and policy advocacy organizations. It shares experiences and success of the programme, identified new policy issues, pushes policy-makers to incorporate them in policies and programmes. Through effective networking and collaboration at various levels, NGO Forum ensures community participation which finally creates an opportunity to build awareness for successful implementation. The hardware-software-mix programme support and inter-agency collaboration have enabled NGO Forum to design an appropriate, low-cost, and demand-responsive WatSan programme approach, managed mostly by the community people. The programme itself ensures participation of the community people, and on the other hand, participation of the community leads to a greater success in the line of empowerment of the community people including women, institution building at the grassroots and sustainability of the programme achievements.

## **Chapter-5: WatSan Promotion in Hard-to-Reach Areas**

As an urgent and crucial issue water and sanitation programme got special attention to the Government of Bangladesh and non-government organizations. To respond to the goal, demand and local needs, NGO Forum has always rationalized and operationalized WatSan issues in hard-to-reach areas and has taken special initiatives to ensure the supports and services. Concurrently, it has modified existing technologies, and innovated new technologies that are adaptive to respective areas. It also has adopted new approach and customized actions in regard to respective people, their culture and geophysical context. The ultimate objectives of these actions are to ensure safe water and sanitation to the people, especially to the poor and marginalized of the hard-to-reach areas. The effectiveness and sustainability of those adopted approach and functional status of WatSan technologies have been proven that despite of several and severe natural disasters, the structure and functions of technologies in different geophysical conditions of respective hard-to-reach areas are sustaining even after one decade of installation. The success and its process has been presented in the following sections with contextual analysis followed by actions and achievements.

### **5.1 Context, Actions and Achievements**

One of the great challenges of Bangladesh is to ensure safe drinking and potable water supply throughout the country particularly in different hard-to-reach areas and to the disadvantaged poor communities. The rural people greatly suffer from unavailability of safe drinking water which is more crucial in hard-to-reach areas. The natural calamity, environmental degradation, arsenic contamination in groundwater, saline intrusion both in surface and groundwater in coastal belt, rise of sea level, tidal surge, water-logging, improper solid waste management, depletion of groundwater table, drought, rocky soil condition, flood, surface water pollution and so on are common factors affecting safe water supply. The groundwater constitutes the major source of drinking water but arsenic contamination in groundwater appeared as the grave threat to the safe water supply. Besides, during the dry season the acute shortage of safe water appears as a major problem due to lowering of groundwater table in some areas. During the summer months the groundwater is indiscriminately extracted for irrigation, which makes suction hand pumps inoperable. Thus it appears as an additional problem to the one-third part of the country. Due to appearance of these challenges in the water supply sector the once achieved water supply coverage of 97.5% has been declined to a great extent. Alongside these challenges, unavailability of feasible and affordable water supply technologies have also been a barrier for improving safe water supply situation, especially in hard-to-reach areas. Though the national coverage of water and sanitation seems good but the hard-to-reach areas, especially the potential vulnerable areas of climate change still remain far behind the national coverage. Due to the man-made disasters and climate change these areas are gradually becoming more risky and vulnerable in regard to safe water and sanitation.

Hydro-geologically Bangladesh varies from region to region. In relation to hydro-geological situation Bangladesh can be divided into 4 major hydro-geological areas namely i) Shallow-water Table Area, ii) Low-water Table Area, iii) Coastal Belt, and iv) Hilly Area. These 4 hydro-geological areas have different characteristics in relation to natural soil formation, and, therefore, water supply situation differs from area to area. A large number of people in

Bangladesh depend on Tubewell for withdrawal of groundwater for drinking purpose in Shallow-water Table Areas. Arsenic intrusion alongside excessive iron concentration in shallow aquifer of groundwater beyond permissible limit has created a major setback in safe water coverage. This has been creating a crisis in drinking water supply significantly based on exploiting shallow layer of groundwater. In the dry season a considerable area of the country faces scarcity of groundwater within suction limit as because groundwater has been declining alarmingly in the recent years in Low-water Table Areas. The main cause of lowering of water table is overexploitation of groundwater for irrigation purpose. The manually operated hand pumps become inoperable, and people suffer a lot especially in the dry season. The coastal belt is shallow-water table zone but higher concentration of arsenic and irons in shallow-water table, fresh water is not available there. At the same time hilly areas have scarcity of safe water due to its geophysical condition. By taking into account of these factors alternative actions from the traditional one for drinking water and sanitation are under the process of experiment. Some organizations including NGO Forum for Drinking Water Supply & Sanitation has developed actions and approach for hard-to-reach areas with special attention to water and sanitation technologies. It has achieved a great success in this regard.

Hard-to-reach areas are difficult to access and poor people of those areas have less access to water and sanitation technologies because they are socially disadvantaged, economically marginalized, and educationally backward. The level of knowledge about Public Health and hygiene behaviour is limited. In hard-to-reach areas, the technologies are not easily reachable and cost-effective. However, without external supports and service, the poorest people remained out of reach from these services. NGO Forum's special focus on hard-to-reach areas and disadvantaged people of those areas has ensured water technologies and sanitation facilities in those areas. The areas are potentially the most vulnerable to climate change and sea level rise because poor people of those areas will be the worst affected. By taking into mind of these issues, it has promoted location-specific water and sanitation technologies in respective areas. Those innovative and location specific technologies are effectively functional and meet the needs of community people.

### **5.1.1 WatSan Promotion in Riverine and Off-shore *Chars***

The *char* areas are diverse by its own characteristics. Generally, the *chars* are of two categories such as riverine *chars* and off-shore *chars*. The characteristics of riverine *chars* are quite different from off-shore *chars* in terms of accessibility, communication, nature and dimension of disasters, recurrence and intensity of disasters, etc. Almost all the off-shore *chars* are in coastal belt of Bangladesh and because of geophysical traits, WatSan coverage and its provided technologies are different because of their adaptive nature. The riverine *chars* are in Shallow-water Table Area. As a result, the availability of freshwater in off-shore *chars* is deeper, so installation of technologies for drinking water is costly. However, the condition of riverine *char* is a bit better than that of off-shore *chars*. The water and sanitation coverage of riverine *chars* is comparatively less in *char* areas in comparison to the national coverage but that is found higher than the off-shore *chars*. More than 98% people of riverine *chars* take water from Tubewell but sanitation coverage is not at the expected level. About 40% of the installed Tubewells or on the raised grounds and the remaining 60% are in the low-lying areas submerged by flood water leaving bad odour after water recedes and turning the Tubewell platform into damaged ones in unusable condition. The involvement of local government in the *char* area is marked by the

perception that poor people has been receiving free latrine and other support from other project areas. The safe water sources are available but could not sustain due to river erosion.

## **A Big Push for Healing the Flood Damage**

Shaharvita, a village under Gaibanda district got about 100% coverage of safe drinking water and sanitary latrine with support from NGO Forum's Post Flood Rehabilitation Programme facilitated after the flood 1998.

The village is in the flood-prone *char* area, which becomes flooded almost every year. Akota has been implementing the WatSan programme with assistance from NGO Forum. The village was taken under WatSan Coverage Village programme just after the devastating flood. In the flood of 1998 the whole village went under flood-water and damaged all infrastructure including Tubewell and sanitary latrine. After selection as WatSan Coverage Village, a substantial number of hardware materials were distributed in the village under the Rehabilitation Programme.

Before the planning of WatSan Coverage Village, Akota conducted a baseline survey to assess the then WatSan coverage of the village. The survey data revealed that only 15% households had sanitary latrine and about 90% households were using safe drinking water. Getting support from NGO Forum, Akota distributed all necessary hardware supports to the village. Md. Abul Kashem, Chairman of the VDC said, "Distribution of hardware materials free of cost under the Rehabilitation Programme has extended our responsibility to promote and ensure higher coverage". He added "Now if we fail to ensure hygiene practice after getting all these materials free of cost that would be a shame for us. As a result, we have geared-up continuous monitoring of its use".

Akota has its own programme in Shaharvita village. Around 380 households are involved with the organization's own integrated development programme. 100% of the group members of Akota Samaj Kallyan Sangstha were having sanitary latrine after the Post-flood Rehabilitation Programme. The Village Development Committee of the Shaharvita village had performed very well for cent percent coverage of safe drinking water and coverage of sanitary latrine as means of hygiene practices in the village. In collaboration with the VDC, the Post Flood Rehabilitation Programme played a substantial role to have such tremendous success.

The coverage of safe water in off-shore *chars* is like Chotobaishdia (40.9%), Borobaishdia (22%), and Rangabali (26.5%) respectively. Only 52% of the population of Char Biswas under Galachipa upazila use sanitary latrine. Under this dismal scenario, the health and hygiene problems related to inadequacy of safe water supply and poor sanitation coverage are alarming in the off-shore islands. Consequently, high rate of incidence of diarrhoeal diseases and infant mortality rate are attributed to lack of safe water supply and sanitation practices. Considering this scenario, NGO Forum has been implementing a project on water and sanitation in Patuakhali district. As the traditional water technologies are not effective in these areas so that it has installed Deep Tubewell, Rain-water Harvesting System and sanitation technologies adaptive to these areas. The observation of functional status of technologies in the areas like Char Biswas, Char Kajol or Char Montaj is not very easy task for an outsider. Whatever achievement is made is to be recognized as remarkable success. Because it is not very easy task to implement programme in such inaccessible areas. However, the technologies installed with

support from NGO Forum are functioning properly and huge number of people are at least getting safe water which has reduced miseries of the remote *char* dwellers.

### ***Deep Tubewell Removed Deeper Crisis***

*It was a 8-hour journey from Dhaka to Shakharia, a bus stoppage, 10-kilometers away from Patuakhali. The bus arrived there at 6.30 PM and no public transport was there to reach Golachipa from Shakaria after 6 PM. Though it is a 17-kilometer distance to reach Golachipa but it was not an easy task. A few young people are roaming by motorbikes and talking in local language with passengers who just got down from the bus. A young bike-rider stopped beside me with hard break and asked me, Koi jaiben?(where will you go?). I became afraid of and replied in low tune – Galachipa.*

*A person standing beside said, motor cycle-e choillea jan ektu pore kischu paiben na (Go by motorbike, after a while you will not get any transport to go). I asked, the bike rider, what is the fair? He replied, Tk.200.*

*I settled the fair at Tk. 180 for reaching Golachipa and it took one hour due to bumpy and zig-zag road. The Bike stoped at small bazar – Ramanbad Ghat at 7.30 PM. I paid him the fair. He told, cross the river by boat. I started walking towards the Ghat in the dark, and was getting sounds that someone is uttering get up, get up. I rode on boat. But the boat will not start until 16 passengers hop in. But I made him to start for Tk. 30. The boat started roaming. Just after a while the boat started bumping with the wave. I simply felt that it was a very dangerous river but could not see anything in the dark. Finally, I reached Golachipa by crossing Ramanabad River.*

*I prepared my plan to reach remote ‘chars’ in consultation with Project officer of NGO Forum. Early in the next morning, we started our journey to avail a boat – the only transport to reach Char Biswas from Bodnatoli Ghat – about 15 kms from Golachipa. The engine-driven boat started at 10 am for Char Kajal from Badnatoli Ghat. About 70 passengers were on the boat. A group (about 25) of water gypsy with their small kids, firewood and all belonging were on roof of the boat. I started talking to them. I asked, “where do you defecate?” One women replied, “Nodi-te” (in the river). “Where do you collect drinking water from?” She replied, “Thik nai!” Kokhono nodi thaeke abar kokhono onner kol theke (sometimes from river, and sometimes from the Tubewell nearby, where we set tent).*

*I got afraid as I never crossed a big river like this by such a small boat. The boat started bumping severely. The only sound I was hearing Allah! Allah! .... The gypsy group also was praying to their God. My throat got parched!*

*A local passenger were trying to encourage me by saying his experiences of escaping from boat capsized in the mid-river. After two and half hours of fearful journey in Darchira River crossing Agunkukha point, the boat reached at Char Kajol. Finally we reached to the Deep Tubewell installed at Char Biswas by a motorbike about 18 kilometers away from Char Kajol Ghat.*

*Jalal Hawlader (VDC president), Salim Munshi, Morjina Begum and Sultan Sornamoth (Caretakers) and a huge number of people warmly welcomed us. The expression of gratefulness was reflecting the benefits of the Deep Tubewell they are enjoying now. Marjina Begum (Caretaker of Deep Tubewell) started as sir, “what you have done, my father could do that for me’. We could not think that such safe water is available under the ground. Some people of this village installed Tubewell but water was not drinkable so that those were removed. This Deep Tubewell has removed deep crisis of safe water and also erased the physical difficulties from my life. I had to collect drinking water from three kilometers away. Sometime I could not do it due to sickness. Then we had to take water from the ditch nearby. Now no one thinks about drinking water from ditch or pond. We, 25 households became organized and form a Village Development Committee (VDC) for water and sanitation coverage.” NGO Forum’s representatives visited and selected location for Deep Tubewell installation. Finally, it was installed at the cost of Tk. 60,000. Nine month later we shared 10% of the total cost. Though it was installed for 25 households but more than 100 households collect water from here. The women from three kilometers away also come to collect water from this Deep Tubewell. She added, “I have got training from NGO Forum on repairing and maintenance and they provided a set of apparatus for repairing but it has not been used, because it has not become dysfunctional yet.” Barek Mondol, Taslima, Kushum and others unanimously stated that now none of them are having stomach problem or are affected by diarrhoea which was a regular phenomena in the area. Altaf Dewan, fishermen by profession said, “Earlier we*

used to take water from river and pond nearby the river during fishing. But now we take a pitcher of water from the Tubewell. Other fishing boats also come and collect water from here." NGO Forum has conducted orientation and conducted activities for awareness campaign so that people have installed latrine in their house and use it instead of traditional practice of open defecation. "The Deep Tubewell has erased our anxieties and reduced physical labor,"- said, Taslima a housewife of a adjacent house of the DTW. Finally, thanking them, we started to visit another Raised Deep Tubewell at Chotoshibar Char village under Char Kajol union, about 12 km from Char Biswas. It was another tough journey by motorbike and on foot to reach the village.

On the way, I found that a huge number of people were going from different directions to a house at isolated location, as if they are going to a village fair. I asked a farmer – picking pumpkin from his field – "where are these people going?" He replied, "People who installed Deep Tubewell at Mizanur's house are coming to see it, so they are going there to request them to install Deep Tubewell in their area."

Finally, we reached at the house of Mizanur Rahaman and Jarena Begum, where the Deep Tubewell has been installed. I became astonished! In fact it was a public gathering. I asked them, "Who told you to come here?" They replied, "No one! We have just heard that you are coming. So we are here to request you to install Deep Tubewell in our area."

They said, "Safe water crisis is too grave here. So people from about 3 kms collect water from this Tubewell." Jarena Begum said, "I had the same problem as these people are facing for safe water. I had to collect water from 2 kms distance. It was too tough to collect water in rainy season. Sometimes I had to cross chest-height water to reach to the safe water source. Now the people nearby households need not to do that. When women from far distance come to collect water, I can feel the pain because I faced the same before couple of months. This Deep Tubewell has reduced physical labour and mental anxiety of the women" – she added.

## 5.1.2 WatSan Promotion in Haors

Bangladesh has several difficult and hard-to-reach geophysical locations like the *haor* area. For the promotion of sustainable Public Health situation in this hard-to-reach area, NGO Forum upholds a special commitment to ensure these disadvantaged people's right to safe water supply, environmental sanitation and hygiene habits combating the challenges of climate change. As the *haor* basin is submerged by water for 5-6 months in a year, NGO Forum tried lots of technologies in this area but, the raised Deep Tubewell is the best adaptive option for this *haor* basin. On way to reach this goal NGO Forum has been running an advocacy campaign in *haor* areas on searching the Ways for Safe Water and Sanitation Facilities for the Hard-to-Reach. NGO Forum doing awareness raising on relevant issues at all levels according to the geophysical conditions of the *haor* area. NGO Forum also developed the sense of ownership of community latrine which will help to manage the cleanliness of these latrines in proper manner.

The *haor* areas generally remain inundated almost half of the year. The impact of climate change intensity flood that contaminate drinking water sources. Alongside, sanitation coverage also decreased often. Deep Tubewell, canal (*khal*), pond and river are the main sources of water for the purpose of household use. About 99% people depend on shallow Tubewell for drinking water. Of the total households, 62% uses for cooking and 61% for other activities from this source while rest of the people use river, pond or canal water for cooking and domestic purposes. In most of the year flood water inundates Tubewells and sometimes they are washed away that cause drinking water scarcity. The geophysical condition for about 5-6 months the area remains inundated, so people are compelled to drink contaminated water which lead to water-borne diseases. In the rainy season Tubewell sinks and in dry season the groundwater level decreases. So 73% of the people do not get safe drinking water. The sanitation coverage is

also comparatively poor in *haor* areas. About 67% people have sanitation facilities of which maximum are unhygienic latrines and about 25% people have minimum idea about safe sanitation practices. Recurrent and intensive flood, rise of water level, excess and erratic rainfall, limp soil caused for filled in latrine and damage sanitation system. NGO Forum has provided and installed Deep Tubewell in *haor* areas. Despite of several difficulties, wherever it has been available people are using safe water from those sources. In addition, it has conducted several motivational activities and facilitated software services which tremendously impacted in changing the traditional knowledge, behaviour and practices. The School WatSan Programme in Dirai upazila under Sunamganj is one of the remarkable actions where students have been transformed as change agent. The active participation and actions contributed to change the hygiene practice of their parents and community people as well.

## Kids Teaches the Community

Rina Rani, a 10-year old girl said, “We teach our parents and elders of neighbouring households what we learnt from the schools.” It has been found that the entire students are very spontaneous and lively in the sessions. Mrinal Kanti, a student of class five of only registered primary school as well as Child Forum member reported, “Now a days we know what is good health, what to eat and what to avoid, what practices and behaviour need to be changed.” He also added, “We know the need of practices that protect us from various kinds of water-borne and other diseases.”

Naba Krishna a class four student said, “If anybody do not wash hands before taking meal and after defecation, do not put sandal while using latrine they higher the chances to be attacked by water-borne diseases. So we asked them to use sandal during defecation. If anybody did not wash hands after defecation and before taking meal then we explained the negative and bad effects of those activities and practices and request them not to do any wrong things that might be harmful for themselves.”

There are few hanging latrines in the village which is polluting the water where the villagers generally take bath and wash household utensils, which is dangerous for health. But people are not able to replace those few latrines due to financial crisis. “Amrar dan dubi gachune- rujgar nai” -the crop has been damaged due to early flash flood, which damaged maximum crops and bringing the miseries in the family. A little girl said, “Amrar gayan thaleio Khaitee parina.” Though we have knowledge but could not intake those fruits and vegetables because their parents could not afford to buy those things due to financial crisis. They also mentioned that several issues like personal health care, family level health care, safe sanitation and safe water, food nutrition, etc have made us to understand the importance of hygiene practice. Health and nutritional message have already reached to those minor kids and even they are practicing it in their own life.

“The most important thing is that those kids are sharing information with the community people and children of their age, which is having a positive impact on the community people. After the sessions those kids have become doctor of the village,” said an old man in the village. The school programme is an important and effective activity to give message at the community level through them, because those kids are providing message to different sections of the community. Finally the success is in such a remote and isolated area like the Gazirgaon village under Rafinagar union of Derai upazila, Sunamganj where integration of health and hygiene message has been reached properly and is being effectively practiced by these people.

### 5.1.3 WatSan Promotion in Coastal Belt

The coastal areas are most vulnerable due to natural disasters and climate change vulnerability. Ensuring sustainability of WatSan technologies are quite difficult in coastal belt because recurrent cyclone, sea wave, flood, groundwater contamination of arsenic, high concentration of iron in water and salinity is the main feature. Drinking water supply in coastal belt is always under threat. However, taking into consideration the hazardous scenario of water supply and sanitation in coastal area, NGO Forum has been playing an important role by operating water supply programme in the hard-to-reach areas with a view to improve the Public Health situation and to combat climate change challenges. Also NGO Forum, being an apex networking and service delivery agency of NGOs, CBOs and private sector operators, has been engaged in implementation of water supply, environmental sanitation and hygiene promotion programmes at the coastal areas of Bangladesh. With a view to promoting the water supply situation, the Forum has been rendering an integrated hardware and software services. The Forum facilitates the programme making its partner NGOs capable regarding WatSan programme operation and management through enhancing capacity by providing them with hardware and software supports. As a result, the coastal people have been able to overcome the adverse situation to some extent after two devastating natural calamities like *Sidr* and *Aila*. The water technologies and sanitary latrines had been damaged but people of hard-to-reach areas were able to restore their water technologies in Sathkira, Khulna and Bagerhat areas.

NGO Forum from its long experiences in the WatSan sector realizes that without providing appropriate hardware support to the community people particularly to the poor and disadvantaged section, changing of the existing water supply scenario of the country is quite difficult. NGO Forum has been promoting water supply situation of the coastal areas as well as innovating different water supply options that are affordable, compatible and feasible to geophysical conditions of the coastal areas. As a part of it different water supply options are being promoted i.e. low-cost Rain-water Harvesting System, Pond Sand Filter, Arsenic-iron Removal Plant, Deep Tubewell, etc in different parts of the coastal belt.

Through delineation of both hardware and software services NGO Forum inspires and encourages its partner NGOs to replicate the best experiences of WatSan programme to contribute to the improvement of the national WatSan situation. At this end a number of partner NGOs have become capable as well as replicating the best experiences in terms of safe WatSan promotion in their working areas successfully. With support from NGO Forum different partners have been replicating their experiences in setting up of rain-water harvesting at different hard-to-reach locations in the coastal belt and stepping ahead towards sustainability to develop climate change resilient WatSan technologies.

The concentration of dissolved minerals in groundwater is higher than that in surface water of coastal area. The coastal belt is identified as problematic area due to complex hydro-geological conditions and adverse water quality. It makes water supply difficult in the area. People of the area depend on conventional water option-Tubewell, which is not operable due to excessive salinity and also arsenic in groundwater. Many other water options also are not feasible in this area. As a consequence, people have been suffering from drinking water crisis. The water and sanitation scenario in coastal areas is still far behind in comparison to other parts of the country. In dry time 87% of total population drinks water from Deep Tubewell and in rainy season the

ratio is decreased to 80%. For safe drinking water 65% of the total population collects water from about 50 meter distance. Similarly, 50% of the total population uses latrines, in which 20% uses hygienic latrines. In the coastal areas only 13% people uses hygienic latrines, while about 89% of wage labourers are used to open defecation. It indicates that poor and marginalized people are still remaining far behind in access to and use of safe water supply and sanitation. As the poor people are the worse victims of climate change impact so it has appeared to be a challenging task for both government and non-government organizations to bring them under water and sanitation coverage.

People's mobilization and participation in the coastal belt to implement suitable WatSan technology were found enthusiastic. The people of the coastal belt help development agencies to formulate alternative technologies and suitable options as well. As both ground and surface water is contaminated by salinity intrusion and iron, so some alternative technologies like PSF, household based RWHS and community-based RWHS are appropriate for those areas. The community people of coastal belt area actively participated in planning, site selection, installation and supervising of the alternative technologies for making it sustainable. With the help of the local people, different partner organizations installed appropriate technologies at the local level. Due to poor socio-economic condition and difficult geophysical condition, some people could not share the cost of the technologies, but they gave labour and moral support. After installing the technologies, the local people have been maintaining it in a sustainable manner.

**Pond Sand Filter (PSF):** The groundwater sources are not effective in the coastal belt of Bangladesh so that people had to depend on open water. Open water sources are also not safe because of excessive salinity in open water except some closed ponds. People of the coastal belt are mostly depended on pond water and now markably on PSFs for drinking water. This technology had been introduced in Bangladesh in the sixties. But then it was only an experimental effort. Just after liberation, a PSF was set-up on the bank of a pond near a market at Patharghata of Barguna district. It became quite popular among the local people. It was not possible to take widespread efforts to set-up more Pond Sand Filters throughout the coastal belt. But it was not due to the unwillingness of the concerned persons. Actually, a reserved water reservoir is essential to set-up a PSF. This pond has to be used exclusively for water supply purpose. Even if fishes are allowed in the pond, they will not be allowed any artificial food. Moreover, the construction cost of this Filter is a bit high. On the other hand, one such filter has the large capacity to supply water for at least one hundred families. Because of the limitations it is still not possible to reach this facility to the coastal people at a widespread level. The technology of the PSF is simple. The tank has three layers. Pond water should be raised to the tank with the help of a pump or Tubewell. The uppermost layer contains large chips of brick or coir which will remove large particles of dirt from the water. Then the water will be accumulated in the mid-layer. Here small chips of brick and sand will finally purify the water and at the bottom layer pure water will be available for use through a tap. The cover of the tank is made of corrugated tin. In the mean time research has been carried out to examine the quality of the filtered water. Researchers have found it to be 100% safe for drinking. Considering the required parameters, it has been decided to use this technology only in the coastal region. Because in many areas of the coastal belt it is not possible to pump water from underground through deep or shallow Tubewells. Especially in these areas, Pond Sand Filter has been used to purify pond-water.

However the present arsenic crisis in Tubewell water in many areas has led to the thought of using this technology countrywide.

It was observed that existing PSFs have stereotype design with two taps only and much lower capacity than the amount of water that could be yielded from the source pond. The demand of drinking water is often more in the catchment areas compared to the amount of water available through these PSFs. As a result, women and girls have to wait in queue to fetch water. Promotion of the newly modified PSFs by NGO Forum has been contributing to optimal utilization of scarce resource i.e. safe water, in the coastal belt and helping address gender issues through saving time and efforts of women and girls for water fetching. It is found that the community people are benefited from these technologies. The community people express their satisfaction with this technology because it is a more sustainable source for them. Some of the PSFs were installed more than one decade ago which are still effectively functioning at the coastal belt. In some cases, the community people have raised the embankment of pond where the PSF is installed through their own initiatives to protect saline water intrusion into the pond. The community initiatives and supports of NGO Forum together have made the technology successful, especially in the remote pockets of coastal belt. Considering the geophysical condition and context of natural disasters in coastal belt, PSF is proved climate change adaptive water technology.

### **PSF Turns Pond-Water into Safely Useable**

Pond-sand Filter (PSF) at the Jalekhali village under Munsiganj union has become a life saving technology to the villagers. It was placed on the bank of the pond owned by Narayan Chandra. About 300 households of the village take water for drinking and cooking from the PSF. Narayan's family and the neighbors are very happy getting this PSF in their village. The groundwater technologies are not feasible at the coastal area due to salinity. Though groundwater table is shallow but the water is brackish and undrinkable. So the villagers take surface water from ponds for drinking, cooking and all other household uses. A couple of years back they had to take clay mixed water from the pond and boil it for making the water safe to drink. It cost much time, labour, and fuel for every family. The PSF, being installed in 1997 has reduced these, specially the workload of women of the village.

The water of the PSF is quite good, it has less sediment and other contents. The owner of the pond has also taken some measures as advised by the Forum's partner organization

SETU who implemented the PSF. "We do not take bath in the pond and do not allow people to wash cloth, cattle, and household tools in the pond", said Narayan Chandra. The bank of the pond is regularly repaired, so that the rain-water can not flow into the pond. So, the quality of water in the pond improved to a significant extent.

Narayan takes care of the Plant regularly. He cleans the stone and sands in the filter regularly, at least once in every month. So they are quite happy with the quality water from the PSF. In the rainy season, there is enough water in the pond and people can collect sufficient water from the PSF. But in the dry season, when water level in the pond goes down, it sometimes becomes a problem to get enough clean water from this PSF.

They had great problem before having the PSF for procuring safe drinking water. There had been no good sources of safe water in this locality. tubewells do not work in the village because of high concentration of salinity and iron in the groundwater. So, people used to collect pond water that caused spreading of many water-borne diseases. Every year many people were affected and some of them died specially of diarrhoea. Now, the frequency and intensity of diseases like diarrhoea and dysentery has been reduced significantly and village doctors are losing their business. “My son is losing his job (village doctor) because there is no diarrhoea”, said an old woman.

Ashok Kumar Mondal, a villager stated, “The Pond-sand Filter has changed the situation of the village. But only one PSF cannot meet up the demand of the villagers. Though NGO Forum expects that all people will use safe water for all purposes but it is not possible to do so due to severe water crisis in this locality”. All the participants opined that they need more PSF in the village for safe water and safe life.

**Rain-water Harvesting System:** Rain-water Harvesting System (RWHS) is a potential water supply option in the acute Arsenic and salinity affected areas of Bangladesh. Crisis in supply of safe drinking water due to increasing trend of arsenic and other contaminants in groundwater, uses of RWHS is on rise in different parts of Bangladesh. A major change in water quality between rain-water and mostly used groundwater is that of iron, manganese and hardness concentration. The problems associated with high iron and hardness in groundwater is not present in rain-water, which increases the acceptability of rain-water among users. Bangladesh is the country of moderate rainfall zone. Annual rainfall in Bangladesh is 2400 mm. Rainfall intensity is less in the northern parts of Bangladesh and high in the north-eastern parts. About 85% of the total annual rainfall occurred in month of June to September. So it is important to design the storage tank for harvesting rain water to meet the demand of the users for all the year round. But generally water can be stored and used for maximum 10 months. Different models of RWHS is designed and implemented in Bangladesh like, Ferro-Cement Tank, Ferro-Cement Jar, Brick tank, RCC Ring Tank, Do it yourself (Earthen Motka). Sometimes reservoir or storage tank is constructed below the ground level and a hand pump is attached with it for withdrawal of water. This model is called subsurface tank and it is for community based RWHS. There are different sizes of RWHS depending on the number of users and their demand pattern and availability of rain-water. Common sizes of RWHS implemented in Bangladesh are from 500 to 3200 liter for household use and 10,000 to 50,000 liter for community use.

### ***Low-cost Rain-water Harvesting System***

*Low-cost Rain-water Harvesting System (RWHS) is a potential water supply option in the acute arsenic and salinity affected coastal areas of Bangladesh. Crisis in supply of safe drinking water due to increasing trend of arsenic and other contaminants in groundwater, uses of RWHS is on rise in different parts of Bangladesh. Rain-water quality is good. A major change in water quality between rain-water and previously used groundwater is that of iron, manganese and hardness concentration. The problems associated with high iron and hardness in groundwater is not present in rain-water, which increases the acceptability of rain-water among users. A common concern about absence of fluoride in rain-water and consequent dental health problem is often raised. However, it can be noted that fluoride is also very less than acceptable value of 1.0 mg/L in Tubewell waters in most parts of the country. pH of rain-water is comparatively alkaline range. Other constituents like Fe, Mg, Ca, Zn, Pb, etc are much below than the acceptable limit. Sometimes Zn and Pb concentration increase due to the galvanized roof CI sheet of*

*the catchment of the collection system but the value is within the acceptable limit. Bangladesh is the country of moderate rainfall zone. Annual rainfall in Bangladesh is 2400 mm. Rainfall intensity is less in the northern parts of Bangladesh and high in the north-eastern parts. About 85% of the total annual rainfall occurred in month of June to September. So it is important to design the storage tank for harvesting rain-water to meet the demand of the users for all the year round. But generally water can be stored and used for maximum 10 months. Different models of RWHS are designed and implemented in Bangladesh like, Ferro-Cement Tank, Ferro-Cement Jar, Brick tank, RCC Ring Tank, etc. Sometimes reservoir or storage tank is constructed below the ground level and a hand pump is attached with it for withdrawal of water. This model is called subsurface tank and it is for community-based RWHS. There are different sizes of RWHS depending on the number of users and their demand pattern and availability of rain-water. Common sizes of RWHS implemented by NGO Forum in Bangladesh are from 500 to 3200 liter for household use and 10,000 to 50,000 liter for community use. Cost of a household based RWHS of 3200 L size is approximately Tk. 20,000 and community based RWHS of 10,000 liter capacity is approximately Tk. 60,000.*

Rain-water harvesting offers a good arsenic free alternative drinking water source. A set of criteria is considered for the selection of appropriate design of RWHS that can provide a suitable, safe, socially acceptable, affordable and sustainable alternative source of water for drinking and cooking. Rainfall quantity and pattern are two important factors for designing RWHS, as this influence in the capacity of storage reservoir. The total amount of water available to the consumer is a product of the total available rainfall and the collection surface area. The climatic conditions vary widely throughout the country. The average annual rainfall amount and pattern shows, the amount of rainfall that could be harvested is mainly occurred from April to October all over Bangladesh. Another important factor is per capita consumption. It is considered 6 lpcd for drinking and cooking which is most acceptable per capita consumption in rural areas of Bangladesh.

Usually after a disaster in the coastal areas, water is transported by tankers or trucks and tanks along the roadside, accessible by the affected people, are filled in. It is observed that water thus delivered is accessible to those living nearby while people in distant places have to collect it by traveling by foot or boat. Often people in remote pockets do not get adequate water. Promotion of such models can be used to access households at remote and isolated places during and after disaster. The RWHS is effective in all hard-to-reach areas including, *haor*, hill tracts and coastal belt of Bangladesh.

The coastal belt faces severe water crisis due to saline intrusions in the freshwater aquifers. Collecting rain-water during the monsoon and saving it for use throughout the dry season appear to be a blessing of the God to the people who had been badly suffered by the lack of sweet drinking water.

### ***Relying on Rain Drops***

*“All the members of our family now get safe water for drinking purpose from our own Rain-water Harvesting System,” says Md. Younus Ali Sarder (50), a resident of Gumantoli village of Iswaripur union under Shyamnagar upazila of Satkhira district. Younus Ali has installed the Rain-water Harvesting System at a corner of his home yard with the technical support of Nakshi Kantha. Md. Younus explains, “For many years we have been suffering from drinking water crisis very seriously. Every moment we need safe water to drink but we do not get it always. We were looking for ways to get rid of this problem at the earliest possible time. We have got this technology as a blessing”.*

*Before installation of the Rain-water Harvesting System Younus Ali's family members were using water collecting from a Pond Sand Filter which is more than 2 kms away from his house. He expresses, "Due to unavailability of the water sources nearby our house my family members had to walk 5 kms on an average per day and had to spend a lot of time for fetching water for drinking purpose. But now we have the water point at our hands at any time".*

*Shuprova Karmakar, a 50-year old woman of Iswaripur village in Iswaripur union, states, "The water supply scenario of the area is worse because there are no adequate water supply sources. The mostly used Tubewell- water is highly concentrated with iron and salinity. There are no adequate neat, clean and hygienically protected ponds to be used for drinking purpose." She adds, "Now we are using drinking water from our own Rain-water Harvesting System that has been installed with the technical help of the Nakshi Kantha".*

*The users of the Systems and the community people now have the positive impression and experience about the water quality of Rain-water Harvesting System. According to the users the water of the System is clear and pure. The water is bacteria-free since the System is air protected. Md. Younus discloses, "For a long time whenever I had opportunity to drink water from this System from my neighbours, I found the water having good taste as well as germ-free. Therefore, I had no doubt about the water quality of the System." In fact the community people are now aware of the advantages of the System and its water quality as a result of promotional activities implemented at the community level by the Nakshi Kantha.*

*The users of the Rain-water Harvesting System know the process of harvesting and storing rain-water in a hygienic way. The users have been provided with expertise on proper operation and maintenance of the System. "When rainfall starts we wait up to 10 to 15 minutes to let the roof top clean by rain-water. Then we start harvesting," some of the users explain. They add, "We clean the Rain-water Harvesting System once a year. We do it at the very beginning of rainy season." Now the users trust that rain-water has become an inseparable part of their life.*

NGO Forum provided the Rain-water Harvesting support and services to different coastal areas like Teknaf, Hatia, Swandip, Kutubdia and other adjacent *chars* under Noakhali, Cox's Bazar, Feni and Chittangong districts. NGO Forum-provided technologies are found functional even after one decade of installation. Mathabanga village of Teknaf is such a village where it implemented its programme in 2002. The water technologies are still functioning even after numbers of natural disasters struck over the last one decade.

### ***Rain-water Redeems Khadiza's Plight***

*The Rain-water Harvesting System installed at her homeyard has made the life of Khadiza Begum (33), much more easier and full of relief and reliability. Khadiza lives in Mathabanga under Baharchhara union of Teknaf, Cox's Bazar. She says, "I found an immense change in the village in respect to the water supply and sanitation coverage. Even two years back I did not know whether rain-water is drinkable or not, but now I know if a person gets proper information and knowledge about anything they can achieve it. The people had traditional practices of drinking spring water though most of the time it had been collected from unsafe and dirty places. Before getting this technology we had a Dug-well that provided water during rainy season, in dry seasons we had to collect water from the spring. Before setting up the Rain-water Harvesting System in my house I had to go to collect water from the spring of the hill, which needed at least 1.5 hours. To reach the source of water I had to go to the hill following the canal through the jungle where there was always the risk of snake and many other wild animals. Not only that it was a very much laborous job for a woman. I could not go alone for water collection and had to call other neighbouring women to accompany me. Since many of us collected water together, it made the water sources diluted and filling the water pot was time consuming. But now I am free of the risk and extra labour. I have got the information and also training on maintenance of the RWHS. Now it is very easy to maintain it and I am taking care of it".*

*Khadiza says that to get the Rain-water Harvesting System they had to go through a process. Her husband participated in the VDC meetings and felt enthusiasm about the water technology. He applied for Rain-water*

*Harvesting System for his own. The Village Development Committee and SHED personnel approved it and sent that to NGO Forum office. The RWHS was constructed under the supervision of the partner organization. She had to share Tk. 1,800 from the total cost. However, after the installation of the System the engineer has trained her on its maintenance both theoretically and practically and also has given her a tool box and manual for taking care of the system.*

*Now she is maintaining the RWHS and expresses her satisfaction that in this remote village getting such a technology is a grace of God, which has been made successful with an effort of NGO Forum and especially the VDC members. It has reduced health care costs and many other drazary. It has also reduced the risk of collecting water from spring at the hill top and saved time for this purpose. The cost for maintenance is insignificant and required materials are available. Khadiza adds, "I clean it every two months that requires some bleaching powder, and physical labour. The 3,200 liters of water from this technology have been serving my eight member-family for six months for drinking and cooking. Sometimes neighbours also collect water from my plant when they fail to collect water from other sources. This technology has given me relief from hardworking so I use and maintain it with care and sincerity".*

**Iron Removal Plant:** The struggle for safe drinking water is a grim fact for the coastal people. There was a time when people drank water from reserved ponds without knowing how harmful it was for their health. Pond-water served for all the purposes like household uses or cooking or drinking. As a result, diarrhoea and other water-borne diseases were their never-parting companions. But a new approach has been started in the drinking water supply sector since the sixties. Tubewell installation was started to raise water from underground. But this work becomes difficult and at some places impossible in the coastal areas because of the geophysical characteristics of the area. Not only that, the Tubewells which have already been installed in these areas, create a new crisis—the presence of too much iron in their water makes it undrinkable. Different types of intestinal disease are the results of drinking the water with too much iron throughout the coastal areas.

Although Deep Tubewells have been installed at places to raise water with tolerable limit of iron and salinity, but it is not being possible throughout the entire coastal areas. This fact leads to new thoughts and researches to make water iron-free. As a result, a local technology has been invented to remove iron from water. This success has not been achieved since long. By now a markable number of Iron Removal Plants have been installed by NGO Forum in different parts of the country, especially in the coastal belt. This plant is made of bricks and ferocement and has been installed near a shallow Tubewell. A pipe connects the tank with the Tubewell. The tank has a CI sheet cover. It has three chambers. The water comes directly from the Tubewell to be accumulated in the upper-chamber. The middle-chamber contains brick-chips to make the water iron-free. Water passes from the upper layer through the mid-layer and iron-free water is accumulated in the lower-chamber.

### ***IRP Makes the Hand Pump Usable***

*Iron in groundwater, especially in Tubewell water, is the common phenomena in almost all parts of Bangladesh. It turns water into a very rough form and creates some reddish spots on teeth, nails, and this is why people are not much interested to use iron concentrated water though it is not harmful for health. The Iron Removal Plant could play substantial role to address such problems. The beneficiaries are getting optimum benefit, though the IRP has been installed only in some specific places of the country. "The water of the Iron Removal Plant (IRP) is benefiting the users in many ways; color of clothes remains as it is, needs less soap for washing clothes, improves the color of boiled rice, decreases digestion problem and finally gives the advantage of fresh bathing," said Sabita Biswas of Lalchandpur village under Tala thana of Satkhira district. The IRP has been installed by SETU at the household*

premises of Sabita Biswas. Sabita has an 8-member family. Sabita's family and some of her neighbours use water from the IRP for drinking and cooking. SETU provided them the IRP taking 25% cost of the technology. Sabita disclosed, "This Tubewell was almost out of use because of excessive iron problem. The integration of the IRP has opened the scope to use this Tubewell-water for all purposes." An aged woman said, "My house is far from the plant, so I only take drinking water from it." She also expressed, "I had chronic dysentery but after taking drinking water from the Plant, I do not have suffering any more."

Ms. Parul Roy (55) another beneficiary of the IRP said, "I put on white clothes that became reddish in color after washing 2 to 3 times with Tubewell water. Then an extra clothes (shari) was needed to visit the kin's or neighbour's house. But after installation of the IRP the color does not change and no extra saree is required". To remove the iron from the water it needs some time. People have to pull out the water from the Tubewell to the iron-removing reservoir, then after removing iron water is deposited into a tank. Then people collect water from the Plant.

"All the people who use the water from the Plant are getting benefit from the IRP but some of us need awareness about its use and taking care", said Purnima Roy of Lalchandpur village. She also added that this technology benefited the women by reducing their work-load. The promotional activities might be effective measures for making this technology popular in most parts of the country, especially in the coastal area.

The coastal areas have been facing various natural disasters for which NGO Forum also implemented disaster response programme in the areas of water and sanitation. After the natural disasters including *Sidr* and *Aila*, NGO Forum also conducted several programme to meet the crying needs of safe drinking water and sanitation in the respective areas.

**Renovation of Ponds:** All the sweet water ponds within the coastal belt that are the only source of water for drinking and cooking were submerged with extensive saline water from tidal surges caused by natural disasters like cyclone *Aila*. The ponds and other isolated surface water sources were polluted due to contamination of floating animal's dead bodies and different wastes. The submerged ponds were dewatered and re-excavated along with the completion of construction of the embankment surrounding the ponds while the *Aila* survivors significantly benefited.

*Installation of new latrine for hardcore poor:* Thousands of latrines were fully damaged by the devastating cyclone *Sidr* and *Aila*. In case of the fully damaged latrines, the super and substructures were fully damaged and washed away and it was not possible to repair those without any external assistance. Most of the people suffered by the cyclones were not in position to construct a new latrine by their own since they lost almost all their assets. There was a possibility of using unhygienic latrine or open defecation by the community people if they were not supported for rehabilitation. To overcome this devastating situation, latrines were installed with RCC slabs and 5 rings along with superstructure made with locally available materials like bamboo pole and bamboo fencing. Most of the latrines were constructed with the height of 273 feet considering the last tidal water.

### ***PSF Purifies the Padmapukur***

"This PSF water is not only saving the life of these villagers, but also the life of this union", said Mizanur Rahman. Indeed, the PSF of the Joykha village at Soniltola union of Mongla upazila is saving the life of surrounding villagers. "We were used to drink pond-water directly. We felt discomfort in stomach which is no more after starting

*drinking the PSF water. So, I collect water from one and a half mile distance now”, says Anima Mondol. People of this region doubted how it would be possible to purify water with mere brick-chips and sand.*

*There is a Pond Sand Filter in Joykha village in Soniltola union at Mongla upazila of Bagerhat district. It has been implemented by the local NGO SHEBA in partnership with NGO Forum. Because Tubewell-water is undrinkable for excessive salinity and iron. Also due to climate change the salinity intrusion occur and the surface water and groundwater has been contaminated by salinity. Also the cyclone Aila contaminated all surface water ponds. This is the only pond in this area called as Padmapukur that has been serving as the water source for the people of this region. Saline water intrusion has been taken place in this area. About 15-20 years back the river-water was quite non-saline during the monsoon. But due to climate change the dry season has been extended and salinity intrusion has also taken place. Cyclone Aila also affected the Tubewell and surface water. Moreover, cooking rice was difficult with the Tubewell water. Therefore, the PSF technology has given them access to more safety and convenience. The PSF spot has become a meeting place of the surrounding people.*

**Disaster-resilient Pond:** During disaster brackish water of high tidal surge enters into freshwater ponds rendering these unusable for consumption. A durable solution to the problem has experimented by NGO Forum. Embankments of the ponds are raised to a height above the highest tidal surge and a guide wall with a turf-topped wide passage is erected around the pond as a protection measure ensuring adequate compaction of the bank.

**Elevated Pond Sand Filter (PSF):** After the cyclone *Aila* many Pond Sand Filters (PSFs) were partially or completely damaged by the tidal surge. It was therefore important to make structural modification of existing PSFs to ensure supply of safe water in the region after such disasters. The platform and bed of existing PSFs were raised to a safe height above the level of probable tidal surge to prevent brackish water from entering into the structure during disaster. The adjacent banks of the pond were also elevated to strengthen source and facility. Adaptation of such model could turn many existing PSFs including freshwater ponds into sustainable sources of water during and after disasters.

## ***The Pond-water to Drink***

*“Drinking water is the most emergent issue in our area” said Latif Mondol. “Water, water, everywhere, Nor any drop to drink”- the story words have become true in the coastal islands. Groundwater as well as surface water in the pond is saline water. But Pond Sand Filter (PSF) at the Banishanta village under Banishanta union has become a life saving technology to the villagers. It was placed on the bank of the pond owned by the Union Parishad. Other ponds around are saline. Even the government installed Tubewell was not working there. Two person namely Shekhar Mishtri and Jaba Barman is responsible for maintenance of the PSF set-up by NGO Forum. Numerous households under the village Banishanta, Laudob, Bajua, Chila, Chandpai, of the union and people from Mongla Port Pouroshava take water for drinking and cooking from the PSF. The groundwater technologies are not feasible at the coastal area due to salinity. Though groundwater table is shallow but the water is brackish and undrinkable. And also one of the crushing impacts of climate change in the coastal area is slow onset of salinity intrusion and now a-days the saline water is affecting total Dakop area. A couple of years back they had to take clay mixed water from the pond and boil it for making the water safe to drink. It cost much time, labour, and fuel for every family. 2-years ago they had immense problem of procuring safe drinking water. There was no good sources of safe water in this locality. Tubewells do not work in the village because of high concentration of salinity and iron in the groundwater. So, people used to collect pond water that caused spreading of many water-borne diseases. Every year many people had been affected and some of them died, especially of diarrhoea. The PSF has reduced the cost price, especially, the workload of women of the village. The water of the PSF is quite good, it has less sediment and other contents. The responsible people of the pond has also taken some measures as advised by NGO Forum’s partner organization SHEBA who installed the PSF. “We do not take bath in the pond and do not allow people to wash cloth, cattle, and household items in the pond”, said Shameswar Gain. The bank of the pond is regularly repaired so*

*that the surge and high tide cannot flow into the pond. So, the quality of water in the pond has improved to a significant extent. This is the only pond in that region that the cyclone Aila could not contaminate by saline water. Shekhar Mishtri and Jaba Barman look after the Plant regularly. They clean the stone and sand in the filter regularly, at least once in every month. So they are quite happy with the quality of water from the PSF.*

Repairing of most of the safe water points like RWHS in the affected areas were necessary as some of them were submerged up to the flashing system, base & tap. Contaminated tidal water got into the tank. So, it was necessary to repair it urgently and disinfect those water points to prevent the community people from the sufferings of water related diseases such as diarrhoea, dysentery, typhoid, etc. For disinfecting the cyclone-affected RWHS, it was required to wash their inner-side with chlorinated water properly. The damaged parts of the RWHS like flashing system, base foundation, leakage of the tank/jar, broken taps were repaired in Shyamnagar, Kaliganj, Dakop, Mongla, Sharonkhola and Koira upazila.

### ***In Search of Safe Source***

*Most of the villagers of West Jelekhali are very enthusiastic about Rain-water Harvesting System as safe water option at the household level. The demand among the community for the System is high. The West Jelekhali village is situated in Munshiganj union at the extreme south of Shyamnagar upazila under Satkhira district. Around 3,000 people live in this village. During the Aila, some RWHS became out of order, the NGO Forum supported to repair.*

*For many years the villagers were suffering from safe water crisis due to inadequate water supply sources. At present the water crisis of the villagers has been somewhat relieved due to installation of some water supply technologies by Nakshi Kantha in partnership with NGO Forum. There are now 2 Pond Sand Filters and 4 Rain-water Harvesting Systems in the village. The community people are somehow meeting their needs through those water options. But in comparison to the number of population the existing water sources are not adequate.*

*During the dry season the pond water declines badly. As a result the pond water becomes unhygienic for drinking. In this situation the villagers are reluctant to drink pond water, but they are forced to do that since they have no available water sources. Therefore, to meet the water supply crisis some of the households are installing the Rain-water Harvesting System. Shibani Rani Mondol who has installed a Rain-water Harvesting System reveals, "To get safe water we had been ready to do anything. So, to fulfill our need regarding safe water supply we have installed a Rain-water Harvesting System at our homeyard".*

*Since time immemorial in a traditional method through using motkas (earthen pots), pitchers, etc the villagers have been harvesting rain-water for drinking purpose. But the way they harvest rain-water is not safe for drinking. Binota Rani Mondol says, "We harvest rain-water through laying plastic sheets on the roof. But in many cases we cannot harvest rain-water in a hygienic manner." The community people are aware of safe water supply by participating in various promotional activities like courtyard meeting, community meeting, household visit, cultural programmes, etc conducted by Nakshi Kantha. They have been made aware and motivated about the advantages of using safe water for all domestic purposes. Nioti Rani Mondol, one of the villagers expresses, "Participating in different meeting and discussion of Nakshi Kantha, a partner of NGO Forum the villagers have come to know that rain-water is safer than pond water and it is germ-free". However, the people are using these water technologies for about a decade which are still providing services to the people of recurrent disaster-affected areas. People perceive that due to climate change and sea level rise, the area is gradually becoming risky for living. Considerable number of Deep Tubewells and other technologies have been damaged but the Rain-water Harvesting Systems are still functional with very minor repair last year.*

**Tubewell with Raised Platform:** Due to groundwater table declination and iron and arsenic contamination in groundwater, unavailability of safe water, Tubewell normally does not work in most coastal areas of Bangladesh. Whatever Tubewells work that become inundated and washed away by tidal surge and cyclone. To prevent Tubewells from getting inundated into brackish water which contaminates the sources of drinking water, raising Tubewell platform above the surge level has been experimented by NGO Forum and its partners in the coastal areas. It requires little extra-costs but has been found very useful. Tubewells with raised platforms remain usable long after the cyclone and serves as crucial source of water for the affected people after disaster. This simple yet important technological improvement has the potential for wide scaling up in the region.

**Latrine with Raised Platform:** To prevent latrines from getting damaged by cyclone and subsequent tidal surge, raised latrines with off-set pits have been proven as suitable option. It involves improving resilience of the sub-structure from inundation while a reinforced cement material increased resilience of the super-structure. Latrine renovation components comprised of a plastic pan, U-bend, PVC pipe, bamboo poles and jute reinforced cement. This has proven to be a very effective structural development against disaster preventing latrines from getting flooded up to a certain level.

**Introduction of PVC Ring-slabs:** During disaster like cyclone *Sidr* and *Aila*, sanitation infrastructures were equally damaged as the water facilities. Therefore, NGO Forum has produced disaster-resilient sanitation infrastructures to help keep the environment safe from water-borne diseases. Low-cost, easily transportable and reusable PVC ring-slabs used to build sanitation sub-soil structure. This is an important innovation experimented, especially after *Aila*. This also has a demonstration effect, as many people have started using this innovative idea to build long-lasting low-cost sanitation latrines using PVC ring-slabs.

#### **5.1.4 WatSan Promotion in Drought-prone Areas**

Groundwater has for long been considered to be pure and safe to serve drinking purpose. Following a safe water campaign in the 1980s, extensive sinking of hand Tubewells by the Department of Public Health Engineering (DPHE) and private sectors and through individual initiatives resulted in around 97% of the country's population having access to 'safe' drinking water. This significant achievement had influence on water-borne diseases particularly in the reduction of incidences of diarrhoeal diseases. However, this tremendous achievement was overshadowed especially in the north-western part of Bangladesh when the presence of arsenic in groundwater was revealed in the early 90's. Massive declining of groundwater level making the traditional water points inoperative has appeared to be another major threats in using the groundwater, especially in the north-western part of Bangladesh. The Barind Tract is defined as Low-water Table Area and it faces severe water crisis during the dry season. NGO Forum has provided Tara Pump in many villages under its programme in this region, particularly in Chapai-nawabganj, Rajshahi and Pabna. In this region NGO Forum has been working for ensuring safe water use for all purposes and sanitary latrine use for better health. Based on the geophysical condition NGO Forum has been providing Tara Pumps, Deep-set Pumps, Deep Tubewell and Rain-water Harvesting System. There has been significant progress in procuring safe water for drinking and cooking in the intervention area. But many of them face water crisis in the dry season. About 70% of Tubewell do not work in the months of March to June. So, the

people of this Low-water Table and drought-prone area need Deep-set Pump instead of Shallow Tubewell. Efforts have been made by NGO Forum and different agencies to develop technologies for arsenic mitigation as there is no reliable household level solution available. Rain-water Harvesting is an option, which has been adopted in many areas of the country where conventional water supply systems are not available or have failed to meet the needs and expectations of the people. In this context, Rain-water Harvesting has also been considered as a probable solution of the drinking water problem in the arsenic affected and low-water table areas i.e. drought-prone north-western region.

## **Many-fold Benefits for Mita**

“Water is a gift of nature. We had plenty of water from river, pond, Tubewell and rain. We abused it in the past. But when we got arsenic in Tubewell water, we found no source of safe water. At last we learnt from NGO Forum that rain is a source of safe water, but it is limited and scarce,” said Mita Sarker, a housewife of Miapur village in Charghat thana, Rajshahi.

Mita has eight members in the family. Her family has three earning members including a school teacher, a service holder and a businessman. In her childhood, around 25 years ago, people used to take well-water and there had been one Tubewell in their locality. People used to drink well-water and Tubewell water, but they used pond and river water for bathing, washing and cooking. Due to this people suffered from cholera, diarrhoea, jaundice and other water-related diseases at that time.

In late 1980s, they installed a Tubewell for their own household and they started using Tubewell water for drinking, cooking, washing and bathing. They got some problem due to excessive iron in water. In course of time they became aware about arsenic problem in the mid 1990s through TV and Radio. They finally became very scared when Pinjira Begum of this village was affected by arsenic and many people including NGOs came to see Pinjira and put up the news to media. They tested their Tubewell water at their upazila and found arsenic in their Tubewell water in 1999.

Mita found a Rain-water Harvesting System (RWHS) installed by NGO Forum in other part of the village near Pinjira’s house. She also learnt about RWHS from postering and participating in the Courtyard Meeting and finding no other option she became very interested to have a RWHS for their own.

Mita became a member of VDC in 2000 and she got a Ferro-cement Tank of 2500 litres provided by NGO Forum. She bore 10% of cost (Tk. 400) of the System and she was very pleased to pay the partial cost in getting the System. Most of the household members of Mita have been drinking rain-water for 8-10 months. She uses rain-water also for cooking.

Mita said, “Now we do not abuse water, because it is limited and we cannot collect rain-water round the year. We use certain amount (3-5 buckets of water) everyday so that we do not get run out of water very soon. We do not very often allow our neighbours to take water from our system”.

Mita is very happy and feels proud of having the RWHS at his home. She mentioned “We are now safe from arsenic threat and we are out of risk from many other water-related diseases”.

### 5.1.5 WatSan Promotion in Hill Tracts

Hills are critical area for sanitation due to altitude, communication, resource availability, ethnic communities and obviously poverty and lack of proper sanitation knowledge. The people of these areas are not accustomed to sanitation practices. The general sanitation facilities include low-cost sanitary latrines, unhygienic latrines, open defecations. There is lack of awareness about sanitation. On way to address this hard-to-reach area sociological aspects of the people of this area are be identified and developed. The practice of some indigenous people is to defecate near water sources. Moreover, the indigenous people have some of their own local technologies and good practices. So, rather than imposing alien technologies, technologies based on the geographical characteristics of hilly area should get priority. This mean appropriate technology, simple and familiar to their locality should get promoted instead of all-fit-one modern technology. The soil formation and structure is different from any other part of the country. The soil condition of hilly area is rocky and stony. Installation of Tubewells for water supply is difficult because of presence of hard formation in the sub-surface. This situation prevails in the CHT, some parts of Chittagong, Cox’s Bazar, Sylhet, in north part of Mymensingh, Netrakona and Panchagarh districts. Due to this, the water supply situation is very worse since, except few, most of the water supply options are not feasible in hilly areas.

Access to safe ware and sanitation facilities and services are limited in hill tracts regions due to various factors. Lack of transport facilities, administrative complexities and other social and geophysical factors make hilly people inaccessible to safe water and sanitation facilities and services. As a result, people are compelled to use unsafe water as well as WatSan coverage scenario is unpleasant. Geophysical feature restrained them availing such support and services from government and non-government actors. Climate change and its impact would be the worst. The existing water and sanitation coverage scenario is found poor in hill tracts in comparison to the rest part of the country. On an average, 60% population gets safe drinking water which come down to 4% in dry season. In Rangamati, Bandarban and Khagrachari, 40%, 58% and 59% respectively have access to safe drinking water. Only 5% people have Deep Tubewell of their own. Hilly people are less aware about necessity of hygienic latrine. Therefore, they are used to defecate in open place. In Rangamati, Bandarban and Khagrachari 81%, 67% and 47% people have sanitation facilities respectively.

Adverse geo-physical condition i.e. the rocky soil texture and irregular terrain is the reality in the CHT areas. And it tends to hinder the process of supplying safe water through low-cost technologies in the areas. Since the people of the CHT areas deserve the right to safe water security as the citizen of the state, NGO Forum as the apex non-government service-delivery agency feels the accountability to address the adversity in alternative mode. Although the alternative technologies are not low-cost, the local partner NGOs with technical assistance from NGO Forum have promoted different alternative technologies at community level with a view to establishing the right of the CHT people to safe water. To overcome the challenges of water supply and sanitation in hill tracts and for making success, NGO Forum has innovated alternative options for water supply and sanitation coverage in the hill tracts and installed them with active participation of beneficiaries in planning, implementation and cost sharing for

technologies. The main sources of water in the areas are gravity flow, *chhara* and groundwater in some areas where it has introduced Spring-water Capping, Ring-well and Infiltration of Gravity and in some case Deep Tubewell considering the geophysical condition. The NGO Forum's introduced technologies are found adaptive because they are most suitable to meet the needs of respective areas and people have warmly accepted it. Those technologies are providing services effectively to the community people and the community people are getting benefit from it. According to the community people, supports and services of the NGO Forum to the hilly dwellers have contributed to increase access to safe water and sanitation facilities and has also changed the attitude and perception towards the necessity of safe water and hygiene practices for good health.

Participation is considered as precondition of success of any development action in community-based and community-led action. The community people of hill tracts actively participate throughout the implementation process. The people take active part in planning, site selection, community mobilization and they also share the cost for the technologies. Due to poor socio-economic condition a significant proportion of households are unable to share the cost for technologies, but the community people decide that those who are not able to provide cash as cost for the technologies will share through physical labour during construction. Due to their active participation in project planning and implementation process, the technologies have been possible to install in the respective areas. Now the community people have become aware about safe water, sanitation and hygiene behaviour and its impact on their life.

The community people themselves maintain water technologies and oversee for keeping it functional round the year. The promotion of the WatSan technologies have contributed in mitigating people's sufferings of water collection, getting access to safe water sources, saving time, physical labour, insecurity of women during water collection, etc. The alternative technologies like IFG, and Ring-well are ensuring access to safe water round the year despite depletion of groundwater table and close of tributaries to *chhara* (spring). The people have become used to use these technologies and accepted it as most viable options.

The alternative technologies i.e. the Ring-well, IFG, Spring-water Capping and RWHS have been introduced in the target communities in the CHT following a series of procedures to find these accepted and sustained. Before introducing the alternative water technologies, the communities have been oriented to safe water, its importance and the ways of ensuring it. The promotional activities have helped the communities pondering the importance of safe water as well as the way of securing it. It has led them to raising the demand for alternative water technologies.

NGO Forum has innovated and in some cases did modification of existing water and sanitation technologies with special focus on hard-to-reach areas like the Hill Tracts. To address the adversities the alternative options like Spring Capping Technologies, Ring-well, and Infiltration of Gravity are introduced to ensure safe water for the hilly dwellers. Similarly, the sanitation technologies have also been introduced in the area as sustainable options of sanitation. Glimpses of success of technologies are presented in the following:

**Spring-water Capping :** Springs are the most reliable source of natural filtered water in rural hilly areas of Bangladesh. Surface springs occur where groundwater level emerges at the

surface because an impervious layer of ground prevents further seepage downwards. The rate of flow of water from the spring varies with the seasons. It is necessary to measure the spring's flow at the end of the dry season to determine its potential reliable yield. An inspection of the ground upstream of the spring is essential to ascertain that there is no danger of pollution or, if there is, that measures can be taken to prevent it. A spring source can be used either to supply a gravity scheme or just to provide a single outlet, running continuously, which is set at a sufficient height to allow a bucket or container to be placed below it. To prevent waste, any flow which is surplus to that required for domestic use can be used to irrigate kitchen gardens. If the flow from the spring is not sufficient to meet peak demands during the day, a storage tank can be incorporated into the structure of the spring protection. This enables the flow from the spring over the full 24 hours to be stored, then used throughout the day to meet intermittent demands by means of a tap in the structure.

Springs are a naturally-occurring source of freshwater, and are often exploited using a gravity-fed delivery system. Springs developed for a gravity-fed water supply should be at an elevation above the supply area, and, while an excellent source of water, should be "capped" to prevent contamination. Spring Capping typically takes the form of a containment structure, constructed from concrete or masonry, which direct spring flows to an outlet pipe. Spring Capping is found in many forms, ranging from relatively simple, uncovered systems to more sophisticated, covered systems designed to exclude leaves, soil and other contaminants such as animal and bird excreta.

The Spring Capping generally require minimal intervention for operation and maintenance. Periodically, however, the chamber should be inspected and cleaned. There are many types of spring caps, ranging from a simple weir structure (open) to more complex constructed (closed) systems. There is also a range of sizes depending on the flow and areal extent of a given spring. Spring Capping is an effective method of supplying water. However, care must be taken not to decrease flows through spring development. Springs can provide good quality water at low (operation and maintenance) cost. Spring development may be detrimental to the rate of discharge of the spring, unless carefully implemented. The basic technology is well known but new in Bangladeshi perspective. Depending on site-specific conditions, capping design concepts could be improved to provide for better use of local materials, greater protection of water quality, and more efficient delivery of water to users.

### Safe Water Gives New Meaning to Lives



Construction of the Kaptai Dam displaced Priyolal Chakma, a 51-year-old UP member of Bhaibonchhara Union Parishad and forced him along with other families to start living at Ganchban village of Bhaibonchhara union in Khagrachhari district. They selected the place to live getting ensured the availability of water from a 'chhara' named 'Ganchban Chhara' which has fallen into the river 'Chengy'. But this situation did not continued as the community people were not getting enough water from the 'chhara' for their daily chores. With the time being the 'chhara' was becoming dryer. At that time a group of people, may be Indian visited the village and at one stage of their inspection they showed a ray of hope to the villagers by discovering a spring which they turned into a water supply technology named "Spring Water Technology". They just used the underground spring water as source of water by a 4" pipe. It became an alternative source of water for the villagers of Ganchban, situated 20 km away from the

Khagrachhari district headquarter. Topographically, the village is a hill intensive area of 45 households. The hilly geographical structure and its remote location, the scattered houses located on foothills made it real difficult for the villagers to avail drinking water.

Though the villagers met up the thirst of water source through this discovery, another problem the community people were facing severely. Diseases were not letting them off. The water would come out continuously through the 4" pipe only. There was no capping system to prevent contamination. The place was moistened and it was totally unhygienic. On the other hand, there was no platform for using the system. The women used to take their bathe in the open place beside the Khagrachhari – Panchhari highway as there was no wall to hide them. It was too embarrassing for the young girls to use the technology for bathing purpose.

But the poor people of Ganchban could not understand that the use of safe water unsafely is the cause of their diseases. One day a Community Mobilizer of a local NGO HRDO visited the village and started raising awareness among the community people on this unhygienic use of drinking water. At a stage, the villagers felt the necessity of safe water technology for drinking, cooking, washing and bathing. Being the responsible person for carrying out social development activities, Priyolal took the lead role in this regard while HRDO with the support of NGO Forum transformed the simple Spring-water Technology into a Spring Water Capping System which is safe from contamination and constructed a platform and wall around the technology.



Around 150 to 160 people from 30 households comprised of Chakma and Tripura community use the water from this technology for drinking and other domestic purposes. "The poor community people of Ganchban are now using the water safely and more than one user can use at a time because of having more than one tap facility. Girls enjoy their bath within the four walls and can protect their privacy. Despite crossing the slippery hilly paths, my people come here for collecting water as it is the only source of safe water for the people of this village. Not only the villagers of Ganchban but also the passerby and driver-passengers meet up their thirst by this roadside water source as there is less water source beside the hilly roads " – says Priyolal Chakma.

Whenever he gets chance, he advises the villagers to drink and use safe water to prevent diarrhoea, skin diseases, dysentery and so on. Priyolal also informs that all families in his union are now aware of the necessity of drinking safe water. But they do not have access to safe water sources as Ganchban village. This technology now belongs to 30 families from the village who jointly has contributed Tk. 10% of total cost which includes their labour also to fulfill the cost-sharing provision by user families. The users' contribution money has entitled the family to own the technology. That is why, every villager feels ownership over the system. They take proper care of it. "If the technology goes dysfunctional we will repair it for the sake of the villagers need"-says the very proud Priyolal.

**Infiltration Gallery:** The Gravitation Infiltration Gallery is the most successful technology in the hill tracts. And gradually it has become the prime technology. In the changing climate change context, this water technology is functioning effectively and hilly dwellers have been getting benefit from this technology. The people who were used to drink *chhara* water but now they do not use it. As a result, it has reduced health care cost, time for water collection from long distance, insecurity of women, etc. The technology has tremendously changed the attitude towards health and hygiene practices of the community people.

Infiltration Gallery (IFG) is an artificial aquifer/groundwater storage tank installed below the bed or the side slope of ponds, rivers, streams or other surface-storage to collect freshwater skimmed off the surface water. River or ponds with sandy soils are suitable for construction of

Infiltration Galleries. IFG provides clean water for the domestic purpose. Infiltration Galleries are capable of supplying large quantities of water, and are used where wells are unable to supply water needs, i.e. where an impermeable rock barrier affects well efficiency, or where surface water sources are too shallow for intake screens. Infiltration Galleries are one or more horizontal screens placed adjacent to (on-shore), or directly underneath (bed-mounted), a surface water source. The main problem associated with IFG is sanitary protection of water. Lack of proper sanitary protection may lead water contamination.

## ***Unsafe Chhara Turned into Safe Source***

80-year old Chandraangsha 'Karbari' - one of the oldest members of Jambura para of Dighinala upazilla of Khagrachhari district. From his childhood he has seen that, for water, the whole community is depended on a 'chhara' namely south kobakhali 'chhara'. There are 56 families in this agro-based community. They collect water from a well beside the 'chhara'. He always felt that people are having water-borne diseases because of drinking water from this 'chhara'. Specially in the rainy season when the 'chhara' water becomes muddy, most of the children become sick after drinking water from it. As one of the oldest persons of the village Chandraangsha 'Karbari' was disappointed for the suffering of the children and always felt that there must be some way to prevent it. He said "we tried to establish a Tubewell in our locality and dug 70 feet of the hill but found no water. So I thought there are no alternative of using the 'chhara' for my community."



But one day in October 2009 some people from NGO Forum and its partner organization ALAAM visited the village. They informed the community people that they are willing to work for the development of water and sanitation situation of their community. They observed their water collecting process, the 'chhara' and talked to the community people about water, sanitation and hygiene related issues. They told them that the villagers are suffering from diseases because of drinking unsafe water from the 'chhara'. From them community people also came to know about the necessity of using safe water and maintaining personal hygiene which they had no idea before. From these NGO people Chandraangsha 'Karbari' first heard that there are more water technologies which may be suitable for establishing in their community where normal Tubewell doesn't work. Representatives from NGO Forum and its partner organization ALAAM notified that if the community people are interested then they are very much willing to help them to recover their water related problems. For that they will first form a VDG consist of community people who will aware the local people about necessity of safe water and sensitize them to install a suitable water technology. And then a water technology will be installed.

Community people including Chandraangsha 'Karbari' were sensitized with this information. They understood that they have to use safe water for drinking purpose, and for that a safe water source is must. They welcomed the NGOs and asked them to install a water collecting technology suitable for them. So a VDG was formed. The VDG worked for sensitizing the whole community people about necessity of safe drinking water and also about the danger of using unsafe water from 'chhara'. As many as 17 families were convinced and they agreed to contribute money and physical labour for installing IFG. The VDG also contributed to measure the needs of the local people and selecting the place where installing the water technology would be user-friendly.

When awareness building and sensitizing community people through VDG was continuing, a Field Engineer and Supervisor from NGO Forum visited the area. They examine the whole area, the 'chhara' and tried to select a cheaper and suitable water technology for this community. In completion of the feasibility they came to the conclusion that the 'chhara' which is the only as well as the main source of water-borne diseases of this community

can be purified and distributed among community people. This technology is called IFG (Infiltration Gravity). It is a technology where beside the 'chhara' a filter would be set underground to purify water from the 'chhara' and then the filtered-water would be collected by the people through a Tubewell. Considering the geophysical characteristic of this hilly area, they found it to be the most appropriate technology. So an IFG was installed in Jambura para. The total of 17 families willingly contributed 10% of the total cost that is Tk. 2,800/- of which Tk. 2,300/- as cash and the rest as cost free physical labour for installing IFG technology. Rest of the cost was borne by NGO Forum.

All the 17 families of Jambura Para are now using water of this Tubewell for drinking purpose. As a result rate of water-borne diseases has been decreased significantly. The villagers have chosen 18-year old Sadhona Devi who has passed class 8 as the Caretaker of the technology because of her intelligence. She is taking good care and has already repaired the pump once with the help from the villagers. "I am very proud of becoming caretaker of the IFG technology. I always feel like I am serving the mankind" she said. Besides taking decision about water related issues of the area, the VDG is now also raising awareness about the other rights of the villagers. The UP members are also taking part in the VDG meetings.

Chandraangsha 'Karbari' is now very happy to see that the family members of the IFG technology user families are now able to work harder as they are free from water-borne diseases. They are spending money for other productive purposes which they had to spend for treatment before. He said, "As one of the oldest persons of the community I am now advising every one to drink water from the Tubewell." He is satisfied that they have a VDG and a caretaker and can repair any minor problem of the IFG technology by themselves. The families are also happy that they don't have to walk a long distance to the 'chhara' to collect water. Now they can collect water from the water point which is very close to their home. Also they don't have to boil the water any more as water from IFG technology can be used without boiling. Chandraangsha 'Karbari' said, "Our land is very much different from the other parts of the country. Scarcity of water in hills is a reality which is increasing day by day. So we are looking for more help from outside. And we are ready to contribute if necessary."

**Ring-well :** The Ring-well is an age-old known option of safe water in rural Bangladesh. Hand-Ring-wells are constructed with simple tools in weathered rock, overburden or sedimentary formations. The well is lined to the aquifer with concrete rings. A Ring-well is constructed by excavating a shaft, generally manually and installing a casing where needed. Dug-wells are used extensively for domestic water supplies. They are generally not very deep because these cannot readily be sunk far enough below the water table. Most of these are less than 50 feet deep. They generally yield only small supplies of water from water-bearing materials of rather low permeability near the top of the zone of saturation. The sanitary Ring-well is designed to prevent contamination of well during fetching of water by multiple users using their own buckets. Traditional design allowed contamination of the well water by unscrupulous elements. Considering the geographical condition of Bangladesh, Ring-wells appear to be a suitable water supply option in hilly, coastal, arsenic-affected and declining water table areas. Proper safety measures should be taken for digging deeper Ring-well. Due to lack of any safety measure, accidents may occur on many occasions due to soil erosion at the deeper level of digging. Prior to the installation of the Ring-wells few test boring to a depth of 70 feet is a necessity to ascertain the sub-surface viability of the selected depth of location. Water quality of dug-well is comparatively good as because due to exposure with air all dissolved substances of groundwater like arsenic, iron, etc get oxidized.



**Portable Sanitation Technology:** Low-cost and sustainable sanitation technology is mostly desirable in the rural Bangladesh. About 45% of Bangladeshi population lives below the poverty level. To address issue of improving sanitation coverage especially for the poor people, it is necessary to develop low-cost affordable and easy sanitation technology. In this connection, NGO Forum has developed a low-cost, easily portable sanitation technology like plastic pan with removable squatting hole and plastic ring. This is an innovative technology of NGO Forum. Considering the transportation problem of the heavy concrete ring slab to the hard-to-reach area, this technology is developed. Alongside, NGO Forum has introduced several technologies that are low-cost and suitable in different geophysical condition. It has created enthusiasm among them who are reluctant to install latrine in their houses due to transportation of concrete made ring and slabs.

### *Healthy Life on the Hilltop*

*Masathwai Karbari, a 42-years old man of Marma origin lives with his family in a hilly village named Paikhyong Para. It is geo-physically a hard-to-reach area located about at 7 km. distance from Bandarban city. As many as 33 Marma families live in the village. The families are poverty-stricken, hard working and dependent on agriculture especially 'Jhum' cultivation. Traditionally, the community people set-up their dwelling on the hilltop 500' up from the plain land. Since his childhood the 'Karbari' has been observing that the sanitation and hygiene situation of his village is very poor resulting in the pitiable health situation. The 'Karbari' had no idea about sanitation and hygiene practices or the necessity of those. When NGO Forum started working with a view to making people aware about safe water, sanitation and hygiene practices, it was very tough to educate him about the issues since he was not educated and he thought it will be very costly which is beyond his means. There was no sanitation facility in his family and in the village also. He along with his family members used to defecate in the open places and did not wash hands properly after defecation since there was scarcity of water and they suffered a lot from stomach problems, excreta and water-borne diseases but did not have any clear idea about the causes. Consequently, the demand for hygienic sanitation facilities never came up in his mind.*



Representatives of NGO Forum and its partner NGO Tahzindong in Bandarban visited the village one day. Water and sanitation situation of the village were observed and the problems were identified through discussion with the village people. NGO representatives tried to educate them about safe water, sanitation and hygiene practices and disclosed the ideas to the people demonstrating hygienic sanitation system and safe water options as well. They made the villagers understand that the reason of diseases in the village is unsafe water and unhygienic latrines. If the practices run as usual, it will create a severe problem in near future. So they advised to use hygienic latrines using the modern and feasible technologies in the hilly places. The NGO Forum and its PNGO Tahzindong representatives also committed to provide the technologies for the villagers to create hygienic sanitation facilities. After few days, Engineers and other responsible persons selected the spots for the installation of latrines. But, it was difficult to install the latrines due to geo-physical barriers i.e rocky soil texture in ground. When Engineers and his people were going to start the work, the hilly adverse characteristics hindered the process. The people did not agree to carry the concrete ring slabs of latrine at the hilltop. They agreed when the alternative technology's plastic slabs were provided. But the people could not depend on the technology also because it seemed to be very slender. Engineers made them convinced by proving it feasible, unbreakable and strong technology. At the same time relatively the availability of water raised as a problem. Finally, the installation process of latrines was completed and 18 families were provided with hygienic latrine facilities of plastic slab, feasible technology for hard-to-reach areas especially hilly areas and a Ring-well was also installed successfully to solve their water crisis.

The beneficiaries contributed Tk. 500 per family for latrine which is 20% of total cost and tk 7,975 for Ring-well installation which is 10% of total cost Tk. 79,757 and their labour as well. Now, the 'Karbari' feels good using hygienic latrines. He along with his family members is free from diseases caused by unhygienic sanitation system. Their physical fitness is better and can work harder now. "I am very happy that modern sanitary facilities are in my village and we are getting access to safe drinking water as well. Now we know about sanitation and hygiene practices and are going through it." discloses Swenue Ching Marma, the Caretaker of Ring-well.

"I am happy to say that now I belong to hygienic sanitation facilities. I along with my family members are getting rid of traditional defecation system in open places and being habituated with hygiene practices and the hygienic latrines are being used by other people in my village as well. Consequently, the ratio of diseases in my village is reduced. Children are in good health and overall health condition of village people are also improved than any other period in the past which is remarkable. I am also satisfied as the facilities also relieved the people from the pollution of the natural environment. Being an older person of the village I am proud to see the recent health situation of the village people", the 'Karbari' said.

Most of the indigenous communities in the CHT used to choose their place of living where they would have the facilities of *Jhum* cultivation and availability of water. Many of them lead nomadic life. They leave a place once when they find it unlikely to provide them the supports of doing *Jhum* cultivation and availability of water. The installation of the alternative technologies considering the needs and priority of the community people has created a nexus of the nomadic indigenous people to live in a particular place for long term or permanently since the availability of safe water for their everyday's uses has been established at their community. Moreover, the community-based and community-managed alternative technologies and the VDG have created a scope of community togetherness. A great number of families have been collecting water from a common source. They sit in a meeting every month where they discuss over the problems and prospects of the community regarding safe water, sanitation and hygiene and many other issues.

## Remaining Stable with Rain-water

Sumon Chakma (45) started living at Ganchban village of Bhaibonchhra Union in Khagrachhari district in 1998 after the CHT Peace Accord, 1997 leaving the bitter days of refugee life in India. He, with his family went there in 1983 from Parachhara village in Khagrachhari district. He got married there. His two sons also were born in India. They got back to Ganchban and set up an abode buying a piece of land.

Before setting up the abode in Ganchban, Sumon thought about the source of water for drinking, cooking, washing and bathing. There was a *Chhara* blowing over the village. Like other users her wife Nana Chakma (38) started fetching water from the well dug beside the *Chhara*. She had to face everyday the agony of passing a long distance for fetching water. With some other neighbouring families of his *Para*, Sumon contacted to the UP-member. The member paid heed to them and installed a Ring-well. But it got lost after a few months. "We started encountering the previous distress. My wife again started collecting water from *Chhara* for drinking and other uses," says Sumon.

They started to face various difficulties. Diarrhoea, skin diseases affected his two sons. Sumon and Nana faced dysentery, jaundice and other water-borne diseases. A local NGO HRDO visited their *Para* in 2004 and started raising awareness among their community. "They oriented

us about the necessity of safe water for drinking and cooking. At a stage they offered us if we could manage some money they would give us a Rain-water Harvesting System (RWHS) at my homestead," informs Sumon. Sumon welcomed it and agreed to contribute with 10% of the total cost. HRDO installed a RWHS at his home that can contain 3200 litre water.

"In spite of my poverty, I shared the cost. It has created the feeling that the system is mine and I should take care of it," expresses Sumon. HRDO has trained him and his wife on O&M of the System. They clean inside of the reservoir with bleaching powder, brush before taking water into it. They wait for 10 minutes when rain starts to let the catchments and gutter be cleansed. "We can use rain-water for a long time whole in a year. The System has decreased my agony of fetching water from *Chhara* crossing a long arduous path. Since I need not to wait for water in a cue now I can save my time and use it in other works. My sons are now free from diarrhoea and skin diseases," expresses Nana Chakma, wife of Sumon with a jovial look.

### **5.1.6 WatSan Promotion in the Tea Garden**

To comply and high up the tea production, labourers, who are leading their lives in an inhuman condition, are the core factor in which NGO Forum works. They are deprived of safe water, sanitation and hygiene facilities. Due to this it is very often experienced that outbreak of water-borne or diarrhoeal diseases has been the common phenomena in tea garden areas. NGO Forum has been working with this labour for promotion of water supply, sanitation and hygiene facilities for improvement of WatSan situation by reducing water-borne diseases in the tea garden areas. NGO Forum is also sensitizing and building capacity of LGIs, partner NGOs, private sector operators (PSO), tea garden labour associations, tea garden owners, community members and other relevant stakeholders for implementation of right-based sustainable water supply, sanitation and hygiene programmes for the disadvantaged people of tea garden areas.

The tea garden's administrative arrangement is a barrier to run any development programme within this area. However, the garden owners, local administration, local government, and other relevant stakeholders are still remaining in traditional estate operation mechanism. They are not sensitized regarding the needs of workers. Sensitization can improve congenial environment for taking any development intervention in the tea gardens. This will help ensuring the access of development initiatives, especially WatSan in the tea garden.

The people in tea gardens are not aware of the importance of safe water, sanitation and hygiene and they are used to traditional practice of sanitation. As the tea workers remained almost isolated from the mainstream social, cultural and development activities they cannot feel the necessity of safe water and sanitation. As a result, NGO Forum has conducted massive promotional activities to make people aware on the issue and created demand of sanitation and safe water for improving health and hygiene condition for better living. Using different IEC/BCC materials, showing promotional films, organizing community meeting, courtyard meeting, meeting with male, female, children and different indigenous groups are the important tools for building awareness among the people in the tea gardens. The sensitization programmes are going on in the tea garden but the administrative barrier sometime creates challenges in such actions.

Tea garden authorities are sensitized but could not extend cooperation to ensure safe water and sanitation, and health facilities for the tea labourers and their families because of administrative barriers. The partner NGOs are engaged in building awareness among the tea garden people on safe water, sanitation and hygiene through facilitating different promotional activities. They are also trying to identify alternative technological options for installation in the gardens where traditional technologies are not feasible.

Different IEC & BCC materials are produced and disseminated among the garden people and other relevant stakeholders. Alongside, health and hygiene education are imparted regularly among the school children of the labourers. Health education i.e. importance of safe water, sanitary latrine and hygiene education are taught in the schools. Tea labourers do not have the capacity to establish safe water and sanitation facilities by their own accord. Since the garden authorities are responsible for ensuring all basic facilities, they should hold up the essence of imparting all services. However, software services have been provided in collaboration with the garden authorities. The negotiation with the garden authorities are going on but it needs more time to come up with open access to intervene the programme in the garden areas.

### *A Festive Fair in Tea Garden*

*With a deeper look one can see the huge contribution of WatSan Fair in promoting WatSan and proper hygiene behaviour. This is not only because a lot of WatSan promotional materials are displayed and documentary films are shown in this Fair, but also to hold a WatSan Fair huge advocacy activities and initiatives are done which helps the organization along with the partner organizations to promote WatSan information and build relationship with other stakeholders including Local Government Institution. The Fair also contributes to improve the programme organizing capacity of the organizers. To organize the Fair, preparatory meetings are called, different committees are formed to upholding different responsibilities. Venue and guest selection is also an important part of the preparatory activities as both of these two are decided according to the theme of that years WatSan Fair. So organizing this Fair is not a very easy or a simple task. On the contrary, it is a team work performed by the NGO Forum and its partner organizations through of advocacy initiatives. On the other hand, WatSan Fair in coastal areas, haor areas or tea garden areas have different importance and impacts as these areas are the hard-to-reach areas, where people are deprived of every kind of development initiatives and facilities. And because of its hard-to-reach characteristics, it is very tough to arrange a WatSan Fair in these areas. But NGO Forum as a part of its on going campaign 'Be Beside the Hard-to-Reach' in collaboration with its partner organizations has successfully organized WatSan Fair this year in different hard-to-reach areas, one of these areas is Tea Garden of Sylhet Region.*

*Safe drinking water and sanitation facilities are minimal in the tea gardens of greater Sylhet Region. Very low coverage of safe water and sanitation leads to the frequent outbreak of diarrhoeal diseases and mortality which is causing pitiable health situation in the tea gardens and low productivity in the entire tea industry. Considering both the needs of the tea garden people and the mandate of the organization, NGO Forum for Drinking Water Supply and Sanitation being the apex networking body feels its responsibility to work inside the tea state with the tea garden owner and the labours. But it is very tough as the owner of these gardens doesn't allow any non-governmental organizations to work with the labours inside the tea garden. Because of the strict restriction of the tea garden authorities it is sometimes stated that 'a tea garden is a state within the state'.*



This year as a part of the on going advocacy campaign of NGO Forum 'Be Beside the Hard-to-Reach', the theme for the WatSan Fair was decided as 'Water & Sanitation for the People of Disadvantaged and Hard-to-Reach Areas'. Sylhet Regional Office of NGO Forum and its partner organizations decided that for highlighting this year's theme, the selected venue must be close to tea gardens as it is one of the major hard-to-reach



area of the country. A preparatory meeting was held where the date, location and guests were decided. Separate committees were formed upholding separate responsibilities. In the meeting Kakiachhara Tea Garden of Srimangol Upazilla was selected as the venue of WatSan Fair 2010 of Sylhet Region. It was decided based on some objectives such as to raise awareness on WatSan issues among the labourers and the garden authorities, to compel the garden authorities for taking the WatSan related concern into serious consideration and also to draw attention of the Government for facilitating the process of providing the tea labourers with all basic necessities. It was also decided that the Fair would continue from 5-7 March. However, getting permission to organize it in that specific venue was a very difficult job for the organizers. The tea garden authority was unwilling to give the permission, as they are not interested to allow any NGO to work inside the garden. The organizers met the garden authorities several times and tried their best to convince them to give the permission. The Local Government also gave their support to compel the garden owner. Finally at the eve of the Fair the permission was received from the Dhaka office of the Kakiachhara Tea Garden. The organizing committee met almost 400 government, non-government officials, UP chairmen and members, teachers and other important local civil society members for ensuring their attendance in the Fair. Earlier the Fair miking continued for three days in the Kakiachhara Garden and surrounding areas including Srimangol town. Students and their parents were specially invited to visit the Fair through their educational institutions.

After all these advocacy initiatives, on 5 March 2010, the Fair started ensuring participation of Upazilla Chairman, Union Parishad chairmen and members, Tea garden manager, TNO, Executive Director of partner organizations, journalists and other civil society members. The three-day long WatSan Fair demonstrated WatSan related information, posters and documentary films were shown. Local artists also performed song, drama and dance focusing on WatSan issues, especially related to the tea garden. A huge number of tea garden labourers attended the Fair while women participation was mentionable. A vast number of student participation was also observed. Visiting the Fair, hard-to-reach people of the tea gardens were able to get themselves informed about many WatSan related issue which they didn't have any idea. Deputy Commissioner of Moulavibazar district, Assistant Commissioner (land), Executive Engineer of DPHE (Moulavibazar), and Kalighat and Ashidron Union Chairmen were present in the closing ceremony. They described the Fair as encouraging and effective initiative. The tea garden authorities also visited the Fair. The community people responded to the Fair very positively.

Organizing WatSan Fair in the tea garden was a very tough task for the organizers. But at the end it was completed successfully and in a very organized way. For the first time, the tea garden authority allowed this type of Fair in the tea garden which is the result of huge advocacy initiatives, communication and sensitization. All guests presented in the inaugural and closing day and welcomed NGO Forum and other NGOs to work inside the tea gardens. The Local Government authorities ensured that the garden authority would not oppose any organization from continuing WatSan promotional activities in the tea garden. If they, action will be taken against them. So WatSan Fair 2010 of Sylhet Region has open up a new possibility for NGO Forum and its partner organizations to work more closely with the tea garden workers along with the garden authorities. Though getting permission for arranging a small Fair like WatSan Fair in the tea garden caused huge advocacy initiatives and hard work but still NGO Forum and its partner organizations are considering it as a chance to work in this Hard-to-Reach area more intensively.

## 5.2 Social Acceptability

The Iron Removal Plant, as an alternative water supply option, is becoming popular among the community people. The community people are being habituated with using water from the system for domestic purposes, especially for drinking purpose. There are some reasons behind getting popular of the system. There are very few water options which are feasible in the coastal area for getting safe drinking water. Secondly, the annual rainfall is higher in the coastal areas. In this reality, since time immemorial the community people are accustomed to harvesting water from IRP for domestic use. The social acceptance of the system has been increasing since the user community now knows that water from this plant is safe, clean, pure and bacteria-free. Apart from this, the Rain-water Harvesting System is constructed at the user's homeyard. So women and girls who are normally involved in collecting water for domestic use need less time and energy. They get water point at their hands. The user families also share with other people about the benefits of the system. Thus the system is getting popular. As community people know details about the Iron Removal Plant, Pond Sand Filter, Ring-well, Spring-water capping, RWHS, etc now they do not hesitate to invest money to install such system of their own. The IRP and RWHS have demand among all level of the community people ranging from lower to higher class. Considering the needs of safe drinking water, the people have accepted these technologies by taking into consideration the benefit of health care cost reduction, reduction of water-borne diseases, and as a whole reduction of physical labour for water collection from long distant places. As a result, these technologies have got well acceptance to the community people. The sustainability of these technologies are very good because the participants and beneficiaries of these technologies reported that these are still functional and effective even after one decade of installation.

### *Safe Water from the Sky*

*"The Plant has reduced the medical treatment cost of our family, work-load of women, decreased the epidemic diseases and mental anxiety", said Shibpado Mridha, the owner of a Rain-water Harvesting System in Jelekhali village at Shaymnagar thana under Satkhira district. During Aila it was affected by saline water but we took initiatives to repair the plant. At that time NGO Forum came to assist in repairing the Iron Removal Plant(IRP)*

*SETU, a partner organization of NGO Forum, provided support to set up Rain-water Harvesting Plant at his home in 1998. The capacity of the Plant is 3200 litres. The women feel mostly benefited from the RWHP as Sandhya, wife of Shibpada and his mother said, "The system has come as a blessing to our family. It provides us safe drinking and cooking water through 7-8 months in a year, starting from the rainy season". This year, they started collecting rain-water from the early June, during the monsoon and they hope that they will continue collection of water from the plant till September. They will preserve water in the big reservoir and use the water till November.*

*They had to bring water from other's pond crossing a long distance and they had to boil and filter the pond-water before drinking. "It took much time of our day to day work and it was a very painstaking job", they said. At that time they had greater intensity of water-borne diseases like fever, dysentery, diarrhoea and other intestinal problems. Today, they are much better off. This RWH Plant reduced the time of procuring water in great deal. They can have safe water from their own home next to the kitchen. They don't need to walk 1 km or more of the muddy road. They don't need to purify the water. They can drink the water directly taking from the tap of the RWHP. "Sometimes, we have to boil water to avoid cold, but it is nice and has good taste. The RWH Plant is a blessing for us" they said.*

*This family does not have diseases like diarrhoea, dysentery and fever. The RWHP has changed the way of life of the family members. Now they get more time for other household works and they don't have any tension as to when and from where they would bring water. Sandhya informed that sometimes, neighbours took water from this RWHP and they expressed much interest for getting more RWHP in the locality.*

### **5.3 Effectiveness of the Technologies in Hard-to-Reach Areas**

Since the water and sanitation programme is gender and poverty focused, efforts were made to ascertain whether the gender and poverty issues were adequately addressed in the hard-to-reach and other plain areas. The effectiveness was looked into the areas of implementation as per the strategy, effectiveness of technologies in terms of functional status in different geophysical context, community participation in overall process of programme planning and implementation, follow-up and monitoring mechanism of the programme, capacity building training, hardware support and support delivery process, and inter-agency collaboration. Whether the approach was effective or not could be understood on what extent the programme activities met the goals of the programme. The extent of effectiveness based on indicators & the issues have been presented in the following sections.

The programme has provision to provide hardware support and software services to the community people for bringing behavioural changes regarding hygiene practices. As the behavioural change is a key focus of the programme that would be achieved through promotion of knowledge about benefit of hygiene practice in life and along with providing safe water sources and sanitation technologies so that the behavioural change get utmost priority. The programme design contains provision of hardware support, especially for water supply from project fund and sanitation hardware to hardcore poor from local government institution's Annual Development Programme budget. The programme also has the provision of cost-sharing by beneficiaries for water supply hardware to ensure participation and ownership by the community people. It is expected that such process would help sustaining the functionality of water sources. However, *char* dwellers are found to be reluctant to install costly sanitation hardware and share cost for water technologies, because they are aware about fragility of *chars* and lack of sustainability of those technologies. It is found that they are living at the present location this year and they are not sure if they would be able to stay here during the coming year. The *chars* are most fragile areas where people are less interested to invest for water and sanitation hardware. Alongside, distribution of free latrines by various development organizations is also the challenge in behavioural change of *char* dwellers.

NGOs are responsible to provide software services to the beneficiaries of respective areas. The hygiene promotion through various means are aimed to demand creation among community people by making them aware about the value of hygiene practices and its impact on household economy, health care cost and keeping human resource as productive. The elected local government representatives maintained relationship with community people with the hidden objectives of keeping public support in favour of them for winning in future election and deal with them technically. Since the agenda of local government is political while NGO's agenda is to provide support by strictly maintaining the provided guidelines, it occasionally clash with the guidelines of the project in the plain land. However, in case of hard-to-reach areas where water crisis is severe, there such kinds of clash is not evident. The coordination between local

government and NGOs are very supportive and cooperative in nature which make the programme successful.

The software services consist of courtyard meetings, household visits, tea stall sessions, community action planning process, visual communication, folk songs and staging drama. However, there is basic difference between plain land and hard-to-reach areas. Though there is no separate arrangement for hard-to-reach areas yet some of the planned activities are making desired progress due to taking alternative arrangement. In some places of hard-to-reach areas some of the activities are really hard to perform by responsible persons due to unavailability of infrastructural facilities. NGO Forum from its learning made alternative arrangement for video show, community meeting which helped in making desired outcome of the programme. From the technological point of view, it is found that technologies are so far feasible and effectively functioning in the hard-to-reach areas. As the safe water is crucial needs of them, people take any initiative to keep the technology functional for the sake of their own. If one technology becomes out of order that creates problem for huge number of people dependent on it. As a result, people's priority is to keep functional of at least water technologies in hard-to-reach areas.

Finally, the programme's success in terms of water supply in hard-to-reach areas is much higher than the sanitation. Though people are much aware about the hygiene practice but due to natural disasters and disadvantaged condition they cannot replace when latrine is damaged because of its household-based ownership. As the water technologies are owned by the community, it is more easier to maintain by joint efforts of the community people.

## **5.4 Sustainability of the Achievements**

In case of sustainability, the community people have now been standing on the realization that they have achieved a tremendous result in the coverage of safe water and hygienic sanitation, and now it is their responsibility to continue with the safe WatSan facilities. Alongside the WatSan coverage, the achievements of health and hygiene status have been significantly increased in the respective hard-to-reach areas. The issue of sustainability is defined in two terms, sustainability of technology and sustainability of hygiene practices. The sustainability of achievements depend on the practices of hygiene behaviour and realization of needs for making linkages with WatSan and health status including the sustainability of technologies in terms of operation and maintenance status. Various kinds of hardware including water technologies e.g. Ring-well; Arsenic-iron Removal Plant (AIRP), Rain-water Harvesting System, Deep-set Pump, Spring-water capping etc and sanitary latrines have been provided in different hard-to-reach areas. The technologies provided are appropriate in respect to the geophysical condition, challenges in relation to climate change and affordability as well. The villagers have not faced any problem in owning the water supply technologies in their respective village sharing a very minimum cost. The operation and maintenance of water technologies are satisfactory. Trained caretakers from the user-groups have been involved in caretaking of the technologies.

## *Caretaking Community Asset*

*Mowlovi Mohammad Mohsin, 60-years old, is the caretaker of the Ring-well set-up with assistance from NGO Forum and SHED at his courtyard involving other beneficiaries of 20 households. Before installation of the Ring-well there was a Dug-well at his courtyard, in which water remained available for a maximum of four to five months. Through the rest of the months they had to collect water from springs located in the hill. To solve the crisis of water Mr. Mohsin and his neighbours decided to install a Ring-well as solution of the problem of drinking water of those households. It is to be mentioned here that the settlement is very scattered and land formation is rough in the village. Mr. Mohsin says, "The collection of drinking water happened to be a very hard and laborious job for women, because mostly, they had to collect water from springs and canals. But now a permanent safe water source is at my courtyard, it is my responsibility to protect and maintain that with care. The community people have selected me as caretaker for this water technology and NGO Forum has trained me as a caretaker of the Ring-well. They also have provided me a toolkit for maintenance and repairing. Now I am capable to repair any minor problem".*

*Mr. Mohsin says, "We the people of such scattered and inaccessible villages were habituated to drink water from the general sources like springs and canals and also habituated in defecation in jungle and bushes from the immemorial time. We did not have any idea about water technologies that has recently been used and we did not know about negative impact of drinking water from canals and springs. Now the information about drinking unsafe water and scattered defecation and its relation with health status and health expenditure has been reached to the villagers of Mathabhanga. Now we know by drinking safe water and avoiding open defecation we can save our lives and can reduce the expenditure for health. By knowing all these messages, especially as a caretaker of the Ring-well, I cannot ignore my responsibilities and neglect my duties assigned by neighbours and the providers of the technology. NGO Forum and SHED are outsiders, but they have been giving hard effort for the improvement of the situation of the village. In response we should honour them and perform our duties to the point. He adds, "I am committed to maintain the Ring-well by any means and through these services I am serving the people. NGO Forum and the community people have created an opportunity for me to serve the people by staying at home. The Ring-well has been considered life-saving and convenient water technology by people. Taking proper care of the technology is therefore my utmost duty".*

*He also expresses his satisfaction that initially it was thought that it would be very difficult to change long traditional habits, but people have been able to achieve the primary objectives and could set a milestone. If people have become habituated with good things by giving up a bad one, they can not go back to bad one again. Same thing has happened in the case of water and sanitation programme in the village, especially in the case of water supply technologies. People have been convinced of the benefits and therefore it is expected that they will stick to it. Even though Mr. Mohsin is not getting any financial benefits from taking care of the Ring-well he feels that he along with his neighbors own the technology and by taking care of it for people's cause his ownership is reinforced and he feels the self-satisfaction over the responsibility he is carrying. "I shall carry on this responsibility in the days ahead and serve people", says dedicated Mohsin.*

Various promotional activities have been conducted to make the community people aware about the importance of and accomplish bringing in 100% safe WatSan coverage and subsequently to raise the hygiene behaviour to a significant mark in the community. The processes of implementation of such comprehensive activity have created an immense impact in relation to health and hygiene promotion based on safe water supply and sanitation coverage combating the climate change and other hazards. Among the implemented activities Participatory Need Assessment, Courtyard Meeting, School WatSan Programme, Community Meetings, etc have been mentioned by the villagers repeatedly as the most useful ones. The villagers also have expressed about the effectiveness of promotional activities with specific impacts such as Courtyard Meetings have changed the hygiene habits of children and women, School WatSan Programmes have impacted on the schoolboys and girls in changing their habit

and have mobilized them working as change markers in their community. These promotional activities have been conducted with the aid of various communication materials like Posters on Safe Water, Environmental Sanitation, Personal Hygiene, and colourful Stickers, Leaflets, Flip-charts, etc which have played an effective role in creation of needs and helped to increase the hygiene practice among the community people. Especially in remote areas it has tremendous impact on illiterate people as well as other section of people including children and adolescents. Such programmes have important and effective role in achieving the target of the programme and now the villagers are aware and motivated enough to continue their hygiene practice based on safe WatSan facilities in adaptation to climate change in different hard-to-reach areas.

## Chapter-6: Conclusion

NGO Forum's water supply and sanitation programme focusing the hard-to-reach areas is the response of long lasting needs of safe water for drinking purpose and sanitation of the people of those areas. The programme has been successfully implemented in respective areas and has already been proved as an effective approach of implementation. The technologies are proven adaptive to climate change and disaster risk which have been found effective. The technologies are fully functional at present under the community-management approach. However, the programme has been following rigorous participatory and consultative actions from planning and implementation to phase out stage. This process has ensured participation of different stakeholder groups including development, religious and local government institutions along with the community people. In implementing the programme, supports and services have been provided by NGO Forum with assistance from local partner organizations and community allies. In addition, the capacity building process and techniques are carried out for respective stakeholders and community people by considering its importance for sustainability of accomplishment. These actions have capacitated the target stakeholders in various forms. Throughout this process community people have realized the needs and importance of such activity that would continue to benefit them and their next generations. Such realization has been transformed into social capital that is essentially needed for sustaining the accomplishments.

The technologies have been found effective in hard-to-reach areas because of its quality and consideration of area specific characteristics during designing of them. It is to be mentioned here that the intensity of natural disasters is gradually increasing, especially in the hard-to-reach areas like *char*, *haors* and coastal belt. So, there is a need to rethink about the design of PSF and Rain-water Harvesting System, especially for the coastal areas. The focus of attention is to be given to design assuming more intensity of disasters. It has proved that the technologies are functioning effectively in different hard-to-reach areas, and those are climate-resilient to a markable extent comparing to the severity of the natural disasters and hazards taking place in Bangladesh these days.

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