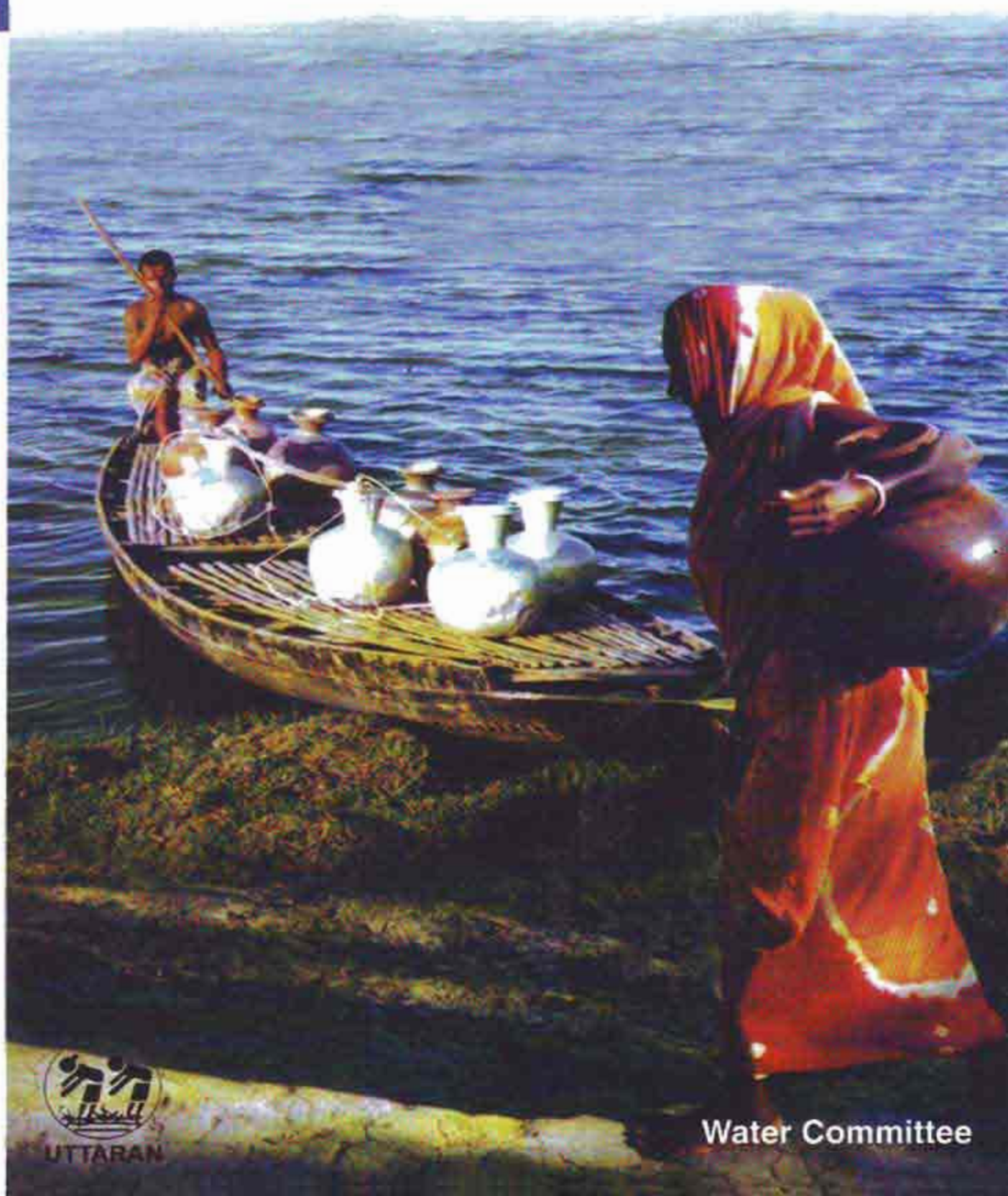


In Search of Safe Drinking Water

In the context of Climate change and Salinity



Water Committee

In Search of Safe Drinking Water

In the context of Climate
change and Salinity



In Search of safe drinking Water

In the context of Climate change and Salinity

English version of the monograph

*Jalobayu Paribartan o Labonakta Elaka Shamprasharaner Prekshitey
Shupeyo Panir Shandhaney*

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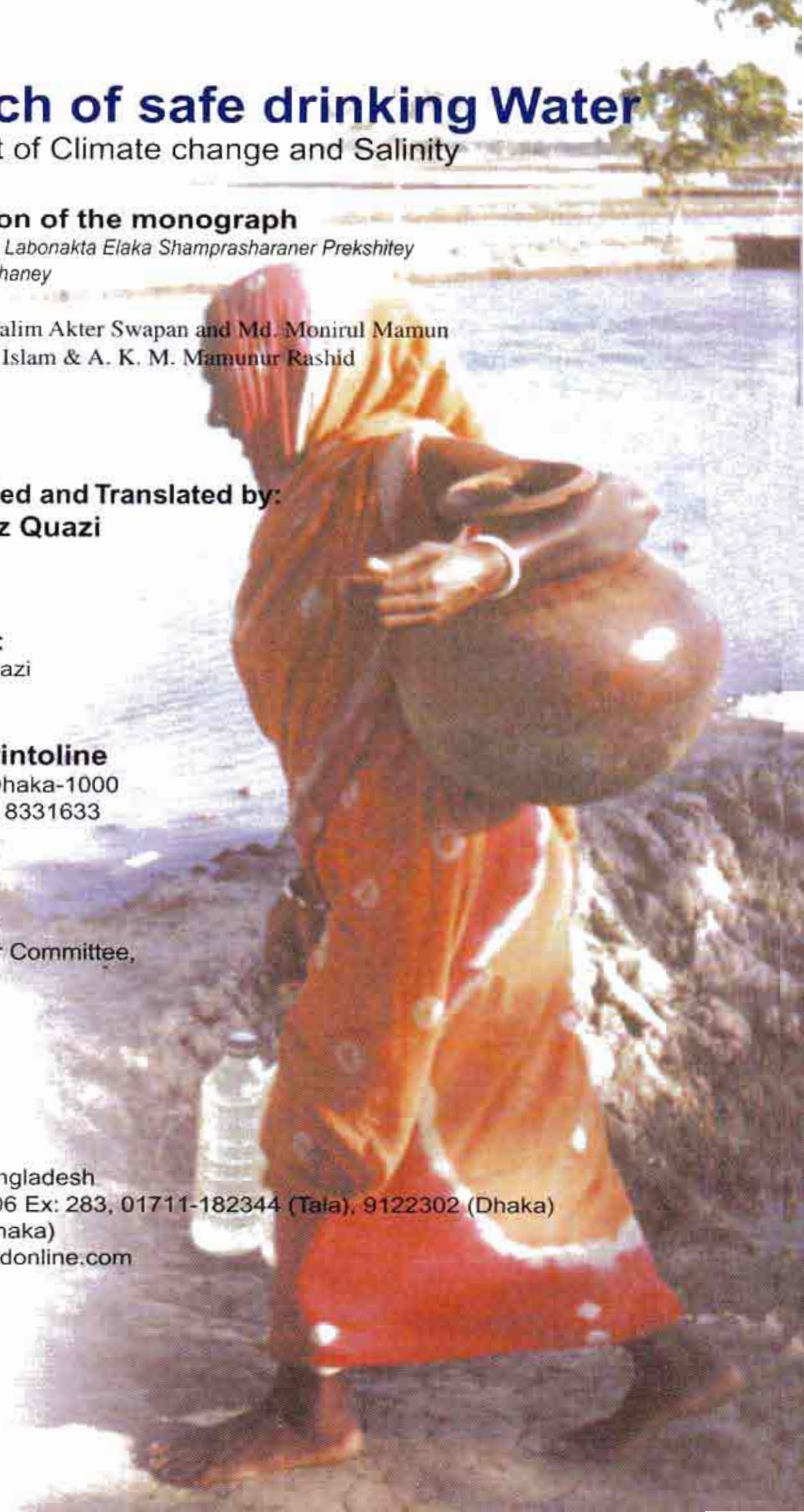
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Forward

The problem of safe drinking water in South-Western Coastal region in Bangladesh is not a recent phenomenon. This problem is becoming more acute and fatal as to the expansion of salinity area. It is apparent, that in future scarcity of safe drinking water would bring acute vulnerability to public life of the region. At this period of time, about 50 hundred thousands inhabitants of the region are suffering as to the problem of salinity and arsenic containing water. Compare to magnitude of the problem, initiatives for it's resolution is absent, to be 'precise'. The Government of Bangladesh has undertaken initiatives to execute National Water Policy, National Water Management Plan, National Safe Water Supply and Sanitation Policy and Coastal Belt management Policy (Draft). However, it could be brought at sight that in given policies, there isn't any clear plan to resolve the problem of safe drinking water of South-western Zone.

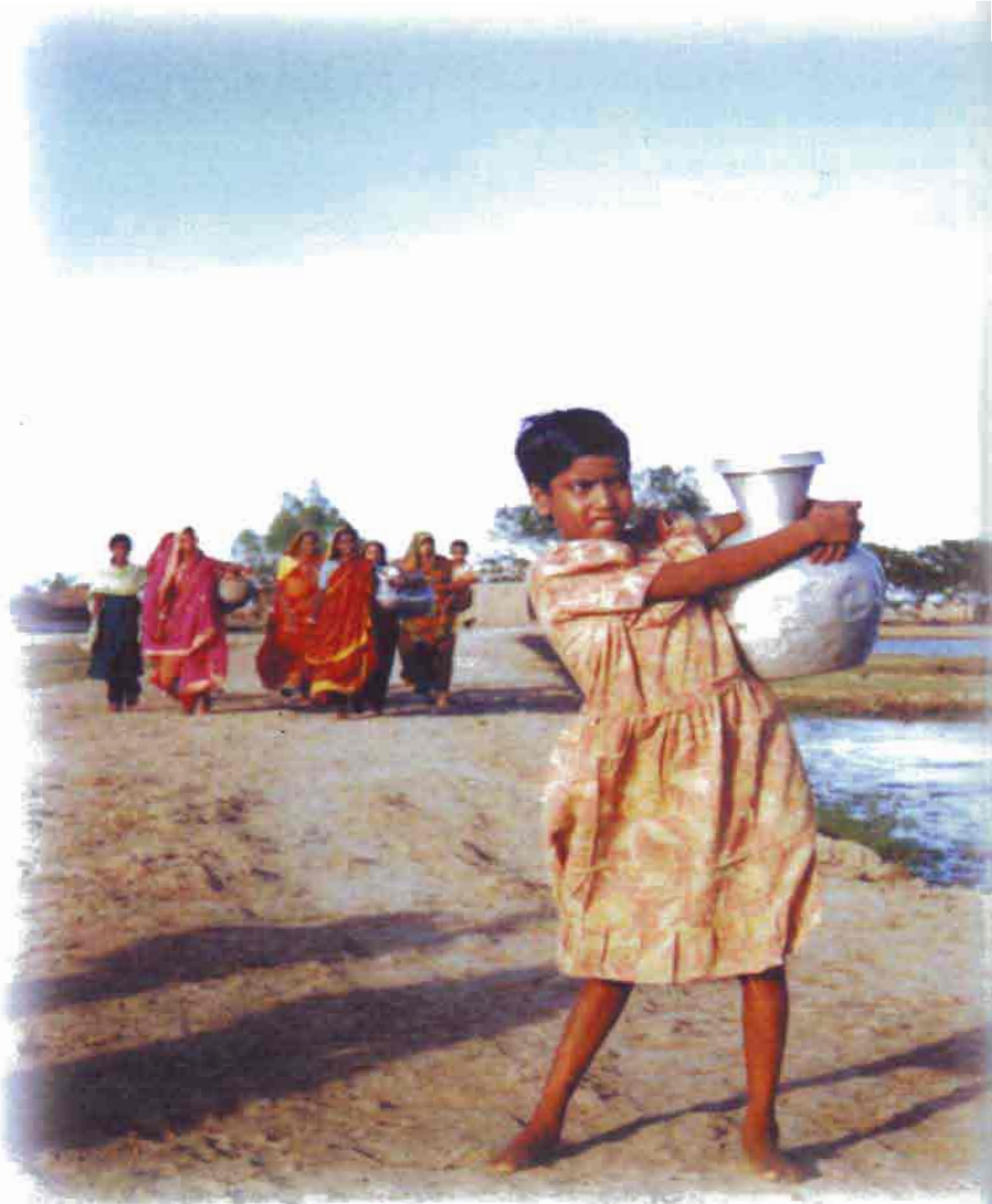
Social Welfare Organization, Uttaran is working on the issues related to safe drinking water for a long period of time. In this region, 'Water Committee' an organization of local citizens has organized a 'movement' with a demand to resolve scarcity of safe water. To bring at sight of all members of society, initiative for this publication has been taken. To reveal the scenario, views, understandings, facts that had been obtained by means of PRA and Group Discussion of the effected male and female of different upazilas, and conduction of six workshops that were participated by teachers, journalists, intellectuals, representative of Local Government, Upazila Health Engineer, Doctors, NGO Workers, poor inhabitants and representatives of diverse professions. Along with given, inhabitants of different social strata, and leaders of 'Water Committee', had been intensively conversed, and exchanged views and opinion with experts had also been carried out. A large part of this publication contain information and conceptions of different categories of people obtained by the given modality. If the publication will be in a position to bring the issue to the attention of the entire society, this initiative could be considered as successful to a reasonable extent.

Indebtedness is expressed to all those who had gathered information for the purpose of this publication and assisted in any form. Thanks is extended to Deputy Director of Bangladesh geological Survey, Mr Reshad Mohammad Karim Ali; who has enriched the publication by providing needed data and information. Thanks and gratitude is extended to the Director of Water and Environment Division of the Bangladesh Unnayan Parishad, Advisor of RVCC project of Care-Bangladesh Mr. Ahsan Uddsin Ahmed, who has provided opportunity to reinforce the materials on policy related issues on water in general, and safe water in particular with his insightful discussion on policy.

With Thanks

Director
Uttaran

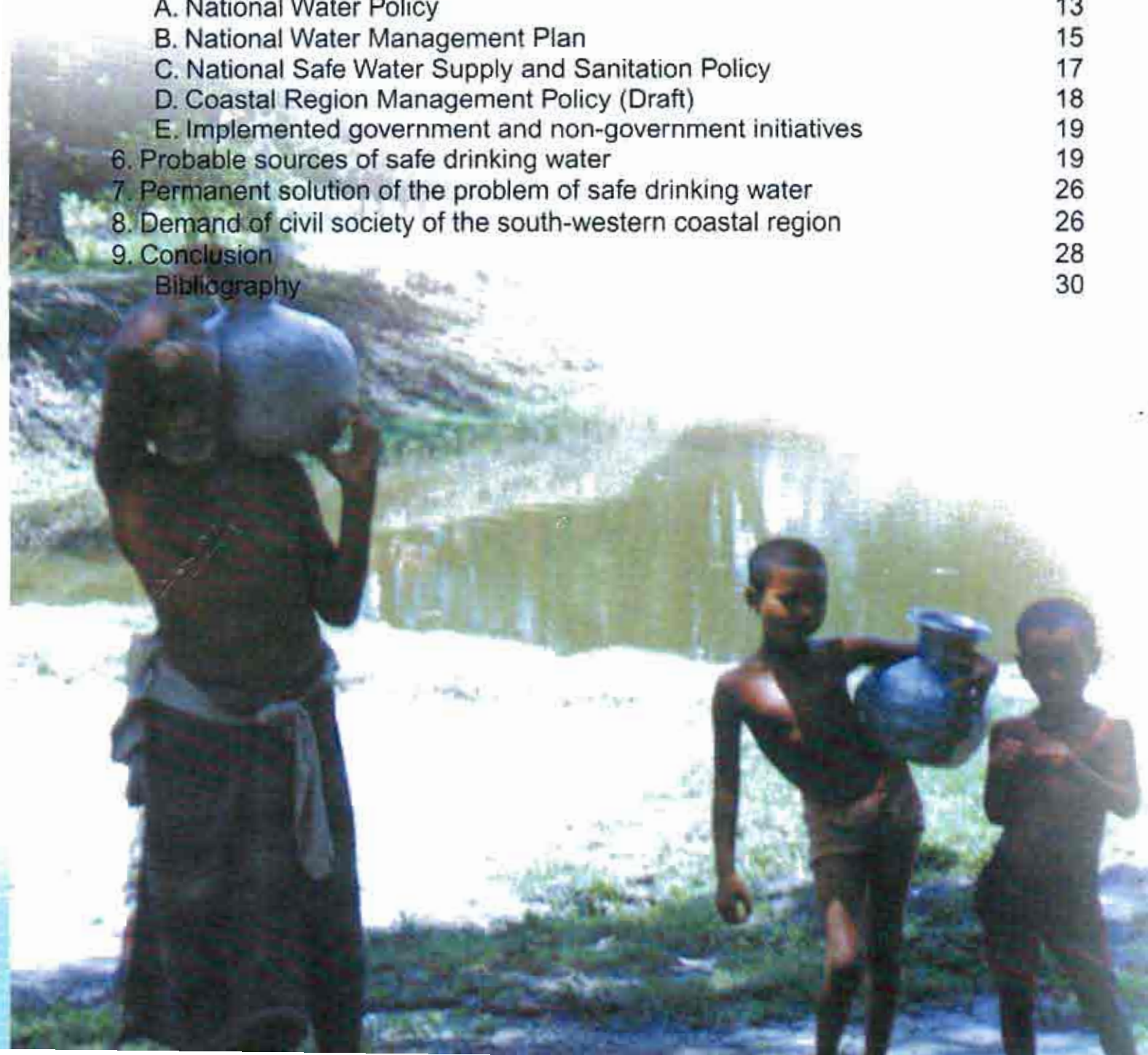
Chairperson
Water Committee



Does Supply of Saline Free Water is the Obligation of This Child or State?

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It is neither petrol nor is it diesel; this is the mode of transportation of drinking water free of salinity from Satkhira city to the crisis prone villages.

1. Background

With the increase of population in the world, demand for the safe drinking water is increasing as well. As to this, human thoughts about safe drinking water as natural resource are gradually expanding. Improvement of life as to the advancement of science, the per capita use of water has increased, however, safe drinking water in the world is limited and its sources are not equally distributed all over the world. Further, human intervention increasing this crisis, making water sources of the world polluted and unusable. Therefore, presently, experts of the world are taking into consideration this matter with great care. To bring this issue into focus of the world, the World Environmental Day, 2003, had been observed with the slogan "Water - Two Billion People are Dying for it."

Scarcity of safe water is causing death of about 50 hundred thousands people each year as to different types of water borne diseases and migration of people from their place of habitation. Economic and agricultural development is also impeded and environment and eco system are effected as to lack of fresh water.

Water resource of the world is abundant, but most of it is not useable for human need. Only 2.5% of the total volume of water of the globe is fresh, of which 68.9% is present at the state of ice and frozen rivers, 0.009% are found at the lake and river and 28% is reserved in underground aquifers. Of 2.5% fresh water, 23% is used in industries, 69% in agriculture, 8% in domestic purposes and only 0.025% could be used for drinking. This inadequate volume of safe drinking water is getting polluted as to human activities and natural processes. It is getting polluted in different regions as to different reasons, such as, the presence of arsenic, nitrate, fluoride in the water, salinity, disposal of industrial and other waste in the water bodies, and use of fertilizer and pesticide. In this context, it could be noted that as of United Nation, by 2025, more than 2.8 billion people of 48 countries will face scarcity of water and by 2050, 54 countries with 4 billion people will encounter similar problem.¹

2. Bangladesh and Water

A large part of Bangladesh is formed as to siltation process of three rivers particularly, the Ganges (Padma), Brahmaputra (Jamuna) and Meghna. These three rivers being the main sources of entire river network system of the country, have been shaping the life and culture of its people through centuries as people relies on these rivers for irrigation, fishery and hydrology.² These rivers are largely contributing to bring prosperity to the country as well as responsible for some of worries that country is presently facing, particularly, flood during monsoon and scarcity of water as to drought in lean period.

The river basins get flooded as to augmentation of the flow of these rivers in monsoon as to heavy rainfall in the Brahmaputra and Meghna basins in the early period of the season and in the basin of Ganges at the end of the season. This results in disruption of human habitation, agricultural land and pollution of drinking water sources as they are marooned. The flood and suffering of the people become severe and prolonged if the heavy rainfall took place in both the

basins at the same time in one hand and rise of the tidal height of sea during 'full moon' and new moon (Vora Katal and Mora Katal) on the other. The flood of 1998 is an instance of it.

The flood apart from devastation, also play pivotal role in the development of landmass of Bangladesh. Flood improves the fertility of the cultivable land and formation of new landmass through siltation. Each year, 2 billion tons of silt from the up-stream of the basins of Brahmaputra and Meghna fall into the Bay of Bengal. Along with Nijhum Island, coastal region of Bangladesh are evolved as to the process of this sedimentation.

The worries of the people of Bangladesh do not end with the receding of water and end of monsoon. Drought and scarcity of water begins with the start of dry season. In Bangladesh, usually the period between November and May is considered as dry season. Insignificant amount of rainfall take place during this period.

During dry period, only 22% of the total annual rain fall takes place in the country and the evaporation rate is four times higher than the amount of rainfall. This result in scarcity of water as to the decline of water flow in the rivers and drying up of large numbers of water bodies.

The problem of flood and drought gave birth to several development ideas as solutions, many of which received attention of the decision makers of the country. The construction of embankment and sluice gate in 1950s to trim down the destruction of flood, on the recommendation of Krug Mission , is one of such instances. However, this initiative, instead of solving the problem has aggravated it, increased in terms of magnitude and geographical coverage - permanent waterlogging in some places has emerged as an addition to the problem. Some experts argued that the water problem of Bangladesh cannot be solve through technical initiatives within Bangladesh as the sources of 92% of the total water flow over the country are located beyond the international boundary. It is to be noted that of 57 international rivers that flow over Bangladesh, 3 are originated in Myanmar and remaining-54 in Bhutan, Nepal, China and India.

The technical solutions, demands joint efforts by all co-riparian countries. However, political contention has been restricting such joint initiatives. Individual countries of the subcontinent are continuing implementation of national water development initiatives unilaterally which is aggravating the situation. The diversion of water from Ganges through barrages has reduced the water flow by 30% and has augment the scarcity of water during dry season by creating crisis for safe drinking water in Bangladesh as an cumulative effect.

The lack of surface water for irrigation during dry season has compelled the farmer of Bangladesh to exploit underground water extensively resulting in lowering of underground water table beyond the suction limits of shallow tubewell making million of shallow tubewells dysfunctional. Many think, that this over-extraction of groundwater is one of the possible reason for the contamination of shallow aquifer by arsenic. Recent studies indicate that shallow aquifers of 61 of 64 districts are containing arsenic beyond the acceptable limit for drinking and

cooking purposes. This has threaten the existence of present rural water supply system of Bangladesh which is primarily depend upon shallow tubwell. The magnitude and nature of this drinking water crisis vary from region to region however, it is much acute in the South Western Region of Bangladesh.

3. South-Western Coastal Region of Bangladesh and Scarcity of Safe Drinking Water

The South Western Coastal Region is composed of Satkhira, Khulna, Bagerhat and part of Jessore districts. The people of this region are facing severest difficulties in accessing safe drinking water. Salinity in ground and surface water, arsenic contamination of shallow aquifer, lack of aquifer, difficulties in extracting saline free water from deep aquifer as to the presence of hard rock and stone layers are responsible for it. Few available fresh water ponds known, as Mitha pukur and rainwater during rainy season are the only drinking water sources for the people of this area. The situation is further aggravating as to reduction of existing freshwater ponds and pockets of safe aquifer as a result of shrimp cultivation,³ gradual rise of sea level, saline intrusion and reduction of fresh water as to decrease of upstream flow.⁴

The South Western Coastal region

The South Western Coastal region is neither the integral part of mainland nor an extension of it. The entire area is coastal wetland and brackish in nature. It is unique in biodiversity. A large number of marine species spend a particular period of their life cycle in the area. The largest mangrove forest 'Sundarban' is situated here. From Sundarban, about 3 and half million ton tree leaves fall in the wetland, which are directly transformed into ingredient of food and through tide and ebb tide it get spread into the entire wetland attached to Sundarban and fall into the sea, which are the key source of food for all living organisms that harbor in the sea. This wetland usually gets flooded twice in a day by tide and ebb tide of the sea. So, its organic productivity is very high. Most of the plants and numerous species of rice that are available in the area have the quality to cope up with salinity. The region is basically flood land of the Ganges. In the past, rivers and tributaries in this region was linked to fresh water of the Ganges, which caused reduction of the impact of saline water. However, today, for multiple reasons, the region has turned into acute salinity region and the extreme scarcity of drinking water is experienced by inhabitants.

A. Problem of fresh water flow

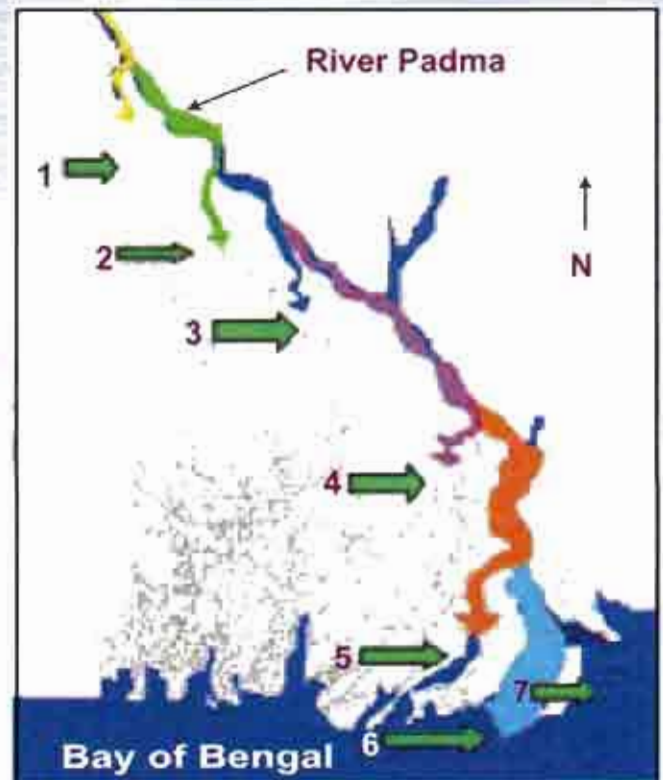
In past, the south-west coastal region was rich in fresh water, as Ganges had been flowing through it. The agricultural land was fertile. However, the scenario got changed as to two disastrous events in region. Firstly, the change of the course of the river Ganges, and Secondly, closing of the face of the origin of the river Matha Vanga.

The Change Of The Course Of River Ganges:

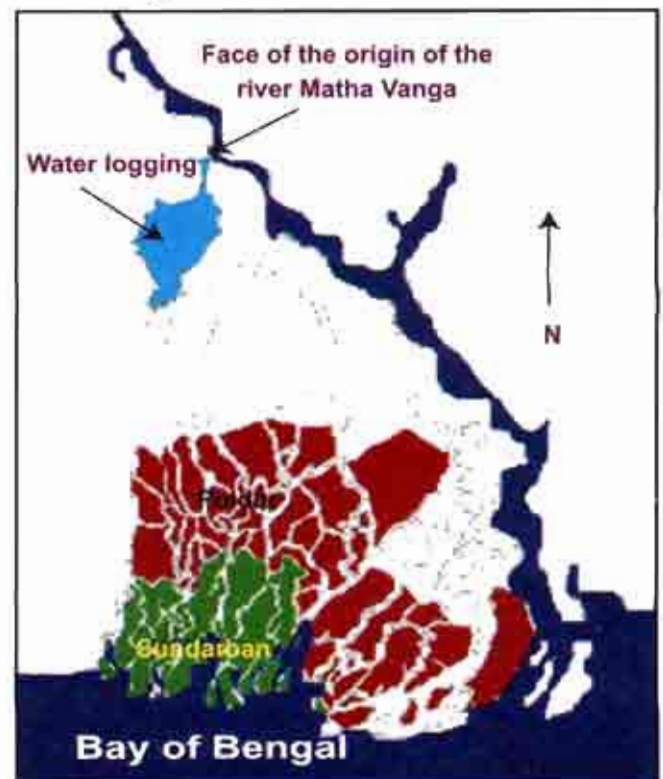
The Ganges river had been flowing over upto 15th and 16th century. Since then, as to different natural causes, the river Ganges gradually changed its course towards south-east. This resulted in the reduction of availability of fresh water in the region. The agricultural system that dependent on fresh water has encountered serious consequences.

Closing Of The Face Of The Origin Of The River Matha Vanga

The region encountered further fatality with regards to fresh water flow in 19th century when the face of origin of Matha Vanga river, a distributary of Ganges, got closed. British colonizers used Matha Vanga river as means of transportation from Kolkata to North Bengal. Strong current of Matha Vanga caused naval accidents, which caused death of many people. In order to reduce the severity of current of Matha Vanga, they sank large boats with full of soil on the place of origin of the river. As a result of this, temporarily, the current of the river Matha Vanga had reduced. Later, the mouth of the river got closed permanently as to sedimentation, which has separated the river Matha Vanga from Ganges and the place has turned to only a drainage channel for rain water. British colonial government had adopted different strategies to revive the channel. However, none of their efforts proven to be effective. In 1919, world renowned water scientist William Cox had presented a plan for making a barrage on the river Ganges at the lower part of the Matha Vanga to raise the water level by 7 feet at the upstream of barrage. He emphasized that the execution of his plan would certainly revive the river Matha Vanga. But his plan was not implemented by the colonial power.



1, 2, 3, 4, 5, 6, and 7 are the direction of the changes of course of the river Padma



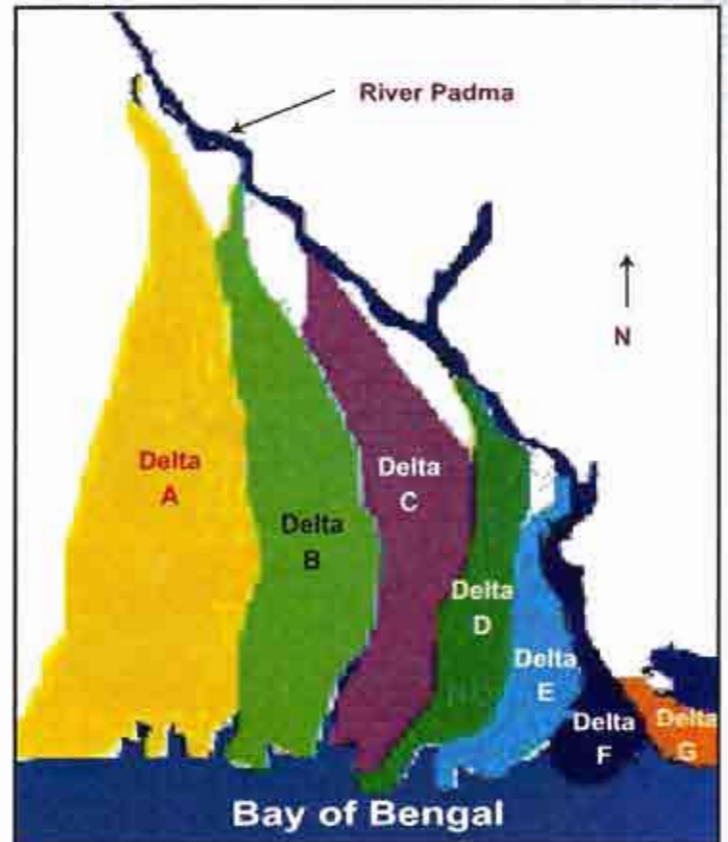
River Matha Vanga with close face of origin

The death of the river Matha Vanga in 19th century caused disaster for the people of Jessore and Kustia region. Cholera and malaria had spread in epidemic form as to lack of freshwater and thousands of people had died. In a similar manner, it had an adverse impact on the agriculture and on Sundarban. For example, the Satkhira range of Sundarban that include part of the mangrove forest which depended on the river Kopotakhso and Bethna, distributaries of Matha Vanga, experienced major change. Emergence of trees which can grow in high salinity was observed instead of those species which can grow only in less saline environment.

The reduction of fresh water flow has caused scarcity of fresh water, in the basin of Matha Vanga, means area which is depended on the river Bethna, Bhoirob, and Kopotakhso, and salinity had increased as to intrusion of water from the sea.

B. Coastal embankment project of 1960s

River and tidal borne sediment concentration has formed the land mass of the coastal region. This process of land formation was hampered by the implementation of coastal embankment project in 1960s. Under this project, 97 polders was constructed, among which 37 in South Western Region, to free the wetland from saline water and to grow more food. The construction of polders has restricted entrance of river water to the wetland which resulted in elevation of river beds as to the concentration of tidal borne sediments in the river bed, instead of wetlands. The elevation of river bed in some area is now higher than the adjacent wetlands as a result the water of the wetland could not pass through the river and, it created water logging in many places. The problem of water logging becomes more acute and prolonged when saline water entered into the wetlands during high tide. This ultimately created scarcity of availability of fresh and drinking water.



A, B, C, D, E, F and G are the delta created by river Padma in succession

C. Reduction of the flow of river Ganges in dry season as to the over withdrawal of water in the upstream.

Ganges or Padma is the largest river that flow over Bangladesh. In dry season, about 175 hundred thousand cusec water used to flow on the river. In 1930s and 1940s this flow had been about hundred and thirty five thousand cusec.

The Ganga water distribution Treaty, commonly known as Farakka treaty ensure the availability of only 27500 thousand cusec water for Bangladesh in the lean period and the remaining amount is available to be diverted by India. India divert water through a feeder canal from Farakka barrage to river Hugli to ensure proper navigation at Kolkata port. It is important to mention that the feeder canal can divert 40 thousand cusec of water which is needed to maintain the required depth of the river Hugli.⁵

The reduction of fresh water flow of Ganges as to the withdrawal of water by India, in the Balashsar and other rivers of Bangladesh, salinity has increased.

The raise of salinity in the river water has created some problem such as, industrial equipments in Khulna is becoming unusable, electricity bill is increasing with the increase of production cost as to running the Khulna power plant, the authority is compelled to cross long distance to collect required fresh water (from Madhumat), destruction of the biodiversity and agricultural system of the coastal area, 'Sundry' tree of the eastern part of Sundarban is attacked by 'Agamora' (root death) disease, sources of fresh water are getting polluted and scarcity of fresh water is increasing.

D. Cultivation of brackish water shrimp

Presently, in the south western region, shrimp cultivation in almost all the wetlands is underway. In most of the cases, salt water from river are brought into the wetland for shrimp cultivation, which is increasing the salinity of the adjacent fresh water ponds and shallow aquifer through seepage and creating problem for drinking water.⁶

E. Arsenic Contamination

Underground water of this region contains arsenic. A study carried out by Uttaran indicated that 79% of the tested tubewells of the area contain arsenic beyond the acceptable limit.⁷ The presence of arsenic in the underground has further aggravated the crisis of drinking water in the region.⁸

F. Lack of aquifer

Ground water occurs in permeable geological formations known as aquifers, that is a formation having structures that permit appreciable water to move through under ordinary field conditions. For extraction of groundwater, medium clean sand is suitable. This sand has considerable porosity and permeability and can store huge amount of water. Fine sand also can store considerable amount of water. However as the position of the area is in the lower part of Ganges delta, the sediments of the region are mainly clay, silty clay, peat, peaty clay. These sediments have very low permeability and is not able to produce water. As a result, the region lacks aquifer from where fresh groundwater can be extracted.⁹ In some place aquifer is present in such a depth from which fresh water extraction is very difficult and very expensive. This situation can be observed in Koira, Paikgasa, Asasuni, Shyamnagar, Kaligonj, Debhata, Dakop, Mongla and Sharankhola. Inhabitants of these areas cross 2 kilometer and in extreme cases 7-8 kilometer to collect fresh drinking water.

G. Land Subsidence.

Dr. Munirul Haque, Director of the Institute of Delta Research Institute of Dhaka University has found in a study that most of the area of wetland is subsiding by 1-2cm each year. Before the implementation of Coastal Embankment Project, river borne sediments used to deposit in the wetland, so the rate of land formation was higher than the rate of land subsidence. However, the process of land formation, as a result of sedimentation had completely stopped with the construction of coastal embankment. In last 3-4 decades as to continuous subsidence of land within the WAPDA embankment is gradually going down and the expansion of saline water is tangible.

H. Excessive use of Underground water in an unplanned way

Since 1980s, vast land of South-western region, except the slight saline wetland, has been brought under irrigation for cultivation of Borro rice through extraction of underground water in the dry season. Excessive use of ground water for irrigation has increased the harvest but created severe problem for underground water table. The shallow water table is declining fast as the rate of withdrawal of water is much higher than the rate of natural recharge of water table. This unplanned excessive withdrawal has created problem for both fresh and safe water which would have long term implications.

I. Increase in Scarcity of Saline Free Drinking Water in Future:

The present problem of saline free drinking water in the region is expected to be increasing in future as to global climate change and execution of Inter River Linking Project of India.

Climate Change:

It has been assumed that the effect of the disaster on Bangladesh will be more fatal comparative to other countries of the world. A large part of Bangladesh (14-17% of the total land mass) will go under the water. About 20 million people will not have a place to live. If the sea level height increase only by 1 meter, 22.889sqm, (greater Khulna 65%, Barishal 99%, entire Patuakhali, Noakhali 44% and Faridpur 12%) of the country will go under the water.

The implication of climate change in Khulna, Satkhira and Bagerhat of South Western Zone is already tangible. As of the view of the experts, since last 3 decades, each year the rate of rising of Sea level in the coastal region is 3 to 4 mm. The height of ground level of South Western region is slightly higher than the sea level and in near future all the sources of fresh water may completely destroy as 1 meter rise of sea level is enough for it.

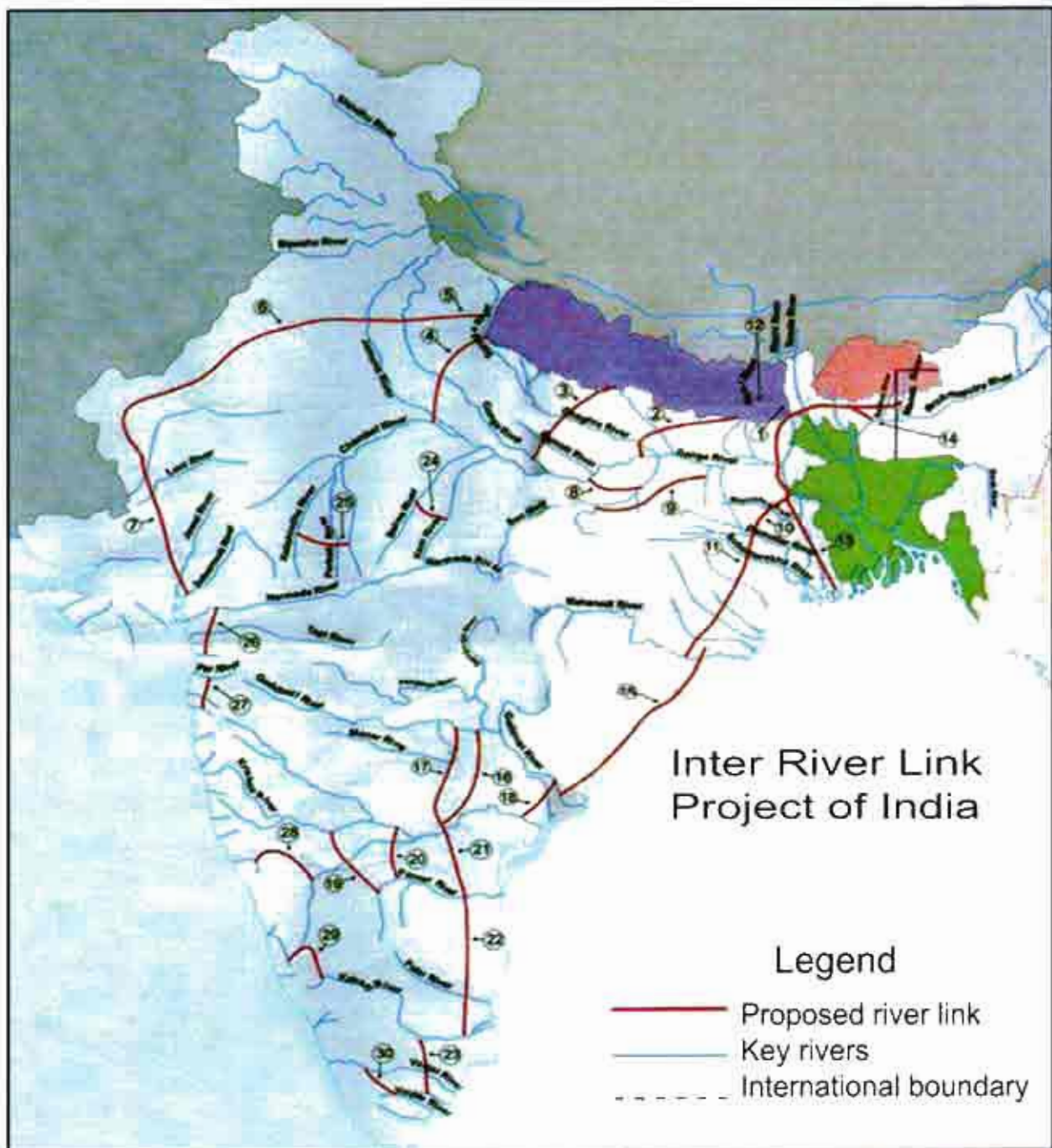
Inter-river linking project of India

The river-linking project undertaken by the government of India will be the largest infrastructure works ever undertaken in the world. Under the project, 30 links and some 3,000 storages will be built to connect 37 Himalayan and Peninsular rivers to form a gigantic water grid. It will cost a whopping \$120 billion and handle 178 sq cubic kms of inter-basin water transfer per year. 12,500 km of canals will be built, 35 giga watts of hydro-power capacity created and 35 million hectares will be added to the total irrigated area.¹⁰ It will also generate a substantial volume of navigation and fishery benefits. The Supreme Court of India, through one of its direction asked the government to complete the project by 2012 however, government informed the court that it is only possible by 2016.¹¹

The project has raised concern in Bangladesh as diversion of water from common rivers through construction of barrage particularly on the tributary and distributary of river Bramaputra would have severe implication on the availability of fresh water. Experts estimated that diverting just 10 to 20 percent of water of the Brahmaputra River in India could cause 100 rivers in Bangladesh to dry.

This will further result losing the necessary depth of the rivers, intrusion of saline water from the sea into the inlands which will increase salinity and scarcity of fresh water. The waterways of Bangladesh will be dried up. Agricultural system and river based economy will be under disastrous condition.¹²

Presently, the source of fresh water in the south western coastal region is Gari and Madhumati rivers. If Inter river linking project executed, the flow of fresh water of both the river will be lost and crisis of safe drinking water supply would increase further and the biodiversity of this region will be destroyed and Sundarban will come under disaster.



4. Vulnerability of life as to the scarcity of water free of salinity

There is an acute shortage of safe drinking water in the villages of Shyamnagar, Assasuni, Kaliganj, Tala, Debhata, Koyra, Paikgachha, Dacope, Batiaghata, Dumuria, Mongla, Rampal, Chitalmari, Morelganj, Bagerhat and Sharankhola upazilas of districts of Satkhira, Khulna and Bagerhat. More than 5 million (50 Lakh) people of the region have been suffering from crisis of safe drinking water. Few PSFs, Rain Water Harvesting System and Deep Tubewells are the only safe sources available for the people of this area which is very insignificant in comparison to the actual need. A large number of people depend on fresh water ponds for drinking purposes which can not be considered as safe. So far no mentionable attempt has been made by government and non government authorities to meet the need of safe drinking water for the people of the region.

As to the inadequacy of safe water source, women are walking from one village to other to fetch a jar of water. In extreme cases, women of some villages walk 6 to 12 km in order to fulfill the daily requirement of 3 jars of water per household. They require to wait in queue to collect arsenic free drinking water from tube well or PSF. People from Assasuni, Shyamnagar, Dacope, Koyra, Mongla are traveling to and from adjacent urban areas to fetch safe drinking water. Drums or containers filled with water, supplied by urban authorities are transported to remote villages.

Case Study - 1:

Shwapna could not get married as to problem of gathering drinking water for the family. She is the third child of her parents who are poor and physically incapable to fetch drinking water from distant places. Her parents arranged marriage for her two elder sisters earlier but now they are reluctant to arrange marriage for Shwapna as no other person is available to ensure the availability of water at home. (relevant photos) Shwapna lives in the village Gabura

of Shyamnagar Upazila under Satkhira district. The village lacks sources of safe drinking water. For 600 households of the village not even a single safe water source is available. A Pond Sand Filter (PSF) was installed by the Government in the village but at present it is dysfunctional. Swapana

and her neighbors collect water from sources located at Shora and Burigoalini villages. They collect water from PSF of village, Shora, which is at a distance of 2 km from Shwapna's house only during monsoon as the pond with which the PSF is attached become dry in dry season. In dry season they cross 3 K.M distance by boat to collect village Burigoalini.



Case Study - 2:

Shundari earns her livelihood by selling drinking water from door to door. She is 55-year of old widow. Shundari has been maintaining her livelihood by selling drinking water in the locality for the last 10 years. Shundari lives in the village, Burigoalini. She walks to and from PSF at the other end of the village to collect water and deliver it from door to door. Shundari has become an essential person for all the inhabitants of the village.



Case Study - 3:

Kalidashi, Alulata and Manisha are from the Shamukpota village of Lata union under Paikgacha Upazila. There is no safe drinking water source in the Shamukpota village. The existing tube wells in the village are contaminated by arsenic and Salinity. So they have to collect drinking water from the tube well installed in front of the house of Bhola Mondal in Bahirbunia village at a distance of 3 km. Kalidashi, Alulata and Manishas do not know when they will no longer be required to walk long distance to fetch drinking water



As to lack of safe water sources, people in the region are suffering from various diseases caused by drinking insufficient amount of water or water with salinity, impurity or arsenic contamination. Various skin diseases, intestinal diseases, dysentery, fever, diarrhea become a part of life for the people. Malnutrition of the women and children, reproductive health problem for the pregnant women, turning skin black, physical weakness and anxiety prevail. There are frequent contentions among family members and increased incidents of women oppression for reasons of not fetching drinking water on time or inability to finish cooking when require as to consumption of long

hours for fetching water. There are other social crisis particularly, education of children is hampered, incidents of child labor, problem in entertaining guests, women are teased on their way to fetch water, problem of getting girls married, increased rate of divorce, migration and local contentions and litigations related to water use have become a regular phenomena.

As to involvement in gathering drinking water a significant amount of their productive hours is consumed, expenditure of household as to purchase of fresh water increases, loss of opportunity for cultivation of vegetable, cost of buying vegetable increases, the durability of house reduced, scarcity of food occur, maintaining livestock and poultry become difficult, scarcity of organic fertilizer become acute, carrying out agricultural activities become difficult, all these together constitute major economic problem.

Case Study - 4

Adolescent girls Jesmin and Josna go to fetch drinking water this way. They are 13 to 14 years old. As there is no source of drinking water in their village, Kathmari. They are two sisters required to fetch drinking water from the neighboring village Godardanga at a distance of 2 km.



Case Study - 5

Sreeula is a village under Assasuni Upazila. Tube wells in the village are either contaminated or possess high salinity. Therefore the villagers are compelled to drink ponds water. Some of them drink rain water and some pay Tk10 per jar of water. There are 4 small and big ponds in the village. Villagers drink water from these ponds without any sort of purification. Women from the Shitalpur village and the village named Yousufpur of Champaful Union under Kaliganj upazila cross the river to fetch drinking water from these ponds. Water in these ponds is depleted during February and



March. Then the villagers have to walk an extra 2 km to fetch drinking water from the pond of Mohiuddin Chowdhury at the extreme end of the village.

A number of environmental problems have emerged as to lack of fresh water such as devastation of agricultural production, reduction in the number of species of fruit, timber and medicinal plants and trees, death of less saline-tolerant trees, destruction of indigenous species of fishes, closure of fresh water fish farms, reduction in soil fertility, destruction and loss of the biodiversity of Sundarban forest.

The given context demand large scale intervention of government and non government institutions to address the issue of safe water in the South Western region.

Case Study - 6:

Keshmonis fetches drinking water daily from 2 km distance. Keshmonis lives in the village named Pankhali of Munshiganj Union under Shyamnagar upazila of Satkhira district. There is no source of safe drinking water in the village. Pankhali village is like a stripe along the WAPDA embankment (around 2 km in length). On one side there the Chunkuri River and other side the shrimp gher. So far 3 children drowned to death in the gher water in the last years. Therefore the mother's shoulder carries their children besides the jar all the way to and from the source of drinking water.



5. National level initiatives and limitations in resolving the drinking water crisis:

The Government of Bangladesh has formulated several policy documents for water resources management and development in Bangladesh. These are: (1) National Water Policy, (2) National Water Management Plan, (3) National Water Supply and Sanitation Policy and (4) Coastal Zone Management Policy for coordination all of the works undertaken by different Ministries for development in the coastal area. Following is a brief review of the said policy documents to examine whether these documents have properly addressed the problem of salinity intrusion due to the climate change in the coastal region.

a) National Water Policy:

Bangladesh Government has already formulated a National Water Policy.¹³ It has been proclaimed in the introduction of the National Water Policy "...as water is an essential item for human lives, socio-economic development of the country and environmental protection, Government has formulated a policy to adopt necessary strategy and programs with the aim of management of the water resources of the country on the basis of extensive coordination and equal distribution. The Government has formulated the policy for a continuous march forward in the accomplishments of the overall objectives of economic development, poverty reduction, self-sufficiency in food, public health and security, improvement in the standard of living style of the people and environmental protection."

In a review of the water policy the observation is that the issue of climate change has not been included in the policy. At present it is globally accepted that the temperature is gradually increasing and the sea level is also rising comparatively. Bangladesh would be one of the most vulnerable countries. Especially the southwest region of the country would meet the severest catastrophe. It is feared that the whole region will go under water. This will not only cause scarcity of safe drinking water but also make the environment unfit for human habitation.

It is necessary to look into the relevant sections of The Policy, which are - Sections 4.1 River estuary management, 4.2 Water resources planning and management, 4.3 Water rights and distribution, 4.6 Water supply and health facilities, 4.8 Water and industry, 4.12 Water for environment are related to safe drinking water. Moreover it is necessary to judge how far the given policy made in the national perspective, how is able to solve the water problem especially in the southwest region.

Section 4.1. River Estuary Management: Special emphasis has been given in this section for solving different problems in the river estuaries of the country. It has also been mentioned that the joint efforts would be taken with

the neighboring countries like Myanmar, India, Nepal and China to solve the problems of the river estuaries originating from these countries and flowing through Bangladesh i.e. the Ganges, the Brahmaputra and the Meghna. So that Bangladesh can enjoy due to water rights in the dry season and can undertaken coordinated efforts for flood control and management. It has been mentioned in section 4.1 (e) that the Government would take necessary steps to control chemical and organic pollution of water in the rivers through joint venture projects with the neighboring countries but there is no hints about the salinity issue. It is clear that the flow of water increase in the rivers would be substantially decreased salinity in the river water but salinity will not reduce in the drinking water.

Section 4.2. Water resource planning and management: This is the most important section contains hopes and aspirations for a solution of all the problems (drought, flood, drainage, river siltation, river erosion, land reclamation from the seas and rivers, damage to lives, properties and infrastructure, preservation of land and water bodies). It mentioned that development efforts would be undertaken through identification of the different hydrological zones in course of the rivers. But there is no indication about removing salinity from the safe drinking water sources.

Section 4.3. Water rights and distribution: This section proclaims that the ownership of water lies with the state. The state reserves the right to ensure equal distribution of water for skillful development and water use as well as poverty reduction. It has been mentioned in section 4.3 (b) that the Government would take necessary steps for distributing water in the deficit zone on priority basis for domestic and municipal use. The section mentioned about reducing salinity from the river water and salinity management but nothing has been mentioned about the salinity problem of drinking water in village areas of southwest part of the country.

Section 4.6. Water Supply and Health System: In this section it has been mentioned that there is salinity intrusion into ground water in the coastal zone that is made unusable by the tidal surge of the sea. The section also contains measures for addressing the problem. Such as sub-section 4.6 (a) includes "provide necessary assistance to ensure supply of safe drinking water through rain water harvesting and 4.6(b) has provision for preservation of natural sources of surface water in major urban areas to maintain the water level and management of rain water. But there is no indicator about availability of saline-free safe drinking water in village areas.

Section 4.8. Water and Industry: In this section we could observe that the excessive salinity in the water is a main obstacle to industrial growth in the southwest region. But it is surprising to note that the section includes various steps to control water contamination but the salinity issue has not got the same importance.

Section 4.12. Water for Environment: From this section we can quote "it is very important to protect the environment and its bio-diversity and the regenerative process under the national water resource development and management". The problems of salinity increased in agricultural land and the environmental problem for salinity intrusion have been duly mentioned in this section. But the sub-section 4.12 Includes measures for water flow from the upper stream to maintain environmental balance in the coastal rivers and sub-section 4.12 (d) includes measures for protection of the lakes, ponds, wetlands, canals, reservoirs etc from environmental degradation and revival of its effectiveness. But the matter of salinity control in tube well water, a common source for drinking water, has not been discussed.

In the background of the above review, it may be concluded that in the National Water Policy it is not adequately included the effective measures to address the safe drinking water problem, which is becoming more challenging for the inhabitants of the southwest coastal region by climate change. Similarly the given policy has not incorporated any measure in any of the mentioned six sections related to potable drinking water. For addressing the problem of gradual extension of salinity zone in the area Section 4.6. Specifies measures for drinking water supply in urban areas but nothing has been mentioned about the rural people who constitute the majority of the population to provide them with saline-free drinking water. So that it can be indicated that the policy makers have not taken the demand of the majority rural population into consideration.

b) National Water Management Plan:

The National Water Management Plan¹⁴ has been prepared for implementation within a period of 25 years. The plan is supposed to be reviewed after every 5 years. Basically this long term plan has been prepared to ensure a better quality of life for the people of Bangladesh through addressing the water related problems and water management development in the light of National Water Policy. This is the largest plan so far formulated by the Government

The National Water Policy and the National Water Management Plan both have neglected the important need for investigation of permanent solution for the salinity issue as a cause of drinking water crisis in the southwest region of the country. Only the National Water Policy has made provision for supply of safe drinking water in Khulna city. The 25-year National Water Management Plan has chalked out an 80-point programme intervention to meet the demand throughout the country. The program interventions have been presented in different categories. It has been mentioned that equal share for everybody will be ensured for a better quality of life through development of the major rivers on emergency basis so that everybody can get safe water for production and maintaining good health.

The major program intervention of Regional Surface Water Distribution Network (MR007) is increase of water flow in the rivers (Program related to AW 005 to increase in water flow in the river Garai). Three major connecting canals have been proposed in it. It has been mentioned that these canals will be designed in a way that the canals can be suitable for control of salinity. The matter has been further emphasized through the provision in the plan for maintaining Bangladesh-India cooperation with scope for further improvement in the field of water resource management in the common rivers. But the policy makers have kept silent about the salinity problem in the shallow and deep aquifer in the southwest region.

Arsenic contamination in the shallow aquifer in both urban and rural areas have duly considered in the projects design. But the salinity issue in drinking water has been once again bypassed although salinity makes water unfit for drinking purpose. While talking about the emergency steps taken for the urban and rural areas, it has been mentioned in the plan that "92% of the need for safe water in the rural and urban areas have been met in the mean time." High degree of success as mentioned in the plan is nothing but under estimation of the dangerous arsenic contamination and salinity in drinking water.

Under the Rural Arsenic Mitigation Program (RAMP) it is said, "Availability of safe drinking water will be increased in different ways." In conformity with this statement it has been mentioned about the success of the project "... arsenic-free safe drinking water will be ensured for 100% villagers...". From this statement it is clear that the issue of saline-free drinking water was never considered in the program.

Under the Large and Small Town Water Supply and Distribution in TR003 use of Deep Tube well has been suggested as a source of saline-free drinking water. In this process 90% of the urban population will be supplied with safe drinking water. According to the summary document No. 7 of the National Water Management Plan there is little scope for use of ground water from the shallow aquifer. So the question arises how the project will achieve its objectives with the huge problem of availability of safe water in the districts of the southwest region.

Has the salinity issue been mentioned in TR004 under the Rural Water Supply and Distribution Process? In this respect it is stated "... the objective of the project is..... Improved services in water supply.... water has been supplied in different areas by installation of Hand Tube wells (HTWs) and in this way water supply will be increased for 100% coverage by the year 2005." It is not clear how the extra demand of water will be fulfilled through the HTWs project by extracting water from the shallow aquifer, which has already been contaminated with salinity. It is evident that most of the shallow aquifers in the southwest region are contaminated by arsenic and salinity. Under the program salinity issue has not been mentioned in terms of safe drinking water supply and distribution (MC 004) in Khulna city although it has been claimed the there will be 100% coverage by the year 2010 through installation of deep tube wells

at a cost of 787.9 crore Taka. Question arises how the requisition has been prepared without any investigation into the abundance of water in the deep aquifer.

The salinity issue has not been mentioned in the projects related to natural disaster management. Following table shows the salient features and allocated expenditure of the projects in the southwest region under the National Water Management Plan.

Project Component Code (National WaterManagement Plan)	Budget allocation for the south-west region (in Crore Taka)	Budget allocation related to salinity (In Crore Taka)
MR 007	891.1	There is no specific allocation for salinity reduction.
TR 003	4405.5(Total national allocation but there is no region specific break down of expenditure).	There is no specific allocation for salinity reduction.
TR 004	7423.4 (Total national allocation but there is no region specific break down of expenditure).	There is no specific allocation for salinity reduction. Only Taka 1.1 crore allocations for Pond Sand Filter (PSF) and Rain Water Harvesting.
MC 004	787.9	For supply of safe drinking water in Khulna city, no mention of salinity reduction.
EA 006	60.0	No allocation.
EA 009	25.0	No allocation.

If we analyze the above table it is revealed that there is 6 projects under the 25-year Water Management Plan to address the water crisis in the southwest coastal region. Except just one, none of the project has been designed in the light of the water crisis in the southwest region. Only there is one project (MC 004) for water supply in Khulna city. This project has also been designed without any investigation into the biophysical abundance of water in the deep aquifer. The salinity issue has not been mentioned in the projects related to natural disaster management. These projects have been designed only in the light of the national perspectives. The perspectives of the southwest coastal region are different from the national perspectives. Therefore, there is very little possibility for the projects to bring any benefit for the southwest region.

c) National Safe Water Supply and Sanitation Policy:

The salinity issue was not properly incorporated in the National Water Policy. Many people expected that the issue would be incorporated with due importance in the Nation Safe Water Supply and Sanitation Policy.¹⁵ But the issue has also been neglected in this policy.

In the Basic Needs section it has been mentioned "it is necessary to improve the water supply and sanitation services in order to meet the basic needs of the citizens." The basic need of the people of the southwest region is saline-free drinking water. Although the policy contains provisions for supply of safe drinking water it has not properly incorporated in any place of the policy the issue of saline-free drinking water supply.

Regarding technology options the policy states "the process of technological development will continue for water supply and sanitation according to the specific local needs". The policy does not specify any technological options for supply of saline-free drinking water and how the specific needs of the people of the southwest region would be met.

Under the investment sections of the policy it is stated, "it is necessary to identify the weakness on emergency basis". No efforts have been taken in the past to discover or develop sources of safe drinking water. So it can be said for sure that none of major objectives of the National Water Policy or the National Water Management Plan would succeed due to lack of proper guidelines in these documents.

Section 8 of the National Water Supply and Sanitation Policy has 4 components. Sub-section 8.1.1. States that the responsibility of supplying safe drinking water lies with the community people. It may be assumed that it is true for the people affected by salinity. But the surprising point is that is there any scope for the community people to take the responsibility while the Government and their officials are frightened to talk about salinity? Moreover, there is the same policy for the urban as well as the urban population. There is no specific guideline in the policy in terms of saline-free drinking water supply in the southwest region of Bangladesh. This is a serious farce for the people of the southwest region. Immediate steps should be taken for rectification of the farce.

d) Coastal Zone Management Policy:

The salinity issue in the coastal zone of Bangladesh deserves special attention. Although there is no specific ministry to look after the coastal affairs as a whole, the Water Resources Ministry came forward to formulate a policy for the development endeavors in the coastal zone. The Ministry has prepared a draft policy. The policy has entrusted main focus on the coordination of development endeavors undertaken by different ministries and departments for an integrated development of the coastal zone.

While defining the objectives of the coastal zone management (CZM) the policy states, "the policy would create a favorable environment for continuous livelihood, poverty reduction and mainstreaming the coastal issues at the national level.

The policy at the very beginning notes salinity as hazard, although it's not specifically about salinity in drinking water per se, but do raise our hopes and aspirations that the salinity issue would be dealt with due importance.

Climate change and salinity in drinking water is firmly related to the 8 special objectives of the policy. As for example, it can be said that it aims at "fulfilling the basic needs of the coastal people." If safe drinking water is considered to be one of the basic needs of the people, this neglected issue deserves due attention.

The special objectives of the policy have been elaborately discussed in the 3rd chapter. Section 3.1. Proclaims that investments would be encouraged for improvement of living standard through economic growth. It has been surely expected that economic growth will help to reduce poverty. But the economic development is not pro-poor. Therefore unless proper infrastructure is developed for poverty reduction, only encouraging investment will not help to reduce poverty. Moreover, the poor people will not be able to get safe drinking water for themselves unless institutional arrangement is made for availability of saline-free drinking water.

Section 3.2. Contains provision for extensive programs to supply drinking water. The question arises whether drinking water means saline-free water or not and also whether salinity in water is considered as contaminated water or not. If it were considered that excessive salinity contaminates water then the policy would surely address the problem of salinity.

E. Implemented government and non-government initiatives

Although the Government has not implemented any exclusive program in the southwest coastal region in the perspective of salinity area, it has undertaken several activities as part of the water supply program throughout the country under different Government policies and plans. Government has installed deep tube wells, and Pond Sand Filters where deep tube well is not feasible. Various steps have been taken by Non-Government Agencies to address the acute problem of safe drinking water although these are insufficient to address the problem in terms of its magnitude and intensity. In order to create easy access to safe drinking water. Non-Government Agencies have installed PSF, excavated ponds and installed rainwater-harvesting system. In collaboration with Mennonite Central Committee (MCC), Uttaran had installed 1200 Very Shallow Tube wells during the period 1990 and 1993. But these efforts are still inadequate for the 5 million inhabitants of southwest coastal region of Bangladesh.

6. Probable sources of saline-free drinking water:

At present Uttaran has been working for establishing accessing safe water to the people on a permanent basis. As an integral part of the process, Uttaran has organized field level PRA, FGD, information collection on predesigned questionnaire, diagnostic study, experience sharing meetings and workshops with local representatives, elites, teachers, journalists, freedom fighters, female members, religious leaders, NGO workers, Government officials and a large number of affected women for finding reasons for the water crisis in different Upazilas and possible sources of saline-free drinking water. Uttaran has also shared with Upazila Health Officials, Department of Public Health & Engineering, NGOs and other individuals, organizations working on the issue to list the possible sources and extraction

mechanism to get saline-free drinking water. These are enumerated below:

Description of the sources:

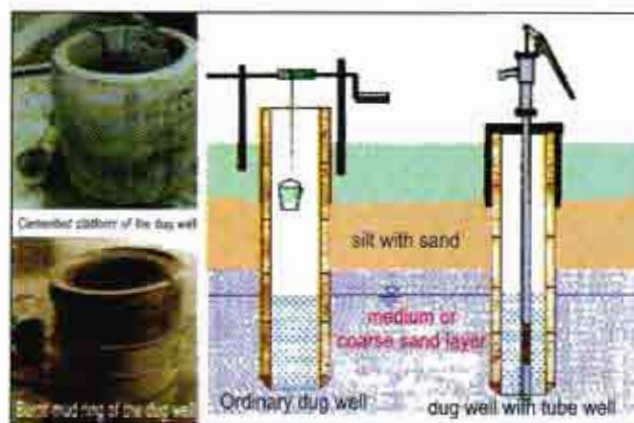
Despite scarcity of safe drinking water in the southwest coastal region several encouraging sources have been discovered or developed through utilization of indigenous knowledge, endeavors of different organizations and research works of Uttaran. Some of these sources are not yet in use or necessary extraction mechanisms have not yet been developed. Locally, the sources of drinking water are divided into two categories.

- a) Surface water
- b) Underground water.

a) Surface water: In the past, most of the people in the region used to drink surface water.¹⁶ Extensive use of ground water for drinking purpose was introduced about three decades ago. People were advised to drink ground water to protect themselves from Diarrhoea, cholera and other water-borne diseases. But at present, arsenic contamination of ground water is in a disastrous situation. Now it is time to revert back to the old practice or find alternatives to get safer water reservoirs at the under ground level. The details sources of surface water are given bellow:

1. Dug well:

Dug well is a traditional source of safe drinking water in Bangladesh. In many countries people depend on dug well for collecting safe drinking water. Surface water infiltrates and purifies through several layers of the earth and pools at the bottom of the dug well. Dug well is recommended as a safe drinking water source by UNICEF.¹⁷



Users consider the dug well water as safe drinking water because of being free from arsenic contamination. At least 20 people can meet their daily need from a dug well. But it is possible to fulfill the daily need of 50 people from the bigger ones, easily. To complete a dug well with concrete platform and drain needed the maximum cost of Tk. 15, 000.

Digging earth well creates hole and placing about 2 to 2.5 feet diameter burnt mud rings one on the another for fulfilling the depth about 30 to 36 feet of the dug well. Brick walling or RCC rings well can also create dugwell. Some dug wells may be 40 to 45 feet deep and 3 to 10 feet in diameter.

The stability of a dug well can easily be used for 50 years by cleaning its bottom of well once in a year. Water of dug well is free from contamination but it is necessary to take all precautions so that it is kept free from any germs or

waste disposal. Especially, dug well should be created in a safe and high place away from any latrine or pit for waste disposal. Presence of saline water nearby may contaminate the water of dug well with salinity. It is better to use dug well water by covering the upper end of the well permanently and fixing a tube well device to extract water from the well.

2. Rain water harvesting system:

Rainwater is completely safe for drinking purpose. Most of the people in the southwest region of Bangladesh cannot use surface or ground water because of high salinity. Rainwater might be an alternative source of safe drinking water.¹⁸ Rainwater can be collected from the rooftop of C.I. sheet or tile houses. Water from thatched house rooftops is not safe. But use of polythene sheet on thatched rooftops to collect rainwater may be safe. In Bangladesh the rainy season continues for about 3 months and a family can collect water for fulfilling daily family need. For the rest of 9 months the family may also drink rainwater if they can store near about 10,000 liters of rainwater. It will require a concrete tank, plastic pipe and some other materials. Approximately TK. 12,500 is needed to complete a rainwater harvester and approximately TK. 200 is needed annually for its renovation. There might be also some inconvenience in using rainwater for drinking purpose. If the harvesting system is not followed properly and water is preserved for a long time it may affect by different types of bacteria or insect. In this case, people can take an additional precautionary measure like jar or charkal filter or sand filter to get pure water from the harvester.



Collection of rain water in large clay Jar, 'Matka'



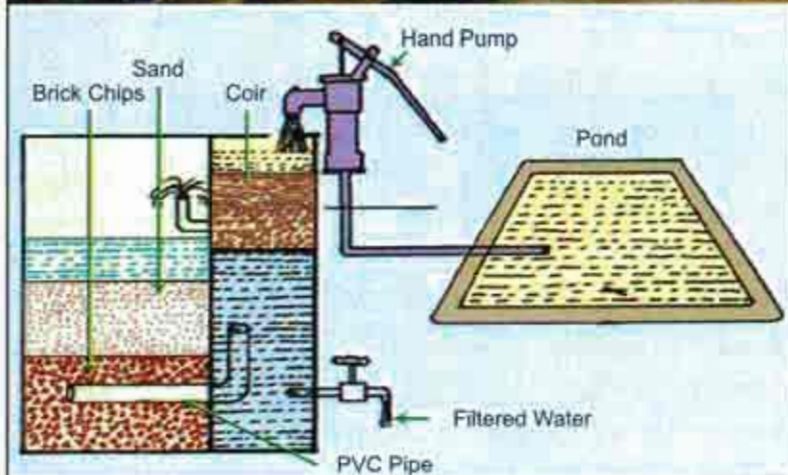
Concrete made rain water Preservation Tank

3. Pond Sand Filter (PSF):

Pond Sand Filter (PSF) may be used to get safe drinking water in the area where coarse sand or thick sand layer is not available which indicate the absence of aquifer.¹⁹ In this process pond water is purified by infiltration

through a sand filter. UNICEF and Public Health Engineering Department of Bangladesh Government have constructed PSFs in the saline-prone area for purifying the pond water for fulfilling the people's need for drinking water. A pond can be reserved for using in this purpose. About Tk. 25,000 (Taka twenty five thousand) is needed to construct a pond sand filter (PSF) on the side of reserved pond. Annual maintenance cost depends on the frequency of maintenance, however approximately Tk. 600 is enough. In this process the water source become usable for 24 hours in a day. At least 200 families can fulfill their need for drinking water from one PSF.

The source of water of PSF process is pond that may easily be contaminated. This may cause spread of water-borne diseases. So, it is necessary to undertake several measures to protect the pond from any source of contamination. The edge of the pond should be made high enough so that contaminated rainwater or floodwater cannot enter into it. The pond cannot be connected to any drain. The pond should be fenced by barbed wire so that no human being or animals can contact the pond water. If there is any water hyacinth or any other aquatic weed in the pond then it should be cleared off. There might be fish cultivation in the pond, but that should be without use of excessive food, cow dung, oil cake or chemical fertilizer. The pond cannot be used for bathing or washing cloths.



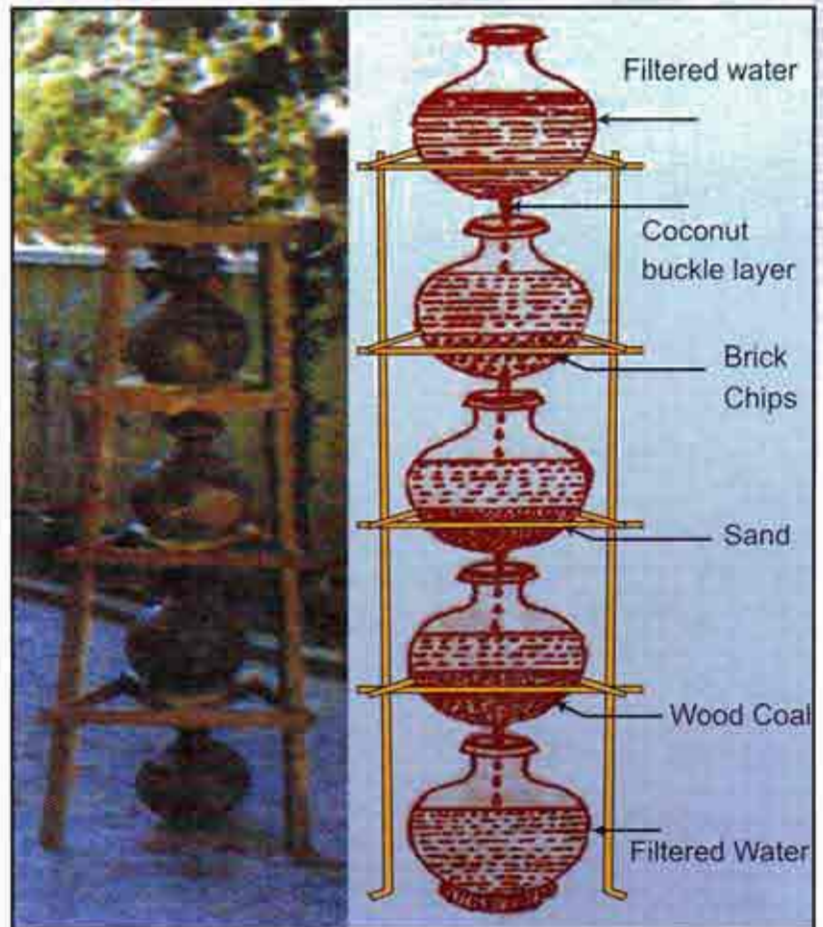
In the PSF process, a brick that consists of 3 different chambers at different levels creates a cemented reservoir. A tube well is installed in a place between the PSF and the pond connecting an underground pipe to the pond water. Coir are kept into the upper chamber. By pressing the handle of tube well, the water from the pond comes to the chamber through the pipe and after removing dirty substances water goes to the filter chamber. After filtering water, it goes to the third chamber. Filtered water can be collected from this chamber. The reservoir should be kept always covered. Use of PSF can be increased, as it is easy to use and free from any complexity.

4. Jar Filter System:

There was extensive use of jar filter system for purification of water in rural area of Bangladesh. In some areas it is still used. This system is more effective, especially for clearing dirt and filth from water.

Using available local materials such as burnt earthen jar, sand, brick chips, wood coals etc, can be used for making jar filter. It costs Tk 300 maximum. Annual maintenance cost of jar filter system is very low. This system can be used 24 hours a day and a family consisting of 4 to 5 persons may fulfill their need for safe drinking water.

According to World Health Organization (WHO) standard, water filtered in this system is fit for drinking purpose in terms of materialistic, chemical quality and contamination. In this system, dug well or pond is used as source of water. Therefore, all precautions should be taken for keeping the water source free from contamination.



Jar Filter System

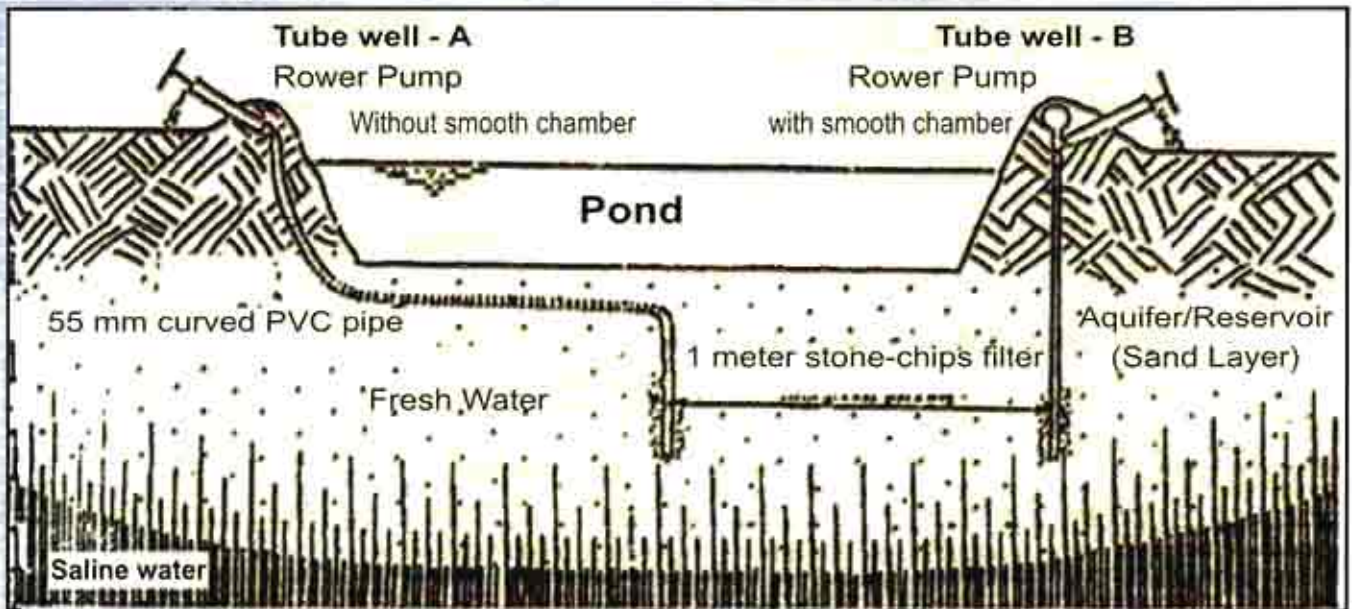
b) Underground water:

Underground safe drinking water can be found from three different sources in the southwest coastal zone:

1. Shallow tube well
2. Water reservoir in dead rivers canals and shoals.
3. Deep tube well

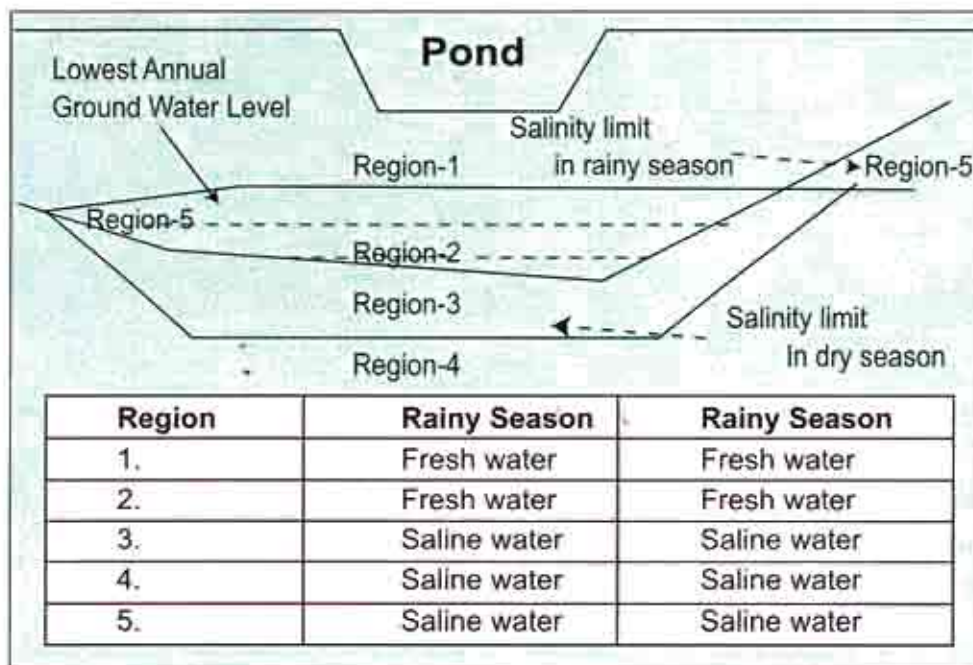
B (1) Shallow Tubewell:

Generally, an artificial aquifer or reservoir is created at the bottom of the pond. It can be created in the ponds where sand is available within 2 to 3 feet from the bottom of the pond. This artificial aquifer for reservoir can be seen in many ponds in the southwest coastal zone of Bangladesh. There are three layers in these reservoirs. The first layer lie at the top; the second is for fresh water and the third or the last layer holds saline water, as is heavier than the safe drinking water.



Very Shallow Tube well

It is possible to get safe drinking water from the system throughout the year. But if the pond dry up in the dry season then water cannot be found in the first layer. Therefore, it is advisable to connect the tube well to the 2nd layer rather than the 1st or the 3rd layer. In this case, the tube well has to be installed in the depth of 20 to 30 feet by the side of the pond. It requires extra skill of the persons who install this type of tube well.²⁰



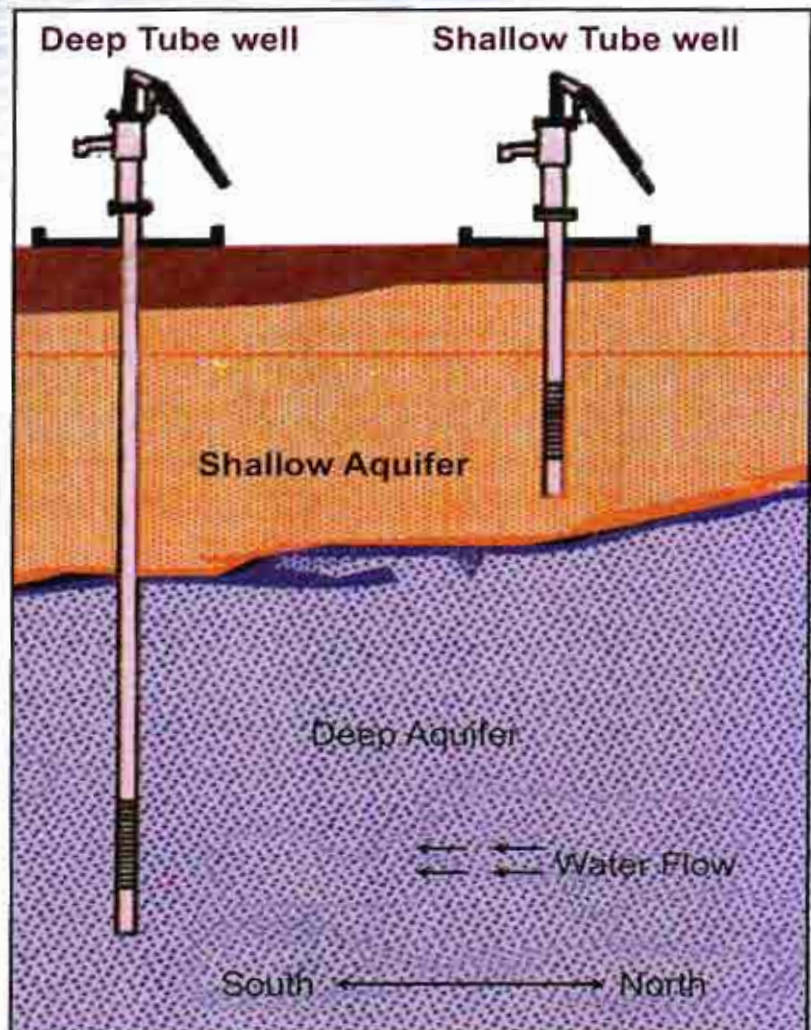
B (2) Water reservoir in dead rivers, canals and shoals:

Uttaran has conducted a number of geological surveys in search of safe drinking water in the saline and arsenic affected zone.²¹ The conducted survey revealed that the main course of the Ganges used to flow over Khulna and 24 Pargana through 7 or 8 tributaries towards the Bay of Bengal. For different natural and man-made reasons, the Ganges changed its course and

subsequently closure of tributaries especially the source of the Mathabhanga truned Jessore, Khulna, Kushtia and a part of India to a dead delta. As a result, a large number of rivers and canals in the southwest region were silted up. These silted up rivers and canals consist of coarse sand layers, huge underground water reservoirs have developed in this region. These reservoirs are refilled very easily by rainwater. So a part of the need for safe drinking water may be easily fulfilled by extracting water from these reservoirs. These sources of safe drinking water could

be used if these reservoirs in the dead rivers, canals and shoals are identified through necessary investigations. It is learnt from the primary investigation reports of Uttaran that there was acute problem of safe drinking water due to salinity in 18 villages in Munshiganj Union in Shyamnagar Upazila under Satkhira district.²² But recently fresh water reservoirs have been discovered in 3 villages namely Chunkuri, Bara Vetkhali and Shinghattali adjacent to the river. So the people of these villages have solved their problem of safe drinking water by installation of deep tubewells to 480 to 500 feet deep. But on the contrary, the people of other 15 villages have been still facing safe drinking water problem due to salinity as these villages are far away from the river, so people are drinking pond water. By

completing a proper experimentation and research in the dead rivers, canals and shoals, there is a possibility to find out a permanent source of safe drinking water from the existing underground water reservoirs.



Different types of tube wells

b(3) Deep Tube well:

Deep tube wells in Bangladesh are in the range of 300 to 1200 feet. In the Northern part of Bangladesh the deep tube well is found in the range of 300 to 400 feet. But in the southwest region and especially in the coastal belt, deep tube well is effective in the range of 700 to 1200 feet. Experiments by communities in the southwest region that the water of these tube wells is less saline and free from arsenic contamination.²³ But deep tube well is not successful in all areas of the region due to excessive presence of silts, fine sand, stone and salinity.

As the water of the shallow tube wells is arsenic contaminated, deep tube wells are required to be installed more scientifically. Otherwise, arsenic contaminated water from the shallow aquifer will infiltrate into the deep aquifer and contaminate it. Number of underground water reservoirs are few and the water reserves are limited. Therefore, it is necessary to ensure scientific use of the water resources.

7. Permanent Solution of the problem of safe drinking water in the southwest region:

There is no other alternative to increase the fresh water flow from the upstream for having a permanent solution to the problem of safe drinking water, preservation of the Sundarban and its bio-diversity and continuation of the traditional agriculture system. Scientific use of the underground water reservoirs is required in the Southwest part of Bangladesh for better management of the water resources. Moreover efforts should be taken after proper investigation introducing appropriate technologies to use the surface and ground water sources. The only way is to increase the fresh water flow is to reconnect the rivers (example: reconnect Mathabhanga river with downstream distributaries) of the southwest region to the present course of the Ganges (the Padma). If it is possible to reconnect, expected possibility will be to increase of water flow . This may be the way to solve the problem of safe drinking water inclusive navigability of the rivers. On the other hand the degree of salinity in the water of this region will decrease. The Sundarbans and its bio-diversity, the water resources will be protected from destruction. It is necessary to conduct investigation and research on the issues. It requires government initiatives.

8. Demand of civil society of the southwest coastal region:

Pani Committee²⁴ is a civil society forum in the southwest region. It has been struggling to press the demand for a solution of safe drinking water crisis. Pani Committee has also been campaigning to protect the coastal wetlands. It has organized a social movement during the late eighties and nineties to redesign the ADB funded Khulna-Jessore Drainage Rehabilitation Project (KJDRP) in an environment-friendly manner. As a result of the movement, the KJDRP project was redesigned and the donor agencies agreed to implement the Tidal River Management (TRM) concept as developed by the local people to remove the waterlogging problem.²⁵ Project is now being implemented in Bil Kedaria in Abhoynagar Upazilla under Jessore district under the KJDRP. "Pani Committee" is formed in 8 Upazila in the southwest region (Dumuria, Paikgacha and Koyra Upazila of Khulna District and Tala, Debhata, Kaliganj, Shyamnagar and Assasuni Upazila of Satkhira District) and a Central Committee with representatives from the Upazila committees. During the period "Pani Committee" has submitted memorandums in several times to the Prime Minister demanding a permanent solution to the problem of safe drinking water in the southwest region. It has also declared a set of demands through organizing press conference.

The proposal may be considered as the demands of the people of the region. The demands are as follows:

- 1) Realistic Plan has to be made in the National Water Policy and the National Water Management Plan after due consideration of the salinity issue of drinking water.
- 2) The salinity issue has to be addressed in the National Safe Water and Sanitation Policy and there should be specific program or project in this regard.
- 3) As per the current National Safe Water and Sanitation Policy, at least one pond should be excavated by government in each saline-affected villages.
- 4) The safe drinking water problem in the southwest region should be solved/ addressed and saline-free drinking water to be ensued for all.
- 5) Shrimp aquaculture related policies and other related affairs/ issues should be formulated with consideration of drinking water with due precautions so that the sources of safe drinking will not be contaminated or destroyed.
- 6) Flow of fresh water and its supply should be increased for agriculture and household purposes.
- 7) Special initiatives should be taken by the Government to solve the problem of continuous expansion of saline area in the southwest region due to water logging, sea level raising and shrimp aquaculture.
- 8) National Water Policy and the National Water Management Plan do not incorporate the unique natural characteristics and bio-diversity of the southwest region. It should be incorporated in the mentioned two policy and plan and necessary measures should be taken for its protection.
- 9) Silted up rivers and canals in the southwest region should be re-excavated on regular basis.
- 10) Dead rivers and other reservoirs of fresh water should be protected from aquaculture and illegal occupancy and these should only be used for drinking purposes.

Conclusion

The scarcity of drinking water that was initiated for the change of course of the Ganges had further aggravated by the closure of the source of the Mathabhanga river. The Coastal Embankment Project (CEP), brackish water shrimp aquaculture and the recent climate change are gradually driving the situation towards severe crisis. It may be mentioned here that the rate of population increase in the region is only 59% during the period from 1974 to 2001 while the national level rate of population increase is 86% for the same period (BBS, 2003). The vulnerability of southwest region is increasing due to lack of employment, collapse of traditional agricultural system and non-availability of safe drinking water. The lower rate of population increase due to difficult livelihood conditions caused by severe water problem in the region is an indication of the effect.

In the National Water Policy of Bangladesh Government has committed and fixed targets for supply of safe drinking water in the light of the Millennium Development Goal (MDG). In order to reach the goal it is necessary to incorporate the salinity issue in the National Water Policy and National Water Management Plan in the perspective of climate change and expansion of saline area in this region. The Government may rethink about incorporation of the issue before making any commitment at the international arena.

Water is life. It is impossible to live a single moment without fresh drinking water. Every citizen deserves to have safe drinking water for a healthy life. And the responsibility to establish the rights solely rests upon the Government. Therefore, effective steps should be taken by the Government to address the problem of safe drinking water. Concerted efforts of the Non-Government Organizations and other civil society groups is also necessary in this regard. Raising mass awareness, discover new sources of safe drinking water and ensure its proper use to address the problem properly for the affected people is inevitable.

End Notes

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19. For details on PSF see-PMID, *ibid*, pp-31 to 36
20. For various types of Shallow Tubewells see Md. Feroze Ahmed and Mujibur Rahman, op cit, pp 410-414. also see- Md. Feroze Ahmed and Hasin Jahan, op cit pp61-62
21. Uttaran, "Potable Water in the Southwestern Part of Bangladesh" Unpublished research report, Tala (2004). The research investigation included the geological aspects of the problems.
22. *ibid*
23. For details on Deep Tubewell see Md. Feroze Ahmed and Hasin Jahan, op cit p-56
24. Pani committee, established in 1988, is a civil society forum in the southwest coastal region. They have been campaigning against destructive water projects like KJDRP and have been on the forefront of people's movement for safe drinking water and integrated management of water resources based on indigenous practices and community wisdom.
25. Tidal River Management. A concept developed by local communities in the southwest coastal region during their engagement with Asian Development Bank (ADB) funded project Khulna Jessore Drainage Rehabilitation Project (KJDRP).The concept embodies the community wisdom and indigenous practice of river basin management based on uninterrupted natural tidal flow in rivers and adjacent beels (wetlands). Later the concept entered into the lexicon of water resources "experts" as TRM.

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