People's Alternative Water Resource Management

A Case Study on Tidal River Management in Bangladesh

People's Initiative on Coastal River Basin Management to Solve Water logging in the Southwest Coastal Region of Bangladesh

Water for People's Network Asia
&
Coastal Development Partnership (CDP), Bangladesh

Water for People's Network Asia

Research Report on

People's Alternative Water Resource Management

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Acronyms

ADB	Asian Development Bank
BWDB	Bangladesh Water Development Board
CEGIS	Center for Environmental and Geographic Information Services
E1A/SIA	Environmental and Social Impact Assessment
GWP	Global Water Partnership
ICWE	International Conference on Water Environment
ICFW	International Conference on Fresh Water
KJDRP	Khulna-Jessore Drainage Rehabilitation Project
NGO	Non Government Organization
O&M	Operation and Maintenance
TWWF	Third World Water Forum
TRM	Tidal River Management
UNCED	United Nations Conference on Environment and Development
WMA	Water Management Association
WMC	Water Management Committee
WMF	Water Management Federation
WMG	Water Management Group
WMO	Water Management Organization
WSSD	World Summit on Sustainable Development
WWC	World Water Conference

Meaning of some local terms

Beel: Sunken land between the high banks of two rivers, of caused by subsidence due to decomposition of underground organic matter.

Matabbar: Rural community leader.

Polder: Encircled land by embankment.

Executive Summary

According to Fortune magazine, "Water is one of the world's great business opportunities. In the 21st century it promises to be what oil was in the 20th." The water poverty (i.e. inaccessibility of water for the poor) is already manifested as a global problem as a result of the inequity in access among countries and within societies. Besides, the commoditization of water through privatization in disguise of better service delivery has been rapidly transforming the public water services, infrastructures and ownership into the greedy hand of Transnational Corporations (TNCs). Water is being bottled and exported; dams and waterways are constructed and owned by the water TNCs.

The traditional community expertise has very little space in the existing water resource management & practice. People through traditional wisdom and practice have achieved considerable experiences and knowledge base of water resource management at community level for thousands of years. The people's traditional water management practice considers water as life; gives enough space for biodiversity, ecology and community people. Water has a very strong spiritual and cultural significance to all Bangladeshis. According to mythology Bengali people consider water sources and water as divine and elixir of life. In Bangladesh, people from the time immemorial have devised many social norms for not deteriorating the water sources. Consequently, people's traditional water resource management practices are an integrated part of cultural heritage, religion, ethics and livelihood practice. The key hypothesis for People's Alternative Water Resource Management is as such *"Different geographical areas have different water problems and challenges and local people know better about those problems and challenges than others. Without recognizing people's traditional knowledge on water resource management, all efforts towards sustainable water resources management might be piecemeal and would be ephemeral."*

The present study unfolds the struggles of the people's to solve water logging (coastal river basin management) in the southwest coastal region of Bangladesh in the form of a case study on "Tidal River Management (TRM) in Bangladesh". This case study briefly documents the phenomenon of water-logging, its causes and effects, government responses, projects aimed to mitigate water-logging like Khulna-Jessore Drainage Rehabilitation Project (KJDRP) and the people's movement to solve the problem with an alternative drainage management concept to reduce water-logging. This case study may provide new insights about traditional wisdom to address complex water resource management issues with pro-people approach.

The Southwest Coastal Region of Bangladesh is situated in the central portion of the Ganges delta with the Sundarban, the largest mangrove ecosystem in the world. In the 1960's, the Coastal Embankment Project was implemented in the region enclosing most of the tidal wetlands within high embankments. Within a few years, the negative impacts of the project appear. The biodiversity of the region degraded, river flows were affected and many rivers silted up, affecting navigation and the seasonal migration of fish and other aquatic fauna. By 1990, over a hundred thousand hectares of land in Khulna, Jessore and Satkhira districts became waterlogged, and agriculture became impossible. Bangladesh Water Development Board (BWDB) tried to implement mitigation projects but the people rejected them on the

ground that the projects would only intensify the problem. On the other hand, the people, through their generations of experience of living in the region, evolved a strategy to solve the problem. This strategy is now known as the Tidal River Management (TRM) Concept. Bangladesh Water Development Board and the ADB have now accepted it as the best strategy to manage the rivers in the region.

Water logging is a wide-ranging disaster affecting the lives and livelihoods of a large population. Due to water logging about 100600 hectares of land was affected in eight Upazilas of Khulna, Jessore and Satkhira districts. Localized drainage congestions are reported throughout the coastal belt. Moreover inundation and all congestions affect coastal livelihood because of crop damage, water borne diseases and other health related issues. A vast area of agricultural land remained under water for more than 13 years. Many villages submerged, houses collapsed. As a result people had to live on roads and embankments, number of livestock decreased at an alarming rate. Procurement of firewood and drinking water became very expensive, education of children decreased and people faced great difficulties to find work and hence the incomes of the poor people were decreased.
In the face of people's movements for mitigation of water logging the government took up a few projects such as Coastal Embankment Rehabilitation Project-I (CERP-I) and Coastal Embankment Rehabilitation Project-II (CERP–II). But the projects were not designed considering the unique natural characteristics of the region and implementation resulted in failure. The people could not place their trusts in such projects. Therefore Bangladesh Water Development Board had to change the projects again and again. Later, with financial and technical assistance provided by Asian Development Bank (ADB); the Khulna Jessore Drainage Rehabilitation Project (KJDRP) was approved in 1993-94. With an initial estimated expenditure of 62 million dollars, it was the largest project of its kind taken up in the region so far. Bangladesh Water Development Board implemented the six-year long project, with assistance provided by Agricultural Extension Department and the Department of Fisheries. The aim of the project was to 'solve the water logging problem to increase agricultural production and alleviate poverty of the area through farm-based employment generation.' The project implementation authority hoped that if the project were implemented in time, about 100,600 hectares of land of 68 unions under 8 thanas of Khulna and Jessore districts would become free from water logging; and about 800,000 people can be benefitted to live a poverty free and healthy life.

To eradicate the water logging BWDB took Tk. 640 million from Khulna Coastal Embankment Rehabilitation Project (KCERP) which included a regulator, sluice gate construction, canal digging and dredging etc. But after dredging the Solmari River dredger could not move back due to siltation in downstream. In the proposed plan Hamkura River was blocked by regulator, it would be a great devastation due to huge siltation in downstream as it was happened in Solmari River. Mass agitation inoculated around against the project and the ongoing activities of the project was withdrawn after completing only 11 percent of the work. But BWDB did not take any alternative initiative to eradicate water logging. Beel Dakatia movement has been recognized as a historical and a national issue on facing water logging. 17th August, 1990 - a large number of spontaneous people gather at polder site Beel Dakatia on the call of "Beel Dakatia Action Committee" ignoring the “144” combating local administration, armed forces and open the beel by four public cut, thereby introduces regular tidal action in Beel Dakatia. People open the Beel for regular tide which continued only three years and nine months as usual BWDB closed Sandther Canal by cross Dam that Leeds rapid dying of Hamkura River. As a

result of people's movements and the advocacy of the NGOs, BWDB continued to change the plans. On October 29, 1997 people breached the right embankment along the Hari River a short distance above Sholgati to allow the tide to drain through Beel Bhaina. The objectives of the breaching were to improve downstream drainage in the Hari River that would ultimately drain water from the Kedaria and Bokar beel areas of Keshabpur and Manirampur thanas and to raise the level of the beel by sedimentation. By 1999 Beel Bhaina silted up and width and depth of the Hari River increased. Near Sholgati Bazar the width of the river increased more than 10 meters. Another important observation was that the upstream beels easily drained out and became partially free from water logging. But BWDB did not take the people's movement easily rather they filed criminal cases against the organizer of the movement. They were also stressed by the police. Later the review team of the ADB visited the area. The review team was convinced of the viability of the Tidal River Management (TRM) concept. Finally ADB advised Bangladesh Water Development Board to redesign the project on the basis of the TRM concept and finally KJDRP was re-designed on the basis of TRM.

People's Alternative Water Management Practice can play as a very powerful instrument to unmask the corporate, anti poor people national policies and process and global trade paradigm and can enhance people's empowerment. It is ironic that though almost every water related projects, either by government or by private entrepreneur are very much 'vocal', 'concerned' and 'in accordance' with the concept of Integrated Water Resources Management (IWRM), the traditional community expertise and historical knowledge have not yet received the deserved space in the IWRM aspect to address the need for a more holistic & vision-oriented water resource management.

Nature has its own management system. The people understand Nature and Nature's self-management. This is called People's Wisdom. Good Governance can prevail in Coastal River Basin Management, if People's Wisdom is given due importance. People have developed Tidal River Management concept (TRM) to mitigate their water logging problem. On the basis of Tidal River Management option, waterlogged area and areas susceptible to water logging can be converted into tidal basins on rotational basis with modification of existing structures and allow sedimentation under planned way. This is a non-regulator/ non-structural type of solution. The main theme is deposition of suspended load under controlled system from tidal channels up to the mean high tide level in the waterlogged areas. As a result of the success of the people's movement, TRM concept is now well accepted as a basic concept for water and river management in the Tidal region of Southwest Bangladesh. CIDA-CARE-RVCC project has considered TRM concept as reducing threat strategy to protect community from water logging due to Sea Level Rise and supports for fund allocation to implement TRM.

The modern global state of affairs is as such that in every where indigenous people have been fighting, struggling for their traditional water rights, access to water resources, water for livelihood. People's Alternative Water Management could be a value-based approach to promote pro-people water governance in the age of corporate globalization, privatization and commoditization of water.

Chapter One

An Overview of the People's Alternative Water Resource Management

1.1 Introduction

Water quality is deteriorating worldwide and in many locations around the world discharges of untreated domestic and industrial wastewater threatening ecosystems and human health. The commitment of all concerned stakeholders on the in a concerted way is needed to overcome the challenges of achieving a secure water world. The greater fluctuation in resource availability associated with presumed climatic changes has already recognized as a major concern in many regions of the world. In the large, low-income cities of Asia, Latin America, Africa, and the Middle East the major problems are typically a growing deficit of freshwater resources, overexploitation and contamination of groundwater, increasingly expensive source development, and underdeveloped wastewater management system with growing pollution, chronic financial problems, and inefficiency of institutions. At the village level, developing countries tend to suffer service and affordability problems. To meet the UN Millennium Development Goal for water and sanitation (to halve the proportion of people without access to safe drinking water) by 2015, 342,000 people will have to be provided with sanitation every day until 2015 (UNU 2003).

The conventional water policies lack the spirit of human rights to water. Water resource policies are mainly focused to improving domestic water service and the modernization of water supply. Achieving Millennium Development Goals (MDGs) targets to halve the number of people without access to affordable and safe drinking water by 2015 will require a major change in policy approach. The supply-oriented policy framework and compartmentalized approach of policy implementation has been dominating water policies in Bangladesh.

1.2 People's Traditional Knowledge on Water Resource Management

Water has a very strong spiritual and cultural significance to all Bangladeshis. According to mythology Bengali people consider water sources and water as divine and elixir of life. In Bangladesh, people from the time immemorial have devised many social norms for not deteriorating the water sources. Consequently, people's traditional water resource management practices are an integrated part of cultural heritage, religion, ethics and livelihood practice. The key hypothesis for People's Alternative Water Resource Management is as such *"Different geographical areas have different water problems and challenges and local people know better about those problems and challenges than others. Without recognizing people's traditional knowledge on water resource management, all efforts towards sustainable water resources management might be piecemeal and would be ephemeral."*

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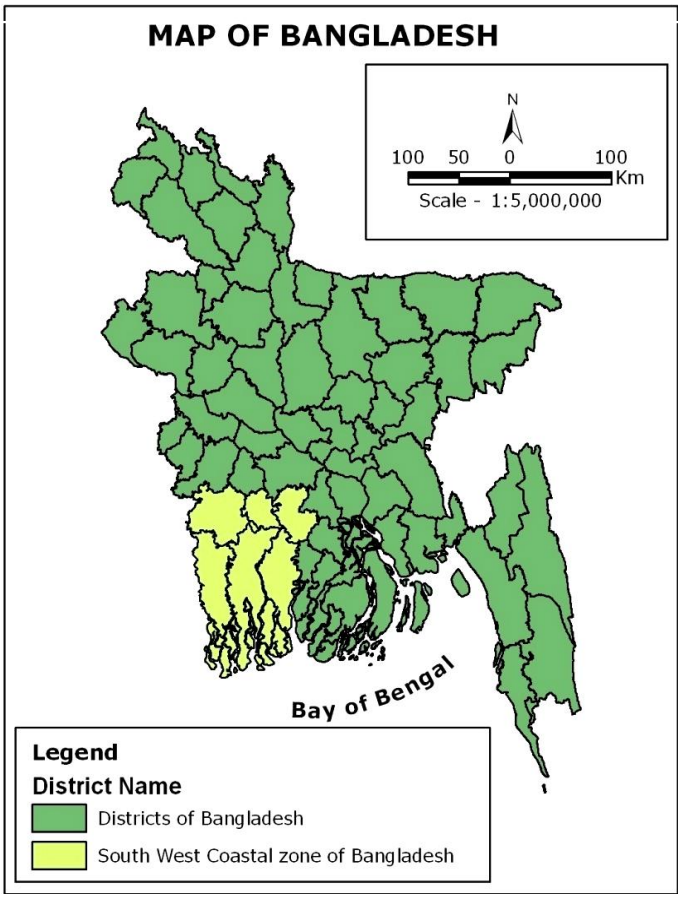
1.3 . An Overview of Bangladesh

Bangladesh is bordered by India to the west, north and east, shares a border with Myanmar to the southeast. Bay of Bengal lies to the south, and to the north is the Himalayan mountain range. The country is located between 23º34´and 26º38´north latitude and 88º01´and 92º41´east longitude (Rashid, 1991). Bangladesh is one of the largest deltas in the world, criss-crossed by numerous rivers, their tributaries and distributaries. Three mighty rivers, the Ganges, the Brahmaputra and the Meghna drain a total catchment area of approximately 1.5 million km2, of which only 8 percent of the drainage area lies within Bangladesh (Khan, 2001). Bangladesh has been formed over tens of thousands of years as a thick layer of sedimentary deposition as the flow of the heavily-laden rivers slows in the Bangladesh Delta (Islam, 2004).



Bangladesh has an area of approximately 147,570 km2 of which 8,236 km2 is riverine and 1,971 km2 is under forest cover. The population of the country is approximately 130 million, which represents a population density of 839 persons / km2 (BBS 2003). This high population density creates a high demand on natural resources. The country has a tropical monsoon climate characterized by marked seasonal variations. Abundant rainfall during the monsoon (July - October) is followed by a cool winter period (November - February), then a hot, dry summer (March - June). In the summer season the average maximum temperature is 34°c and the average minimum is 21°c. The average maximum temperature in winter is 29°c and the minimum is 11°c (Khan, 2001). Rainfall in this region shows temporal and spatial variations. Seventy to eighty percent of rainfall occurs in the rainy season. The annual average rainfall within Bangladesh varies from about 1,100 mm in the extreme west to 5,690 mm in the northeastern corner of the country (Khan, 2001).

Bangladesh, rich in biodiversity, have a variety of 266 inland and 442 marine fishes, 22 amphibians, 109 inland and 17 marine reptiles, 388 resident and 240 migratory birds, 110 inland and 3 marine mammals. Unfortunately more than a dozen vertebrate fauna have been lost during the last century and 54 inland fishes, 8 amphibians, 58 inland reptiles, 41 resident birds and 40 inland mammals have come under different categories of threat (IUCN 2000). The Sundarbans, the world's largest mangrove forest (6,017 km2), is also under threat due to increasing encroachment and environmental damage (Islam, 2004).

1.4 Water Scenario at Regional Context

Till the 17th century, there was an abundance of freshwater brought down by the Ganges and its tributaries, namely, Mathabhanga, Ichhamati, Bhairab, Gorai, etc. But the gradual eastward migration of the Ganges reduced the flow of these rivers. In the 19th century, a horse-shoe shaped loop on Mathabhanga was eliminated by cutting across, which cut off the supply of water to the rivers feeding from the loop, such as Bhairab and many other rivers that branched off from the Mathabhanga. Now all the rivers carry only surplus rainwater during the monsoon.

The partition of the sub-continent in 1947 was based on demography. The topography and the courses of rivers did not find any consideration in that exercise. Hence the river system of the Ganges delta, of which the southwest region of Bangladesh forms the major portion, became disjointed. This enabled India to control the flows of the trans-boundary Rivers in its own territory, to the detriment of the lower riparian Bangladesh. The most important of such projects is the Farakka barrage across the Ganges, just 16 km upstream of the Bangladesh border, which was commissioned in 1975. The barrage diverted the major portion of the Ganges flow to the Bhagirathi-Hooghly, for the declared purpose of ensuring the navigability of the Hooghly at Kolkata port. Thus, flow of Ganges to the smaller rivers of the region decreases, the flow of the Gorai was also affected, as the intake mouth of the Gorai from the Ganges gradually silted up.

Table: Discharge of water from Dams in West Bengal

Name of Dam	**Discharge of water – 2000**		**Discharge of water - 2004***	
Massenjore	Period	Quantity (Cusecs)	Date	Qty. (Cusecs)
Tilpara	Sept. 21-25	200,000	18-19 Sept.	120.000
Durgapur	21-25	62,900	-do-	120,000
Konar	Sept. 21-28	230,000	-do-	Not published
Tilaiya	Sept. 21-28	Combined 400,000Period	-do-	-do-
			-do-	-do-
			-do-	150,000
Panchet			-do-	45,000
Maithon			-do-	15,000
Dwarka	Not available	-	-do-	4,000
Brahmani	Not available	-	-do-	

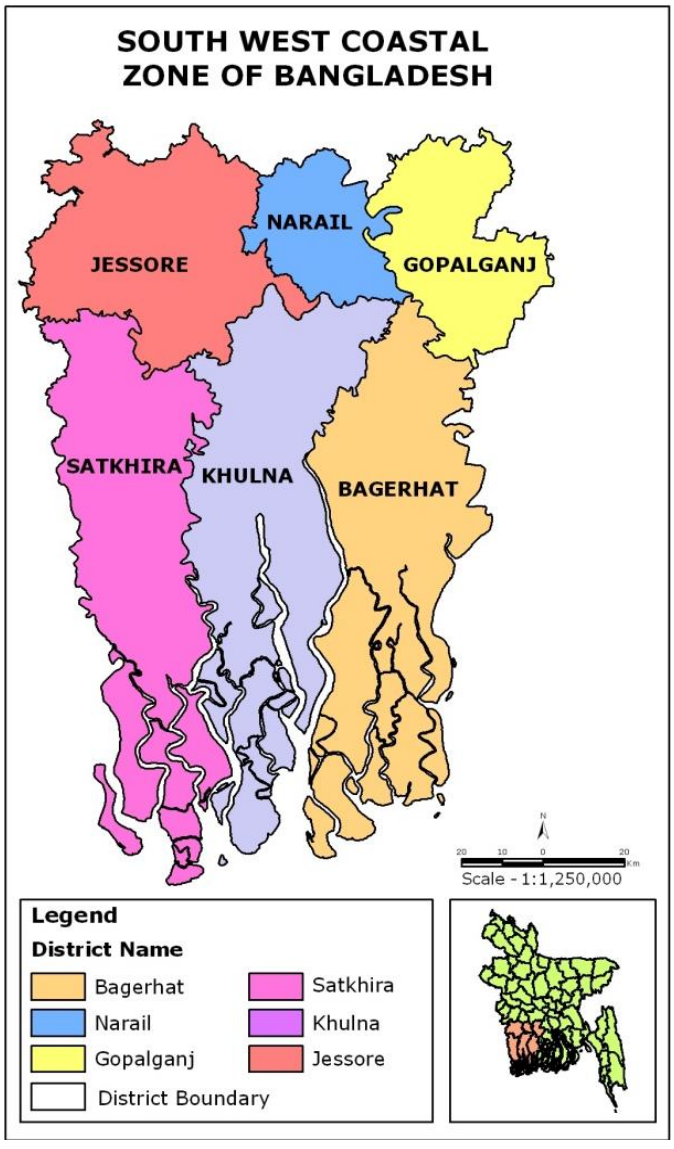
As all tributaries of the Bhagirathi - Hooghly are rain-fed, they almost dry up in the dry season. In order, to provide irrigation during the dry season and to produce electricity, eight reservoirs on these rivers have been built. The most important of these reservoirs are Messanjore and Tilpara dams on the Mayurakshi and the Tilaiya, Konar, Panchet and Maithon dams on the Damodar and its tributaries. As a result during rainy season huge volume of water is released from these reservoirs, which caused the flood of 2000. Until the year 2000, the region was considered as flood free zone. The first flood in 62 years occurred in this region in that year and since then the area is being flooded nearly every year.

Chapter Two

People's Alternative Water Resource Management: A Case Study in the SW coastal region of Bangladesh

2.1 Southwest Coastal Zone of Bangladesh

The term "coastal zone" refers to the transition area of land and sea. According to Bangladesh's Integrated Coastal Zone Management Plan (ICZMP), three main criteria are used to mark out coastal zones: tidal fluctuations, salinity, and cyclone & storm surge risk. Using these criteria, the coastal zone of Bangladesh (shown in Figure 2) consists of the Exclusive Economic Zone (EEZ) and 19 districts. Out of these, 12 districts demonstrate all three of the criteria and are defined as exposed coast. The remaining seven districts, where one or two of the criteria are observed, are defined as interior coast. The coastal zone comprises 32% of the land area of Bangladesh (47,201 km^2) and a population of 35.1 million people (Islam, 2004).



Mr. Satish Chandra Mitra, in his book, "History of Jessore-Khulna" had written in the beginning of the 20th century, "*The recently discovered fallow land of ages yields a golden harvest. People braved their lives in lands full of dangerous beasts of prey*". He further wrote, "*Both the area of human habitation and population itself, are increasing because of the greed for staple crops*".

The Southwest Coastal Region of Bangladesh is unique in its environmental nature and is one of the most fertile regions in the world. It is also very rich in natural resources. The zone (shown in Figure 1) includes 6 districts (Khulna, Satkhira, Bagerhat, Gopalganj, Narail, and Jessore) out of the 19 coastal districts as well as the 6017 square km Bangladesh portion of Sundarban mangrove forest, which has a total area of about 10,000 square km. The rest

of the Sundarban lies in West Bengal, one of the State of India. The southern part of the region has a brackish water regime, while the northern portion has fresh water. The region is comprised mostly of low-lying land, barely one meter above mean sea level. Most of the land used to be Tidal Flood Plain. The region is criss-crossed by numerous rivers. But during the last 3 - 4 centuries, the big rivers lost their connection with the Ganges and became mere drainage channels for surplus rainwater. Only the Gorai remained as the main distributary of the Ganges before the Ganges joined with the Brahmaputra and Meghna.

The tides used to govern the environment, ecology and economy of the region. The 3.5 million tons of forest detritus dropped from the Sundarban, decomposing in the water, produces enormous quantities of nutritious organic food for all kinds of aquatic life. As such, the estuarine rivers, creeks, canals and cross channels used to be, and still is, one of the best feeding and breeding grounds for fish and other aquatic life forms. The tides carry heavy loads of silt, and when the diurnal tides covered the land, the silt used to be deposited on the land, compensating for the natural subsidence, common to all loose delta soils throughout the world. The silt, mixed with the decomposed detritus also enriched the soil.

When the first rains of the monsoon washed away the surface salinity, the farmers traditionally used to build low earthen dikes to prevent the incursion of the tides, and similar temporary wooden sluices to drain off surplus rain water. They then cultivated numerous varieties of flood tolerant and salinity tolerant rice. After the harvest in December the dikes and sluices were dismantled, and the tides given free access to the flood plains, enabling it to restore the land. Numerous kinds of fish and other life forms then used to enter the flood plains, where the people used to catch fish. Thus, with plenty of rice and fish, there was no shortage of food and nutrition.

The geophysical situation, land characteristics, multiplicity of rivers and the monsoon climate turn Bangladesh into highly vulnerable to natural disasters. The southwestern region is affected by floods, tropical cyclones, river bank erosion, siltation, water logging, salinity intrusion, and tidal and storm surges. The southwest region is particularly affected by salinity intrusion, and siltation, which can lead to water logging and flooding. The morphology of southwest coast of Bangladesh influences the impact of natural disasters on the area. Significant features include:

- A vast network of rivers and channels;
- An enormous discharge of water heavily laden with sediments;
- A large number of mudflat in between the channels;
- The "Swatch of No Ground": a submarine canyon running NE-SW partially across the continental shelf about 24 km south of the Bangladesh coast;
- A shallow northern Bay of Bengal that work as a funnel to the coastal area of Bangladesh; and
- Strong tidal and wind action (ESCAP, 1987).

2.2 The Characteristics of the Case Study Area

The study area encompasses the greater Khulna and Jessore districts in the south-west Bangladesh, excluding parts of Sundarban. The total area is about 8,000 sq. km.

Climate: The region's climate is salt-laden air throughout the year, especially when winds blow from the sea, humidity and saltiness increases to the south. The maximum and minimum temperatures usually

range from 29°C to 4°C and 5°C to 15°C. Average annual rainfall during the period 1965 to 1990 was about 1750mm. The relative humidity ranges from 64-75% in the dry season and 75-87% in the wet season. The four distinctive seasonal weather patterns are: dry winter season, pre-monsoon season, monsoon season and post monsoon season. The dry winter season from December to February has infrequent rains, and river water becomes saline. The pre-monsoon and post-monsoon seasons are transitional periods, covering the months of March to May and October to November. During these two periods, cyclonic storms rise from the Bay of Bengal. The cyclones during the post-monsoon period are usually more destructive.

River System and its dynamics: The area is in the active delta of the Padma River according to the Generalized Physiographic Map of Bangladesh (Alam & Others 1990). Southern part of this is tidal delta. Delta building process is still active in this region with fluvial process operative in the northern part, whereas tidal process is operative in the southern part. The area is mainly drained by a number of north-south flowing rivers. From east to west, important rivers are the Gorai-Madhumati-Baleswar, the Bhairab-Pusur, the Bhadra-Gengrail, the Hari-Teka-Mukteswari, Sibsa, the Kabadak-Betna system and the Jamuna-Ichamati-Kalindi Rivers. Most of the rivers are tidal in nature and east-west Rivers are interconnecting with the north-south Rivers. Flows of these east-west rivers are very important for the complete circulation of tide all over the tidal flat. In the rainy season, water becomes fresh to slightly salty and in the dry season, it becomes salty. The inland rivers represent the remaining channels of the old spill or regional rivers, which have lost their connection to the mother river, the Ganges. The Kumar, Nabaganga, Kabadak, Bhairab are good examples of such inland rivers. The inland and regional rivers run into tidal rivers or estuaries mentioned above. In the greater Khulna area, the coastal rivers or estuaries are saline because of low freshwater discharges, especially in the dry season. The river flow regimes are driven by high, variable sediment loads. The rivers of this region show a continuous process of silting gradually from the NW towards the SE direction. Most of the river waters carry substantial amounts of suspended sediments.

Traditional Human and Natural setting: Taken as a whole, greater Khulna area is formed entirely by the deltaic process of the Ganges and is a low laying zone occupying the central portion of the southern delta between the Hooghly and the Meghna estuary. It is intersected by a large number of rivers and estuaries, which again are connected by innumerable interlacing cross channels, the surface being only slightly raised above flood level. Natural processes of earth subsidence, land build up and affluences of coastal biodiversity were prevailing side by side. The banks of the rivers are higher than the adjacent land, so the land slopes away from them on either side forming aeries of depression between their courses. Ecology and socio-economic life are regulated by the rivers and wetlands. The river courses are always in the state of change. The people settle on high lands which obviously are river banks. With the change of river course new habitations grow up on high lands on both sides. Thus a series of human settlement with cultivable depressed lands (wetlands) in between has become a general feature in this region. The serpentine shape of the roads through villages which have run parallel to the banks of rivers, either dead or alive, bears testimony to the curvature of the river course. Rivers dead or alive on one side of the roads and human settlement on the other, with vast tidal wetlands that acted as nursery, grassing and breeding ground of coastal biodiversity on the rear, were the general picture of enter south-west region of the country.

Physiographic characteristics: Important physical characteristics of the study area are peat basins, tidal flood plain and the Ganges floodplain. However, the case study is limited to the tidal floodplain. The tidal floodplain is bounded in the north by the Ganges floodplain and in the south by the Sundarban and also crisscrossed by numerous tidal creeks or channels. The tidal floodplain is strongly influenced by tide, salinity and rainfall and has high drainage density. The average tide difference is about two meters. Most of the areas are between one to three meters above mean sea level and have a southward regional slope. The water and the soil are saline but in the rainy season salinity becomes low. Fresh water flows from the upstream regions and the tides normally control the salinity of this region.

2.1.1 Historical background of water-logging and river management

The study area holds around 400 years' old indigenous technical knowledge on river management. The major portion of the study area is low-lying, barely one meter above the mean sea level and below high tide level. The livelihood of the study area is historically shaped through the interplay of tidal river system and the Sundarban ecosystem. Homesteads, roads, vegetable gardens and orchards were developed on areas artificially raised by digging ponds and ditches. Daily tides used to inundate the lowlands twice a day. The Sundarban mangrove forest drops an average of 3.5 million tons of natural debris per year which is carried by the tides throughout the floodplain. This natural debris and the stubble of the previous season's rice crop are decomposed in the water and produce nutritious organic food for all forms of aquatic life. When deposited on the land along with the heavy loads of silt carried by the tides, it also enriches the soil, and the silt compensates for the normal subsidence of the loose delta soil.

In old times, the local people under the leadership of local "Zamindars"/landlords and "Matabbars" used to construct small earthen dikes for eight-month duration and wooden sluice boxes around different "Beels" or "Ghers" on cooperative basis-that was very much coherent with the local environment with a little hindrance to natural flow of biodiversity and silt. A professional community was developed for the purpose, locally known as Shana (means, those who organized people maintaining embankment). The cost of those constructions used to be realized in "Hari" system. That means after harvest 2% to 5% of the paddy had to be given to the local management committee (equally by landowner and crop sharer).

Consequently, agriculture, coastal-biodiversity, navigability of rivers and land build up process were quite unaffected human settlement exist side by side but often-tidal surge disrupted inhabitations. The fertility of this region has always attracted people from other parts of the country. The problem of crop failure still existed, as dykes were not sufficiently high and strong. Opening the sluice gates was not enough and the gates were weak. These were temporary structures and needed repair every year. After ending of the Zamindary System, the maintenance of the traditional tide management structure is disrupted. As a result, the land-water management problems became serious and crop failure occurred frequently.

In 1959, to solve this problem, a large project on construction and maintenance of permanent polders was undertaken by the then government. In the Khulna and part of the Jessore districts, 39 polders were constructed to protect the arable lands from tidal inundation and flooding, and to increase crop production. In 1984, Dakatia beel, a part of one polder became water-logged for the first time, due to rapid siltation of the Solmari, Hamkura and Hari rivers. Later this problem spread to more polders. Moreover, lands outside the polders in the greater Jessore district went underwater. This problem is

gradually creeping to the northern part as well as in the southern part of the embankment area. In 1995, the Government of Bangladesh with financial support from ADB initiated the Khulna-Jessore Drainage Rehabilitation Project (KJDRP) to find a more permanent relief to the suffering of the local people. The KJDRP is located in the southwestern part of Bangladesh and comprises parts of the Khulna and Jessore districts. The total project area is 127,800 hectares with a population of 1.1 million (1997 estimates)

2.1.2 Livelihood in Southwestern Bangladesh: Vulnerable to Water Disasters & faulty development

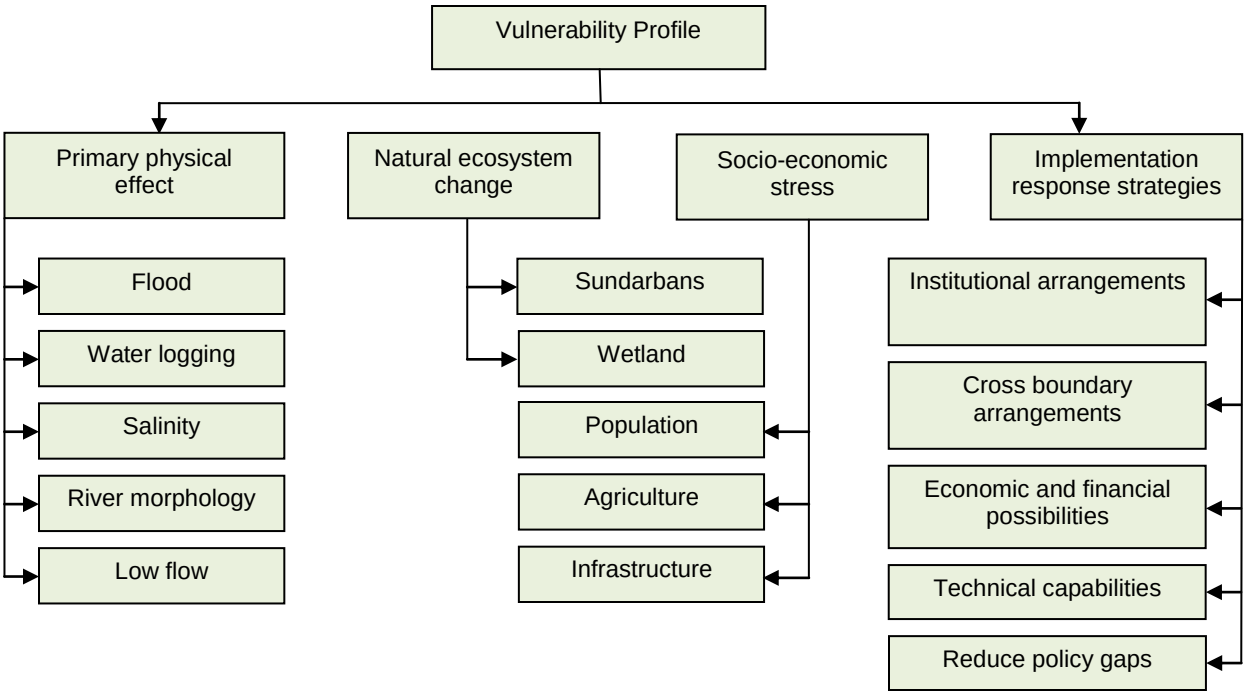
Environmental disasters such as water-logging, the silting-up of rivers and salinity have become common occurrences in south-west coastal region of Bangladesh and are causing inconceivable agony for the people. Water-logging destroyed houses, disrupted communication and the rhythm of daily life, destroyed fruit trees and reduced the number of domestic animals. Only an insignificant area of land is cultivable in the dry season. Because of waterlogging, the fuel crisis became acute. The collection of wood fuel and drinking water became increasingly difficult; human waste was thrown into water in the absence of dry land. People who were earlier maintaining their livelihood by agriculture lost their land become fully dependant on fishing. Many migrated to other areas as life became difficult. The pollution caused by the stagnant waters created epidemics of water-borne diseases. Schools closed and children were deprived of education. Hundreds of thousands lost their occupations and became destitute.

People in the southwest region are highly dependent on the natural resource base in sustaining their livelihoods. Agriculture and fisheries are important economic sectors, employing the major population, and aquaculture is increasingly being pursued as an alternative livelihood option for rural households. Major agricultural crops include rice, betel leaves, fruits and vegetables, mustard and oilseeds, coconut and sugarcane. The region is densely populated, and most farm families cultivate the scarce land resources intensively, resulting in land degradation and reduced productivity. Increasing salinity and water logging was reducing the availability of cultivable land day by day. Fishing provides employment to a large number of families, on a full- or part-time basis. The southwest shallow waters and marine zones host diverse categories of marine fish species and other aquatic life. Coastal water bodies are rich in nutrients in the transition zone between fresh water and brackish water, providing habitat to unique wildlife and vegetation. The largest fishing ground in the Bay of Bengal is close to the Sundarbans mangrove forest (Anwar, 1988).

Recently, a major economic trend has been the emergence of aquaculture, particularly prawn and tiger shrimp farming. Tiger shrimps are grown in huge saltwater enclosures which are generally operated by large landowners, raising questions about the social and environmental impacts of this practice. Freshwater prawns are grown in smaller enclosures and can be combined with rice farming. Prawn aquaculture is increasing among smaller farmers. According to a baseline study in the Sundarban Impact Zone, 4-27 percent of households in the southwest region are dependent on Sundarban resources for their livelihoods. Among them are shrimp fry collectors (35%), fisher folk (33%), honey collectors (22%), boat operators (4%), thatch collectors (3%), shell/crab collectors (2%) and medicinal plant collectors (1%) (SBCP, 2001). In addition to its contribution to the major economic sectors, the natural resource base provides coastal people with materials for building houses, cooking fuel, raw materials for handicrafts, etc.

People in this region are highly vulnerable to water disaster. In addition to the water disasters which have always plagued Bangladesh due to its natural setting, impacts of anthropogenic interventions are creating further challenges to the country's sustainable development. The predicted impacts of water disaster will only increase the difficulties coastal people face in securing their livelihoods, maintaining health and safety, and achieving sustainable development.

Vulnerability Profile hierarchy regarding water crisis / disaster



2.1.3 Coastal Embankment Project (CEP) - The cause of Water disaster

In the 1960's, the then government of East Pakistan was faced with the need to produce more cereals to feed the growing population. To take advantage of the "Green Revolution" inspired by the development of High Yielding Varieties (HYV) of wheat and rice, the then East Pakistan Water and Power Development Authority (EPWAPDA) implemented the Coastal Embankment Project funded by the USAID. Altogether 4000 km of high embankments with 780 sluices were built, out of which 1566 km of embankments and 282 sluices were in the Khulna region alone. These embankments enclosed all the land in the coastal region within 92 polders, out of which 39 are in the Khulna region alone. The Coastal Embankment Project (CEP) resulted in a sudden increase in rice production in the region. Farmers were able to harvest two or even three bumper crops per year. Even landless agricultural laborers and petty traders also found round the year employment. But Nature's reaction against the intervention by man was already building up. The long-term negative impacts of Coastal Embankment Project (CEP) are as follows:

- **Water-logging:** The heavy loads of silt carried by the tides, failing entry into the flood plains, began to be deposited on the riverbeds, and the riverbeds began to rise, until they rose to levels higher than the level of land within the polders. The silt also jammed the exit points of the sluices. On the other hand, the land inside the polders, deprived of the compensating silt, continued to subside. The

temporary drainage congestion, which first appeared in 1982, gradually became permanent water logging to such an extent that, by 1990, an area of 100,600 hectares in Khulna and Jessore districts alone was permanently waterlogged. Now due to inadequate drainage facilities of the monsoon water created subsequently permanent water-logging on over 150,000 hectares of prime agricultural land in eight Upazilas of Khulna, Jessore and Satkhira districts. This causes suffering to one million people and it is increasing day by day. There are also pockets of waterlogged areas in Kalaroa upazila of Satkhira as well as Fakirhat and Mollahat upazilas in Bagerhat district. Permanent water logging has greatly reduced agriculture and related occupations. There is no alternative source of livelihood. Stagnant water all over the area leaves no space for disposal of human and other wastes, causing pollution and proliferation of water-borne diseases. There is scarcity of drinking water, no grazing for cattle. Children cannot go to school. Unemployment has led to increase in poverty, outward migration and overcrowding in urban slums, creating new problems. Over 1.2 million people have been adversely affected by water logging.

- **Salinity:** Besides water logging, water and soil salinity are normal hazards in southwest coastal area. Rahman & Ahsan (2001) estimated that a total of 1.02 million ha of land of coastal zone is affected by different degrees of soil salinity (SRDI-2002). It traditionally restricted the cultivation of Aus, Boro (HYV) and dry season Rabi crops. The critical salinity level for agriculture is 1 to 1.5 ppt NaCl; for Sundari growth it is in the range of 10 to 15 ppt, and for optimum shrimp production between 10 and 20 ppt. There is a seasonally changing salinity interface, with the threshold limit for agriculture moving inland in May in the southern part of the coastal zone, further accentuated by the reduction in dry-season flows entering the Gorai distributaries, following the diversion of the Ganges flow upstream of the border. Salinity now reaches as far as Khulna, Bagerhat and Satkhira, creating problems to normal agricultural practices and affecting the supply of clean water for industrial use. The presence of salt water in the rivers upstream of the estuaries makes the use of groundwater near the river problematic, as there is a risk that salt water will be drawn into the aquifer. Strong regulations concerning groundwater use are required in these zones, including ways for their enforcement. Negative effects of increasing salinity are not limited to economic activities, such as productivity of agricultural crops, and availability of water suitable for industrial uses. River water salinity has also important implications for the natural environment, such as functioning of the Sundarban ecosystem, sedimentation rates in tidal rivers, and human health. “Mangrove swamps case study; the sundarbans of Bangladesh” stated that one of the threats for Sundarban was the Construction of coastal embankments which has changed sediment pattern, and contributed to the vertical growth of deltaic landforms. This has transformed a hydrologically synchronised biota in to a marginalized and scattered ecosystem. Human health is especially influenced by sole dependence on saline water for domestic purposes. Both surface water storage in ponds and ground water pumping are experiencing increasing salinity at present.

Comparison of soil salinity status between 1973 and 2000 of the region

District	Salt affected area (000 ha)		Salinity Class								Salinity increase over 3 decades	
	1973	2000	S1		S2		S3		S4		Area (000 ha)	Per
			1973	*2000*	*1973*	*2000*	*1973*	*2000*	*1973*	*2000*		
Khulna	120.04	145.25	3.90	28.83	92.54	37.32	13.00	59.49	9.80	19.61	25.21	21.0
Bagerhat	107.98	125.13	8.30	35.66	77.08	41.50	2.60	41.23	0	6.74	17.15	15.9

Satkhira	146.35	147.08	16.50	26.03	85.60	40.08	33.50	59.96	1.090	22.01	0.73	0.5

- **Scarcity of Drinking Water:** It is said that water is life. But as per the theme of *The World Environment Day 2003 "Water: two Billion people are dying for it"*, the people of southwest coastal region are dying for scarcity of drinking water. Water is everywhere in this region but not a drop to drink. This shortage of water in this region makes the lives more critical along with other disaster. In the previous year scarcity of drinking water was not as much as it is at present. Once rain water used to be reserved in various rivers, canals, ponds and it was also used for drinking. Fresh water also came from the northern part. But due to the said Farakka Barrage and CEP, this fresh water flow has been reduced. To meet the daily necessity of drinking water women and children of the families have to carry water from long distance facing various social and physical problems. As per the opinions of the specialists the main cause of drinking water scarcity are salinity, arsenic, and shortage of ground water. The sea level of this region is raising 3-4 ml per year and it creates new salinity affected areas, which creates further scarcity of drinking water.

Situation in Southwest Coastal Region of Bangladesh

The water situation in the Southwest Coastal Region of Bangladesh is, to say the least, extremely serious. Briefly stated, the Key challenges are :

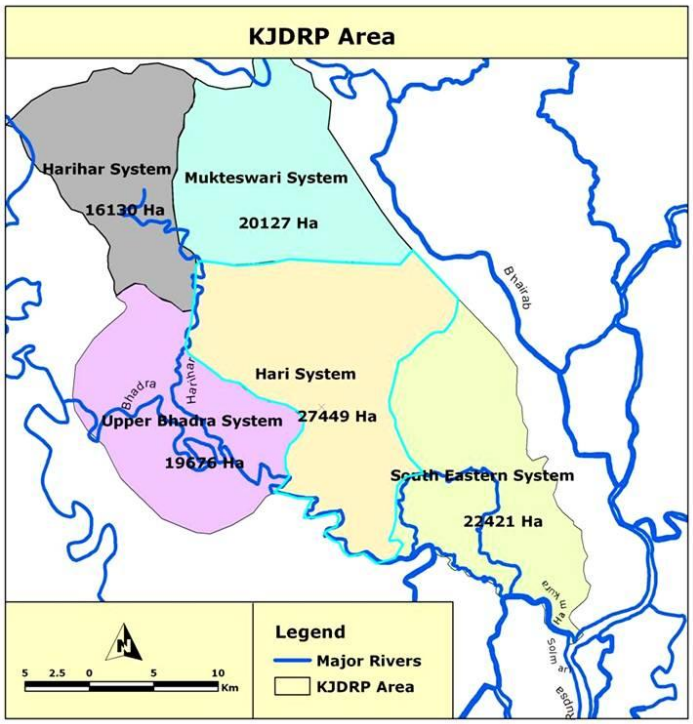
- Nearly 2 million hectares of land affected by dry season salinity;
- Population is increasing @ 1.8% p/a, and poverty and widespread food insecurity are rampant;
- Healthcare facilities are very insufficient, and the main water-related problems are Arsenic and Salinity intrusion
- Deteriorating wetland ecosystem and continued deforestation;
- Deteriorating soil quality;
- Most of the rivers in the region are silted up and incapable of carrying large quantities of water during floods;
- Riverbank erosion; increasing water pollution (shrimp, agro-chemicals, lax sanitation etc.)
- Ignorance about and lack of appreciation for appropriate indigenous knowledge and technology;
- Lack of effective participation of women in decision making;
- Lack of effective community participation in decision making;
- Insufficient dry season flow to provide ecological security, navigation and fisheries;
- Gap in National policies to identify and solve the problems of this region; and
- Weak Regional Cooperation.

- **Arsenic Contamination of Ground Water:** Once upon a time in a lush, green country, criss-crossed with swift-flowing rivers, thousands of poor people were dying every year from drinking unclean water at monsoon time. Then a fairy godmother came along and, waving her intermediate-technological wand, promised: "Sink these shallow tube wells and your diarroheal illnesses will go away." And the fairy godmother and her friends helped the government of the country to sink the tube wells and the people got better. But they all lived happily for only a short time after...' Another natural phenomenon is also responsible for the scarcity of drinking water - arsenic contamination of ground water. Most of the shallow tube-wells in the region yield either brackish water or water contaminated with arsenic. When arsenic contamination of ground water was first detected, no importance was given to it. But later testing of tube-well water throughout the country and the increase in the number of people affected by arsenicosis in different parts of the country again put the people in a dilemma, because, during the period of their dependence on tube-wells, the surface water situation had drastically changed. Thus there is great scarcity of drinking water in the shrimp areas, which cover most of the southern districts of this region. This shortage of drinking water affects women the most, as it is their

responsibility to collect drinking and cooking water for the household. They have to walk several kilometers to collect drinking water, wasting much of their time that they could have used in productive employment.

2.1.4 Government of Bangladesh (GOB) & Asian development Bank (ADB) Partnership to solve water-logging

After water logging emerged as a problem, and to solve water logging problem of Beel Dakatia, "Khulna Coastal Embankment Rehabilitation Project-1" was approved. The project aimed at rehabilitating about 78,793 acres of land under Dumuria, Fultala and Batiaghata upazilas of Khulna district. But the people within the project area rejected the plan and the donor agency also found the technical aspects of the project faulty. As a result, the project was withdrawn after a year. Later, a new draft plan, 'Coastal Embankment Rehabilitation Project-2 (CERP-2) was prepared that also included polder no. 24 of Beel Dakatia area within its design.



The people were pressing hard for the formulation of an environment friendly project to mitigate the water-logging problem. But the Bangladesh Water Development Board (BWDB) failed to propose any project which would take proper account of the existing eco-system. When the affected people had rejected the Coastal Embankment Rehabilitation Project (CERP) and its successor CERP-2, the BWDB came up with the ADB-funded Khulna Jessore Drainage Rehabilitation Project (KJDRP). KJDRP with an initial estimated expenditure of US$62 million was the largest project of its kind taken up so far. The KJDR Project was approved by the ADB on 14 December 1993 and it was formally incepted in 1994 & ended in 2004. The total cost of the project was $44.9 million or 72% of the appraisal estimate of $62 million. ADB contributed $32.6 million (70%) of the actual project costs. The declared aim of the six-year KJDRP project was to 'solve the water-logging problem to increase agricultural production and alleviate poverty of the area through farm-based employment generation.' The project implementation authority hoped that if the project is implemented in time, about 100,600 hectares of land in 68 Unions under eight Thanas will become free from water-logging. As a result, about 800,000 people would benefit from a poverty-free and healthy life. But the plans had to be revised in the face of people's resistance and advocacy of NGOs. Later on a new drainage plan was taken up on the basis of the study by EGIS.

2.1.5 People's Alternative Water Resource Management: An Achievement of the Community-based Grassroots Social movement

The KJDRP project of ADB showed resistance against socially acceptable solution like Tidal River Management (TRM) for reducing drainage congestion. In addition, the relentless advocacy ultimately convinced the Asian Development Bank (ADB) to critically review the KJDRP and, on the basis of the people's demand, they agreed, albeit partially, to go for an eco-technological solution to the water-logging problem: the Tidal River Management (TRM) concept. This resulted in some alteration of the drainage plans, in the context of specific ecological characteristics of the south-west coastal region.

The impacts of People's Movements to solve Water logging during 1976 to 1990

Positive impacts	Negative Impact
• Hamkura River has been getting deeper by 30 feet and widens more than 300 feet. • One and half meter thick silt deposited nearly 900 ha areas of Beel Dakatia. • Two hundred hectare of land went above flood level and area cultivated round the years. • The area became suitable for fish, aquatic animal and also for the aquatic weeds. • Tidal action removed the water logging spoilages. • Reduced the possibility of seasonal flood. • Water logging of downstream beel, adjacent with the cut point, was removed. • Increases the navigation capability of downward Bhadra River. • Increases the underground aquifer.	• The area which is very far from the point still remained as water logged. • Due to high salinity in the summer season environment degradation visible. • The benefited community facing conflict due to the environment degradation.

2.1.6 Chronological description of the major Community-based Grassroots Social movements

The people of the water-logged area have petitioned many times to the authority to solve the water-logging problem and the authority paid no heed to their grievances. Major events of the peoples' movement area as follows:

Noronia Canal digging movement in 1976: A 5 (five) vent flush sluice gate was constructed at Baldighata of Bhaduria in Dumuria in 1967 under the Coastal Embankment Project. Runoff water of 6500 ha of areas of 54 villages was drained out by this gate. But at the 6th year of the construction of the sluice, the canal became silted up as a result the areas became water logged in 1973. In 1976 the local community dug an alternate canal through voluntary service and made its interconnection with Bhadra River directly. Local Administration tried to stop such activities, but people overcoming all sorts of harassment and completed the canal digging work; as a result water logging was removed from the areas for the moment.

Death Trap Bhobodhoho's Regulator resistance movement in 1986: A common slogan of Bhobodhoho is 'Bhobodhoho's embankment is the death trap'. In 1965 two parallel gates were built at the end of Hari River. One of them was 21 vented and the one was 9 vented. At that time the depth of the river was 45 ft. Within the 15 years of gate constructions the river became silted and water logged the areas. As a result 139 villages of Sadar, Manirampur and Avaynagar upazila of Jessore district fallen in disasters. To face such situations in 1986 thousands of peoples of the locality cut down the Embankment to commence the open tidal action. People's movement compelled President of Hussain Mohammad Ershad to come down in Bhobodhoho at that time. After breakdown of Embankments, it was evident that water logging problem was solved and farmers started to produce crop in beel Kedaria, beel Baker etc in

that year, open tidal flow water of beel Kedaria recede significantly. But Water Development Board again repaired the cut Embankment.

Dohuri Public Cut movement in 1988: Dohuri public cut movement is a historical event. It is the first organized protest against CEP. Dohuri situated at the west bank of Hari River. The movement is linked with BWDB and owners of shrimp farm, incorporated government owned "khash" canal in their farms and they made cross-Embankment on it that obstructs water to drain out. Around 20 thousand people participated in that movement. Professional terrorist with police force was engaged by the farm owners for suppression of the movement. In 23rd July of 1988 one police and one civilian was died, in this collision hundreds of civilian were injured. At last local community able to evicted lease farms and commenced open tidal regulation through open channel. In this context, BWDB filed 3 cases for public cut and 4 cases for farms eviction. Around 3 hundred people were accused and suffered 11 year running the cases, later they were got release from the cases under political pressure.

Historical Beel Dakatia Peoples Movement in 1990: To remove the water logging BWDB took a Tk. 64 crore from Khulna Coastal Embankment Rehabilitation Project (KCERP) which included a regulator, sluice gate construction, canal digging and dredging etc. but after dredging the Solmari river dredger couldn't move back due to siltation in downstream. In their proposed plan Hamkura river was blocked by regulator, it would be a great devastation due to huge siltation in downstream as it happened in Solmari river. Mass agitation inoculated around, against the project and the ongoing activities of the project was withdrawn after completing only 11 percent work. But BWDB didn't take any alternative initiative to remove the water logging. Beel Dakatia movement has recognized as a historical movement on facing water logging and into a national issue September. 1990, A large number of spontaneous people gather at polder site Beel Dakatia on 19^{lh} September with the call of "Beel Dakatia Action Committee" ignoring the Govt ruling of 1 44,combating local administration with armed forces and open the beel by four public cut, thereby introduces regular tidal action in Beel Dakatia. People open the Beel for regular tide which continued only three years and 9 months; as usual BWDB closed Sandther Canal by cross Dam that Leeds rapid dying of Hamkura River in no time. Through one of the four cuts made in the embankment, Beel Dakatia was again connected with the river Hamkura. Through regular tidal actions and the accumulation of alluvium, the land formation process of the beel resumed.

In two years from 1990 to 1992, 2500 acres of char (newly risen) land emerged. We saw rice being cultivated in the char lands in October 1992. The logic which worked behind direct intervention by the local people was based on their experience and popular wisdom. The disaster that the polder caused was mitigated to an extent by the people's action. Popular wisdom was reflected in the fact that the resumption of tidal action restored the balance that was lost when the supply of alluvium was cut off from the beel by the polder. The experience has proved that if people take initiatives to face their problems, they can expose the faults of any large engineering work that concerns their lives and livelihood. The success in draining out water of Beel Dakatia encouraged people of adjacent waterlogged areas. They organized themselves and formed committees at different levels and took initiative to turn their waterlogged land into agricultural land again. Madhukhalir beel and Patra beel are examples of such collective efforts. However, these efforts could not achieve desired results at every stage because of a lack of proper organizational

structure and planning. On 29 October 1997, the people breached the right embankment along the Hari River a short distance above the Sholgati to allow free access of tides to Bhaina beel.

2.1.7 The value of people's traditional wisdom: learning's from the revision of Khulna-Jessore Drainage Rehabilitation Project (KJDRP)

It is true that people's efforts could not achieve the desired results at every stage because of a lack of proper organizational structure and planning. However, the people's initiatives and innovative ideas drew the attention of the policy makers and donor agencies towards "People's Alternative Water Resource Management". A new era has begun where people's involvement in solving the problem of water-logging is quite sincerely ensured. The experience has proved that if people take initiatives to face their problems, they can expose the faults of any large engineering work that concerns their lives and livelihood. Even the KJDRP Project Completion Report, 2004 recognized that project implementation delays could have been reduced considerably if the beneficiaries demand for the TRM system had been appreciated earlier.

The proposed drainage plans under Khulna-Jessore Drainage Rehabilitation Project has been reviewed by the people as follows.

- The geo-characteristics of the region had not been considered. The positive role of the alluvium in the process of land formation had been ignored. The main thrust had been to prevent tidal water from entering the project area and to confine the alluvium outside the project area.
- The navigability of a few selected rivers was expected to be maintained, allowing smaller rivers to silt up and die.
- The plans aimed to keep water levels outside the main proposed regulators during the ebb tides lower than that of the waterlogged polders. This, in effect, overlooked the interconnected nature of the rivers and ignored the overall drainage system that the rivers have built up through an intricate network,
- Forest detritus supply nutrients to the water which is a food source to aquatic life forms. The isolation of rivers from one another would hamper the circulation of these nutrients.
- The ecological changes that might take place if any of these drainage plans were implemented had not been given any consideration. The accumulation of alluvium will elevate many areas in the Sundarban, which will obstruct the tidal operations and endanger the mangrove forests.

The proposed drainage plans of KJDRP were abandoned in the face of peoples resistance and due advocacy of NGO's. Later on new drainage plan was taken up on the basis of People's Concept.

Open tidal intrusion in Burulia and Pathra Beels : In the dry season of 1988-89, Bangladesh Water Development Board began river digging by cross-dam at the downstream of Upper Bhadra river. As a result the downstream of Upper Bhadra cause rapid siltation up to 7 feet which out-brake water logging at the adjacent areas to get rid of the situation the local community opened the Burulia and Pathra beel for regular tidal action. As a result vast land became free from water logging and the Beel became resourceful with natural fish, adjacent area became high with siltation and numbers of plant also dies for high salinity, after one season (6 months) the dam was reconstructed by BWDB.

Chapter Three

Tidal River Management (TRM): Linking IWRM and People's Wisdom

3.1 Tidal River Management (TRM): Review of People's Alternative Concept

The purpose of TRM is to allow tidal flow within the polder in a planned or controlled way that causes siltation within the polder for consequent rising of land height and increase the water velocity in the river to wash away the silt deposited on the riverbed. The NGOs supported the people's alternative proposal of Tidal River Management (TRM), on the basis of the experience gained from Beel Dakatia and other similar popular activities. The combined power of people's movement, media campaign and NGO advocacy finally moved the ADB to send a fact finding team to the concerned area in 1999. In the meantime, the people had unilaterally implemented the TRM concept in Beel Bhaina in 1997, and though the BWDB had instituted court cases against the leaders of the people's movements, the experiment had proved successful. The tides had deposited sufficient silt within the polder to raise the level of the land and drain off the water, and the water current had also washed off the sediments accumulated in the silted up river. When the fact finding team of the ADB found that the Bhaina Beel had become free of water logging and cultivable as a result of the implementation of TRM, they became convinced and persuaded the BWDB to incorporate the TRM concept in the KJDRP.

Hijacking the People's Concept of Tidal River Management (TRM): Constriction of coastal embankment project and its flow up of different rehabilitation project have failed to perform its objectives rather successive projects intervention enhances problem tree. People's suffering expresses as protest and movement thereby gradually flourishes different people's organization on water logging issue. Initially there was a little coordination and had no organizational form of those movements. Gradually, those movements have been taken as organizational shape and developing coordination among them, beside NGO involvement also increases, participation of different stakeholder is visible. However, intensity of the problem is also widening, so, coordinated afford of all concerned would helpful to resolve the crisis.

These are the gradual people's initiatives to develop, enrich and implement TRM concept. Specially after Beel Dakatia's People's Movements and successful implementation of TRM, the people became more confident and on the basis of that confidence, people conducted advocacy to redesign KJDRP and due to people's pressure KJDRP authority 4 times changed the drainage plans. After successful implementation of Bhainar beel TRM, ADB and BWDB compelled, but it was proved latter, though BWDB ``agreed'' on TRM and TRM becomes the basis of the final design of KJDRP, they did not implement TRM concept heartedly and honestly. For this reason KJDRP tailed to achieve its desired goal. During the implementation of the KJDRP, local people remained skeptical of the project and demanded a complete environmental impact assessment (EIA) and social impact assessment (SIA). During the EIA and SIA

consultations conducted by Center for Environmental and Geographic Information Services (CEGIS), local people called for the adoption of their idea of TRM. Convinced of this approach, CEGIS recommended TRM as a technically sound, economically viable, environment friendly alternative. However, CSOs alleged that the people's concept of TRM was different from the TRM implemented by the executing agency.

Government twist of Tidal River Management (TRM): People opined that the following deviations of TRM Concept by BWDB are the reasons for the failure of TRM in Beel Kedaria:

- Selection of site for TRM was not appropriate, after Beel Bhaina Beel Kukshia was the appropriate site for TRM
- TRM was executed through use of Regulators instead of open system. TRM was carried out only for 5 months instead of whole year
- Failure of TRM is not to introduce TRM both at Hari and Upper Bhadra simultaneously (According to the CEGIS report)
- BWDB ignored the compensation for affected people and Environment Management Plan -EMP of CEGIS in tidal basin. (Harnessing biological productivities).

3.2 People's ongoing struggle for TRM & Endeavors to counteract to KJDRP

Though KJDRP has failed to achieve its desired objective: mitigation of water logging; the inundation, water logging still exists, people have been continuing their straggle for TRM and appropriate drainage plan. In protest of BWDB's structural solution, local people lunches movement and cut in several point of water logged Beel like Dohuri (1988), Borli (1989), Pathra (1993), Beel Dakatia (1990-91), Beel Bhaina (1997), they have been fighting for open TRM of said location. People's movements compelled government to abandon their original plan for Modhukhali regulator and TRM was introduce in Beel Kedaria instead of Modhukhali regulator by BWDB in 2002-2005 with 600 hectares of land, but BWDB has not learned from those events and neglected the people's concern during implementation phase of TRM in Beel Kedaria.

At present the water logging has extended beyond KJDRP area, with shifting the downstream river system is in an upsetting state. As for example, Taligati- Ghangrail system, Lower Salta- Lower Bhadra system and even the Sibsa are not in a good condition at all. This problem can not be mitigated or moderated by implementing only one TRM.It is unable to be realized to survive the Taligati- Ghangrail river system if the TRM is not implemented simultaneously in upper Bhadra and Hari river. Consequently, the water logging problem will engulf southern and will gradually be out of control as life of upper Bhadra and Hari river are entirely depend on life of Taligati- Ghangrail river system.

As a result of people's movements and the advocacy of the NGOs, the BWDB continued to change the plans. At this time, on October 29, 1997 the people breached the right embankment along the Hari River a short distance above Sholgati to allow the tide freely entrance and leave beel Bhaina. The objectives of the breaching were to improve downstream drainage in the Hari River that would ultimately drain water from the Kedaria and Bokar beel areas of Keshabpur and Manirampur upazilas and to raise the level of the beel by sedimentation.

By 1999 it was seen that the Bhaina beel was silted up and the Hari River, which had been reduced to a trickle, had trebled its width and its depth had increased more than 10 meter near Sholgati bazar. Another important observation was that there is no silt in the upstream of the breach, and that water from the upstream beels easily drained out and became partially free from water logging. But the Bangladesh Water Development Board filed criminal cases against the leaders of the movement, and there was large-scale harassment by the police. On the other hand, the Review Team of the ADB visited the area, and became convinced of the viability of the Tidal River Management (TRM) concept. Accordingly, the ADB advised the Bangladesh Water Development Board to redesign the project on the basis of the TRM concept. Accordingly, the KJDRP was re-designed on the basis of TRM.

3.3 Key Outcomes of the people's movement

As a result of the success of the people's movement, TRM concept has now become accepted as a basic concept for water and river management in the Tidal region of Southwest Bangladesh. CIDA-CARE-RVCC project has considered TRM concept as reducing threat strategy to protect community from water logging due to Sea Level Rise and advocacy for fund allocation to implement TRM concept. Nature has its own Management system. Water Management plans must be designed and implemented on the basis on the river's own management system. Projects that interfere with the river's own management system create environmental disasters. The people understand Nature and Nature's self-management. This is called People's Wisdom. This People's Wisdom must be given due importance. Only then can Good Governance prevail in Coastal River Basin Management.

The widespread application of the objective, technological knowledge of the west is not fruitful in all cases. Development processes must ensure the involvement of the people and their traditional wisdom and experience. Local people have been trying to participate in decision-making processes for long. Foreign experts come and go but they have no stake in the environment in which they apply their “superior!!” knowledge and skills. But the local people have to stay there and survive. Any change in the environment profoundly affects local communities and the lives of the people and biodiversity. Therefore, if local communities have to achieve desired progress, they have to have more power in taking decisions. As such, all development organizations must work to achieve this goal.

If we want to revive the Ghangrail- Taligati river system, TRM must be implemented simultaneously with all the connected rivers i.e. Hamakura, Salta, Ghangrail, Hari, and Upper Bhadra. The EIA and SIA report of CEGIS advocated that TRM should be implemented jointly in Hari and Upper Bhadra River. If it was, the situation may improve to some extent. Comparing with 1998, the situation is more deteriorated now. So, numbers of TRM are mandatory at this moment for the accomplishment of Beel Khuksia TRM.

Observing the TRM of Beel Kedaria, it can be reported (IWM's Final Report March 2006) that it totally failed to show any positive effect on downstream Taligati- Gangrail river system rather it deteriorates. So, the previously implemented TRM has little positive role in the subsequent river system, total benefit from more than one TRM is much higher compare to single TRM. Recent water logging devastation creates to a large extent attention to media, policy maker, donor and all concern of the country. Huge demonstration of protest against BWDB occur in and around in the region compel poly maker to approve 7million taka for Draft project proposal (DPP) of BWDB, it was prepared without consultations of the local people and

again it is a structural approaches with limited scale provision of TRM. People are very much skeptical about the long term benefit from the DPP of BWDB.

Tidal River Management (TRM) of Bhaina Beel

Bharatbhaina beel is situated in the Basin of Hari river in Keshabpur upazila of Jessore district. On 29th October 1997, people breached the embankment to silt up the basin with tide-borne silt. The water logged lands were filled up to a depth of 5-6 feet and Hari river achieved a depth of 30 feet. The representatives of ADB saw the result and expressed their satisfaction. EGIS (Now known as CEGIS) studied the result of breaching of the embankment and recommended application of the TRM concept, But court cases were instituted by the Bangladesh Water Development Board against 100 persons for breaching the embankment. Due to excavation of river bed by cross dam and dredger, it was observed that water logging problem was being more severe instead of being benefit. In 1977, all records of water logging of the past were broken through covering the entire locality. To get rid from such disasters, thousands of people move to Bhaina and cut dam. The tidal river management was introduced in the Bhaina beel on 29^{lh} October of 1997 and was continued till the end of 2001. Under such circumstances BWDB started to study and monitor the fact.

From their study flowing out come revealed.

- ✓ The depth of Hari River has been increased up to 0-12M and widen 2-3 times.
- ✓ About 90 percent of the silt deposited in 600 hectares of land and average height increased one meter.
- ✓ About 200 hectares area has been complete free from flood.
- ✓ About 70000 hectares area of the whole region has been became free from water logging.
- ✓ Employment opportunity has been increased due to fish and other aquatic species were abundant in the river.
- ✓ Use of waterway has been increased.
- ✓ Ground water aquifer recharge enhances as per study of CGEIS.

Water logged areas which is very far from the point was remained water logged and salinity increases. The silt of different part of tidal basin areas is not evenly distributed; BWDB studied the beel and provide a report which included: ***TRM is technically feasible, economically viable, environment friendly and socially acceptable. So they had taken a project to manage the tidal river.***

The KJDRP implemented the Tidal River Management (TRM) concept in 600 hectares of land in Beel Kedaria. The purpose was to raise the level of the land by filling up the beel with tide borne silt and restore the navigability of the Hari / Sree river which had been silted up. But the local people stressed that this activity did not produce any beneficial result. Nawab Ali Mollah (57) and Abdus Samad, former WMA president of Barandipara of Abhoynagar, informed that the experiment did not bring any benefit to Beel Kedaria. The reason was that the 21 vent Sluice at Bhabadaha, about 6 km downstream of Beel Kedaria, could not be opened fully. Another reason was that numerous "Pata" (cross river) nets were affixed, thus not permitting free flow of silt laden tidal water. Moreover, the land for the TRM was acquired without making any compensatory payment. They said that tidal flow in a planned manner could have solved the problem, but the KJDRP totally failed in its expected outcomes. If the monsoon brings even one drop of rain, it cannot be drained off. Already, water level had begun to rise in the villages Bet, Bhita, Dighali, Aanda, Dumurtala and Chalse. In case of heavy rains the water logging that will result would be the worst in history, as the Sree / Hari river has become totally silted up for a length of 8 km and partially silted up for 7 km. Already hundreds of people have submitted memorandum to the Deputy Commissioner, Jessore, for draining off waterlogged areas. But no significant activity is forthcoming from the Government

side. There is also no initiative to re-excavate the silted-up river. There was a bulldozer which was used for excavation purposes. It was seen being driven away to Nowapara. But the local people stopped it near the Teka bridge. Many people were seen sitting near the machine on August 11, 2005. They were waiting for the driver to come, so that they could take it back to the downstream of the Bhobodhoho sluice and re-excavate the river. But the driver did not appear till noon, and the people were expressing their anger and frustration.

3.4 Experts and People's Opinion on TRM

TRM is our concept. We inherit it from our father Grand father. If Govt. accepted this before, such devastation had not happened but the government's implemented water management policy failed to achieve any success."

Ranjit Bowali
Convenor of the Bhabadah People's Committee to solve Water-logging
Jessore, Bangladesh

Dr. Ainun Nishat, Country Representative of IUCN-Bangladesh perceives TRM as people's traditional Wisdom'.

The ADB's operation Evaluation Department (OED) in its perspective documents mentioned that, structural engineering solutions proposed by the KJDRP were not compatible with the needs of beneficiaries and local wisdom. The OED document also acknowledged that the initial performance of the TRM approach seems encouraging and need to be assessed effectiveness, viability, and sustainability of this TRM approach in Bangladesh and its replicability elsewhere in the region encountering similar problems.

The Environmental and Social Impact Assessment (EIA/SIA) study of KJDRP, conducted by the Center for Environmental and Geographic Information Services (CEGIS) analyzing both technical and social grounds has reported the Tidal River Management (TRM) as the most suitable for solving the drainage congestion problem in the area on a sustainable basis. The EIA/SIA study recommended that the development of TRM option should be based on detailed surveys and studies and planned carefully through intensive interaction with stakeholders, which should be facilitated through a properly planned and implemented monitoring and feed-back mechanism.'

Dhali Abdul Qaium of Water Resources Planning Organization (WARPO), Bangladesh described technical aspects of TRM approach as such *"Structural interventions (in the form of bigger polder, more regulators etc) to alleviate drainage congestion and water logging problems proved less effective. Tidal river basin management (TRM) approaches seem an effective and sustainable way forward. Under this scheme, a certain low-lying area within the polder is allowed to act as a retention basin, allowing the tidal prism to spread over throughout the basin during high tide. By this process, silt is deposited on the low lying areas making them higher; fluxes of water leaving the basin during low tide are silt free thus helping to keep the tidal channels deep. This approach has been tested in the field with encouraging results".*

Giasuddin Ahmed Choudhury, Chief Engineer, O&M, Bangladesh Water Development Board, Ministry of Water Resources, Bangladesh reveals how government is trying to include TRM into the IWRM. He described as such, *"A community focus participatory approach was adopted since June 1995. The community was associated with the project management in the preparation of rehabilitation and tidal river management (TRM) plans. The community was also participated in finalizing the design of the drainage structures and canal networks for ensuring effective drainage. The WMOs actively participated in the*

construction of perimeter embankments in some places by procuring land free of cost from the beneficiaries and helping the contractor to mobilize the labour force. WMOs help collect basic data and information through field surveys and disseminate information among the Beneficiaries".

Tidal River Management (TRM)

The TRM approach allows for local control and management of the resources in the KJDRP area. Its main challenge lies in the fact that this requires major coordination between the different communities in the area, structures which were missing when the TRM was implemented, and which are developed in parallel with the implementation of the TRM.

Center for Environmental and Geographic Information Services (CEGIS)
The Case of the Khulna-Jessore Drainage Rehabilitation Project (KJDRP) in Bangladesh

3.5 Initiatives of the NGOs to promote TRM

TRM is still a conceptual idea promoted by Non-governmental Organizations like Coastal Development Partnership (CDP) & Uttaran; later supported by the Center for Environmental and Geographic Information Service (CEGIS) and formulated by the Snowy Mountains Engineering Corporation (SMEC). However, TRM has some practical lessons based on the experience gained from Dakatia beel, Bhaina beel and other small beels. The Dakatia beel could be considered as an ideal practical example of TRM. After the breaching of the embankment of Dakatia beel, the Hamkura River became a strongly flowing river with 300 feet width and 30 feet depth at the new highway bridge on the Khulna-Chuknagar Road. The people transferred the TRM learning's from the Dakatia beel on other beels such as Bhainar beel, Golner beel, Bahadurpur beel, Magurkhali beel. In all cases, the TRM knowledge transfer proved successful and this provided confidence to the NGOs to promote People's Alternative Water Resource Management concepts like TRM as a component of IWRM.

When the BWDB presented the plan for KJDRP, NGOs under the initiative of Uttaran opposed the proposals and demanded guaranteed people's participation in all stages of the project - from designing projects to their implementation - and that drainage plans should be ecologically sound. Local and national civil society organizations such as BanglaPraxis, Bhabhadah People's Struggle Committee, Coastal Development Partnership, Pani Committee and Uttaran have blamed the ADB for creating an ecological disaster by funding a project which, on the one hand, inundated several hundred hectares of land and on the other hand, caused rivers to dry up. The Association of Development Agencies in Bangladesh (ADAB), the national coordinating body of NGOs, and the Coalition of Environment NGOs (CEN) performed leading roles in the campaign. Widespread media campaign and a TV film broadcast over Bangladesh Television helped the advocacy to a great extent. The ADB suspended the implementation of the project in the face of continuous efforts of NGOs and the people's movement, to be taken up later subject to environmental and social impact studies (EIA & SIA), and scrutiny of their findings. The government and BWDB have accepted the TRM option (according to their understanding).

The NGOs and people's organizations continued to advocate for the adoption of the TRM concept for the whole project area. But the BWDB decided to develop one temporary tidal basin (Kedaria beel) in the north-western part of the project area, while managing, improving and closing the existing basin in Bhaina beel (which is reaching the end of its useful life). The BWDB also decided to drop the Kashimpur and Tiabunia regulators from the project. Although according to the original schedule, the KJDRP should have

been completed by the end of 1999, due to various delays, the project finally came to a close on 31 December 2002, with the TRM concept implemented only in an infinitesimally small area in Kedaria beel. However, the BWDB now admits that the TRM is the best strategy for mitigating water-logging in the area.

A write petition was filed on 13 August 2006, by the BELA and the BLAST seeking appropriate judicial intervention to address the sufferings of more than 100,000 people in 144 villages of the three upazillas of Abhaynager, Monirampur and Keshabpur of Jessore. Following the motion hearing, a division bench of the High Court has directed the concerned authorities to provide all such services, products, goods and other supports within their means that are required to ensure that the people of the affected villages of the three Upazillas are safely located and are receiving food, water and other essentials during the water logging periods.

3.6 Challenges to redefine IWRM as the People's Alternative Water Resource Management (PAWROM)

One of the limitations of TRM is it is time consuming. It needs at least three to five years to silt up any polder. In this time the issue of people's livelihood becomes more important. Another limitation is, though it is people's centered concept, it needs strong and broader people's organization to implement this concept. So it needs a longer preparatory phase to develop TRM based plan. In addition, to develop proposal on the basis of this concept it needs institutional support, technical support. But the experts of the implementing organizations generally do not consider TRM in positive manner. Still now Governments, Mainstream Academicians, Institutions does not approved TRM as an effective method for river basin management.

Defining TRM as a PAWROM tool

Coastal Development Partnership (CDP) provided an acronym PAWROM for the People's Alternative Water Resource Management (PAWROM). The Bangla word "PAWROM" means deep affection or close to the soul. CDP considers TRM as a practical tool of PAWROM. TRM is an eco-engineering concept where ecosystem components can play positive role to solve the water resource management issue. TRM is people centered & functions with bottom up approach. It is sustainable because it is nearly costless and needs very cheap O&M. Moreover, it has no such long term negative impact. Besides, it considers silt as positive component to Solve water logging.

3.7 Recommended guidelines for future actions and policy directions

A number of lessons which are learnt from the long experience of establishing TRM could play as guidelines for future actions and policy directions on water resource management. Some the notable guidelines are as follows:

- Mere economic considerations (e.g. enhanced production of high yielding varieties of rice) should not encourage policy makers to adopt structural development projects, totally ignoring long-term environmental consequences.
- In the highly sensitive and fragile environment of the southwest coastal region of Bangladesh, where the lives and livelihoods of the vast majority of the people depend to a large extent on the sustainability of the ecology, traditional wisdom and experience of the people must be incorporated.

- Policy makers should not be misguided by the so-called 'highly-educated experts'. In problem identification, design and implementation, active participation of the grassroots stakeholders must be ensured to avoid any future disaster.
- Strategic Environmental Analysis incorporating traditional wisdom and indigenous practical experience must be done prior to any large development project.
- In any rural scenario, and especially in such a highly sensitive region as this, there is a strong linkage between the state of the environment and development. Short-term economic returns cannot compensate for a damaged environment.
- The NGOs, if they are to serve the people and implement development activities, must be environmentally knowledgeable. People's development cannot be achieved by ignoring environmental issues and implementing development projects in an impressionist manner. Such perspective will be like filling water into a leaky bucket.
- NGOs working in the region must develop empathy with the people and adopt the perspective of the people as their own; only then will it be possible to alter the points of view of high level policy makers.
- Government should complement NGOs who are facilitating water users' associations, involving marginalized groups.
- All the organizations and agencies connected with the different stages of the development process must be responsible for promoting TRM and IWRM as people-oriented approach.

3.8 Conclusions

Current global scenario teaches us that in every where people have been fighting, struggling for their traditional water rights, access to water resources, water for livelihood; People's Alternative Water Resource Management (PAWROM) could be an option to initiate demand for pro-people water governance. Although People's Alternative Water Resource Management (PAWROM) is a traditional instrument, it can be used as platform to unmask the corporate, anti poor people national policies and process and global trade paradigm. To do so, People's Alternative Water Management practice can play very powerful instrument to show people's empowerment. TRM is not only a drainage concept. It represents the people's empowerment. It is the resultant of people's knowledge, which they earned through hundreds of years livelihood practice. So, it can be said confidently that TRM concept developed by farmers is one of the appropriate concept for coastal tidal river basin management. The concept developed by the people needs broader people's participation and engineering expertise combination. To transform concept into workable implementing project, the engineers should admire the people's wisdom and on the basis of that wisdom, engineers may develop their drainage plan. We have to keep it in mind that IWRM is expert's tool whereas PWRM is people's tool.

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Ashraf-ul-Alam Tutu: The Founder of CDP

The year 2008 is a sad year for CDP. On 12th February, 2008 the founder of the Coastal Development Partnership (CDP) has passed away. Ashraf-ul-Alam Tutu was the founder of Coastal Development Partnership (CDP). Tutu was the freedom fighter in 1971 for independence of Bangladesh. After the great liberation war, he involved with different people's movement for their rights. He was one of the pioneer environmental activists in Bangladesh. After the inception of CDP in 1997, he provided leadership role on various issues of natural resource management, environmental conservation, human rights and good governance to ensure the sustainable development of the Southwest Coastal Region of Bangladesh. Tutu was one of the pioneer activists on monitoring Khulna Jessore Drainage Rehabilitation Project (KJDRP), member secretary of Sundarban Biodiversity Conservation Project (SBCP) Watch Group. He was International Committee (IC) member of NGO Forum on ADB; Chairman, Right to Food Movement, Member, Committee on Education and Communication (CEC) of IUCN; Bangladesh Chapter Coordinator Asia Pacific Network of Food Sovereignty (APNFS); Steering group member of Water for Peoples Network-Asia and Agribusiness Accountability Initiative (AAI)-Asia, and focal person/member advisor for different International, National & Regional Networks. He was the author of more than 40 books and his publications are widely published in different International journals.