

Report prepared by

Bangladesh Water Partnership (BWP) and Institute of Water Modelling (IWM)

PREFACE

Water has a cross cutting characteristics meaning that it affects nearly all sectors of life, livelihood and economic development. Given that, sustainable management of the limited and fragile water resources is becoming the central theme of all development activities targeting to poverty alleviation and economic well-being. In the South Asian Deltaic region; comprising Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka, sustainable water management demands immediate and effective attention. This region is characterized by a large number of population density and high population growth rate, poor economic, technological and institutional capacity, absence of effective cooperation, fragile ecosystem etc. which are the major impediments to sustainable harnessing of the region's water resources. On top of this, impending climate change has made the task a challenging one.

We need to prepare ourselves both in-terms of technological knowhow and capacity development to cope and meet the challenge. Various research and development works are taking place in different countries to that end. Besides, there exist traditional knowledge systems that are suited to a particular area but can be replicated in other places with appropriate alteration and modifications. All these knowledge bases could be assembled, discussed and shared among south Asian countries to enhance our capacity to cope with the anticipated water related crisis and disaster.

In this backdrop, a regional workshop on 'Sharing Lessons and Experiences on Current Water Management Issues, Opportunities and Challenges from Deltaic Region in South Asia including Impending Climate Change Impacts' has been organized jointly by Bangladesh Water Partnership (BWP) and Institute of Water Modelling (IWM) during 28-29 March, 2014 at Dhaka in Bangladesh. Financial support for the Regional Workshop was provided by GWP SAS. The main aim of the workshop was to share lessons, knowledge, exchange views and experience for best utilization of available water resources in the South Asia Delta region under impending climate change.

WE express our profound gratitude to the participants, distinguished guests, resource persons, presenters and session chairs for their sincere and thoughtful contribution towards making the workshop a successful one.

We are deeply indebted to Country Chair and representative of GWP India, Nepal, Pakistan, Bhutan and Sri Lanka for sparing their valuable time and taking the trouble of travelling the long distance to attend the workshop, and sharing their valuable experience.

Lastly, we would like to convey our sincere thanks to the staff and professionals of Institute of Water Modelling for taking the lead role to successfully organize the workshop. We would like to thanks all who contributed immensely to make this workshop a grand success.

M. Shahidul Hassan
President
Bangladesh Water Partnership

Prof. Dr. M Monowar Hossain
Executive Director, IWM, Dhaka
Bangladesh

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1 INTRODUCTION

A two days long regional workshop on ‘Sharing Lessons and Experiences on Current Water Management Issues, Opportunities and Challenges from Deltaic Regions in South Asia including Impending Climate Change Impacts’ was held in BRAC Centre, Dhaka, Bangladesh, on 28th and 29th March, 2014. The workshop was jointly organized by Bangladesh Water Partnership and Institute of Water Modelling (IWM) under the aegis of GWP SAS. The workshop was attended by more than 140 participants from home and abroad. Delegates from Pakistan, India, Nepal, Bhutan and Sri Lanka were also present in the workshop. National delegates included senior officials from the Ministry of Water Resources, Bangladesh Water Development Board, Water Resources Planning Organization including many other government and non-government organizations, academic institutions, research organizations working with water resource management in Bangladesh.

Mr. Ishwar Raj Onta, Chairperson GWP, South Asia Region could not attend the workshop due to his sickness, however, he was represented by Ms. Priyanka Dissanayake, Regional Coordinator, GWP-SA.

2 OBJECTIVES OF THE WORKSHOP

In recent times, over population is a serious problem across the world and this is particularly true for the South Asian deltaic region which houses about 22% of the world population. With continued economic development, this over population has created stress on the limited natural resources base, particularly on water resources. Rapid urbanization, deforestation, industrialization coupled with climate change is expected to exacerbate the situation. Given this, concerted efforts are needed to manage the region’s water resources in a sustainable way. The existing knowledge available in the public, private and civil societies including education and research institutions can be effectively utilized to properly understand the multifaceted dimension of the crisis, to plan and implement projects and programs aiming to enhance wellbeing of the people at the same time ensuring sustainability of water resources and the wider environment.

With this perspective, this regional workshop was organized to discuss, identify, explore, formulate and promote evidence for policy formulation and implementation process for improved water resources management in South Asia.

3 WORKSHOP PROGRAM

The workshop was held covering two days, 28th and 29th March, 2014. On Day-1, the program was divided into two sessions. Session-1 was dedicated for inauguration of the workshop while Session-2 of Day-1 and whole of Day-2 was Technical Session where case studies from the participating countries were presented and detail discussions were held. Besides, Group Discussions were held on three thematic issues where participants gave their views to address the issues and problems identified.

Detail of the workshop program is given in Annex-1.

4 INAUGURAL SESSION

In the inaugural session, Barrister Anisul Islam Mahmud, Honorable Minister, Ministry of Water Resources, Government of the People's Republic of Bangladesh was present as the Chief Guest. Besides, Dr. Zafar Ahmed Khan, Secretary, Ministry of Water Resources, Government of Bangladesh and Mr. M Shahidur Rahman, Director General, Bangladesh Water Development Board was present as special guests. Dr. K AzharulHaq, Vice president, Bangladesh water Partnership gave the welcome address while Prof. Dr. M Monowar Hossain gave an overview of the workshop. The inaugural session was chaired by Mr. Shahidul Hassan, President, Bangladesh Water Partnership.

All respected guests present in the inauguration of workshop highlighted the importance of the workshop and emphasized that such workshops can be a very useful ways to foster regional cooperation for water resources management in the regional countries as well as to cope with the emerging challenges of climate change.

Dr. K. Azharul Haque, Vice President Bangladesh Water Partnership (BWP) gave the welcome address at the Regional workshop. He underscored that this is a very important consultation workshop that will determine where South Asia goes from here to the next decades with their water resources and how to make best utilization of this natural resource. He said that a new concern in the whole water management system is the climate change impacts and it has become a very important factor because it is difficult to predict it. The unpredictable nature of climate change makes it very difficult to formulate strategies to cope with it. Therefore adaptive and mitigating measures must be designed keeping sustainability and long term effect in mind. He expressed his optimism that the workshop will address the issues of water security in the face of climate change. Water security is not only for municipal purpose i.e. for drinking and homestead use, water security will also knock food security, environmental security, ecosystem security etc. that is related to water.



Dr. K. AzharulHaque, Vice President, BWP delivers his welcome speech.



Barrister Anisul Islam Mahmud, Honorable Minister for Water Resources, Government of Bangladesh, speaks as the Chief Guest

Honorable Minister for Water Resources **Barrister Anisul Islam Mahmud** was the Chief Guest at the inaugural session of the Regional workshop. In his speech he said that one of the most important problems that are to be faced in the next few decades in a broad sense is the problem of water management. Sharing of knowledge, resources and co-operation on international scale is required to handle the water management situation.

He stressed that in Bangladesh, it is not only food security but land security is also an issue. Bangladesh is a deltaic region and is actually the confluence of the three big rivers the Brahmaputra, the Ganges and the Meghna. The land is crisscrossed with meandering and braided rivers, contributing among many other things erosion/depositions and morphological changes. Therefore, water management is directly related to not only drinking water and sanitation but most importantly food security and also because of the erosion/depositions factor, land security.

He expressed that in fact today a major portion of the Ministry's time is spend not on irrigation, not on flood control but on erosion and bank protection because embankments are breaking out. Whenever it happens, it goes to the parliament and Member of Parliament approaches the Minister. Bank protection works are usually done though international contracts which cost extremely high whereas local engineers in BWDB are usually allotted limited money to do the work. He emphasized that the river bank protection works are expensive by any standard.

Regarding his past experience as a Minister in the sector he outlined that each year about 2 billion tons of sediment loads are carried by the river systems which comes from upstream and are delivered to the Bay of Bengal. The water flow and sediment flow makes the sedimentation and erosion problem complex at the downstream reach where Bangladesh lies in the GBM Basins. He emphasized that the current sediment load may even be 2.5-3 billion tons. Sedimentation causes a lot of problems. He quoted the Brahmaputra river case; it is a braided river and the reason for that is silt that drains and gradually deposits, raising the bed level. The water then finds new channels to travel downstream creating braided pattern.

He also outlined that water management is not only associated with water supply, sanitation, land and food security, flood control and bank protection but also silt management. In the past resources were only focused on flood control drainage and irrigation management. However, now policies and implementations are done with a much broader view to tackle multifarious problems. He focused that Bangladesh has become almost self-sustaining in food production due to water resources management. Food

security has been attained to a certain degree to inspire confidence. However unless care is taken on water and land management, then that may become a probable cause for disaster.

As for water management he stressed that it has connections with climate change. The predicted sea level rise is about 84cm which will inundate 20% of the land. He informed that Polders were made few decades ago. It started from late 1950s or early 60s and the days of polders continued until to 1970-80 and we went for that option. The polders built in the past have provided with great benefit for the last 40 years. However, the design of polders must be sustainable, so that they can minimize siltation and provide protection from sea level rise, create fisheries within polders in a sustainable way.

The minister also stressed that sharing data with other countries is necessary to address the problem from regional context. International co-operation is of great importance and necessity. Unfortunately that practice has not picked up pace. Bangladesh has about 54 cross Boundary Rivers but data from other countries on these rivers are largely unavailable which makes water management of these rivers as a lower riparian country almost impossible.

The Minister concluded by saying that since the regional countries having a common history and common past, the people of these countries are more or less similar and therefore, should have compassion for each other. A prosperous Bangladesh is the best security for the neighboring countries and a poor, poverty ridden one would be just the opposite. Bangladesh demands water only under equitable principles and the problems related to this issue should be resolved.



Prof. Dr. M Monowar Hossain, ED, IWM presents Workshop Overview.

Prof. Dr. M Monowar Hossain, Executive Director, Institute of Water Modelling gave an overview of the workshop highlighting the background and objectives of the workshop. He emphasized that over population across the world is a serious problem especially in South Asia which resulted in severe stress on natural resource management. On top of this impending climate change is expected to exacerbate the situation. Added to this challenge is reducing poverty, hunger and developing the economic footing through effective water resource

management in deltas of South Asia requires process that are effective for poor household and operate at river basin level, to stakeholders scale and across country boundary.

Prof. Hossain emphasized that such approaches could be elaborated on the basis of assessment of local knowledge blended with technical study results. Existing knowledge and experience available in public, private and civil societies including institutions can be effectively utilized for proper understanding of the problems, and for planning and implementation of appropriate measures. To achieve the goal, this regional workshop has been organized to identify the burning issues, explore and formulate strategy and implementation process for improving water management issues in South Asia in the face of impending climate change.

He further stated that broad objective of the workshop is to share lessons, knowledge and experience for best utilization of available water resources in South Asia under impending climate change impacts, and the specific objective of the workshop are:

- To share lessons on current issues and opportunities in addressing Deltaic Regions in Nepal, Bhutan, Sri Lanka, Pakistan, India and Bangladesh.
- To promote regional Co-operation among the countries for improved water management of South Asia to ensure water security under impending climate change scenarios.
- To share water and climate related lessons and experiences, and
- To assess the impact on vulnerability of water resources in the management of deltas.

Ms. Priyanka Dissanayake was the Special Guest at the workshop. She works in the capacity of Regional Coordinator, Global Water Partnership-South Asia (GWP-SA). She represented the Chairperson of GWP-SA.

In her speech she informed that that there are plans to work with the Country Water Partnership organizations from Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka and also from Afghanistan and Maldives is in the agenda for the next 2 years. GWP-SA planned to undertake a number of regional activities in its agenda. This workshop is the 1st regional activity along with ambitious plans to collaborate with regional organizations in the region, South Asia Cooperative Environment Forum (SACEF) program and SAARC. They are the mandated organizations in the region.



Ms. Priyanka Dissanayake, Regional Coordinator, GWP-SAS, addresses the workshop as Special Guest

She revealed that declarations, documents and plans have already been made ready towards such a goal for environmental issues. Most of the countries have prepared their NAPAS and National Adaptation Plans as well as their climate change strategies. These projects aim to enhance implementation of these strategies which are effective at regional level, at national level and even at the local community level.

She informed the workshop on South Asia Environment Cooperative (SAEC) program which has been assigned with another program on drought management. Plans were made to develop early drought warning system for South Asia in collaboration with World Meteorological Organization (WMO) and International Water Management Institute (IWMI).

She expressed her satisfaction on the delta programs which are specially implemented projects by Bangladesh and where Bangladesh Water Partnership has focused roles in addition to their other usual activities. Bangladesh has recently initiated preparation of Delta Management Plan 2100 which is going to be a long term plan for Bangladesh. She informed that there are lots of things on implementation from project itself from which others can learn from Bangladesh. She also emphasized on regional cooperation.



Mr. M Shahidur Rahman, Director General, Bangladesh Water Development Board, addresses at the inaugural session.

Mr. M Shahidur Rahman, Director General Bangladesh Water Development Board, was present in the workshop as special guest. In his speech he said that Bangladesh is a disaster-prone country. Disasters like tropical cyclones, storm surges, coastal erosion, floods, droughts and saline water encroachment in the coast are common problems almost in every year. Almost every sector of socio-economy in Bangladesh is affected by these disasters. You also know that Bangladesh is very low elevated flat country, where

major portion of coastal land form lies within 2-3 meters above mean sea level. Due to its topographical feature and geographical location, the country is extremely vulnerable to water induced disaster.

He said that total coastal area of Bangladesh is 47,201 km² and per square kilometer density of population in this area is about 946. About 26% of total population lives in our coastal region. Population in this area will increase to 60.8 million in 2050. Bangladesh Water Development Board has taken significant initiatives since inception in 1960 to date. BWDB constructed 139 polders in the coastal region. These polders were planned and design for protecting low lying coastal area against tidal inundation and salinity intrusion considering the tidal effects. They were found to be very effective in protecting the life and livelihood of the coastal people at that time although with the passage of time some unwanted effects have crop up.

He further said that climate change is likely to have significant impacts on coastal lands. Southwest Region and Southern area will experience severe water logging problems by climate change induced sea level rise and increase of precipitation. To cope with the anticipated havoc, BWDB has taken up various activities which have a big financial implication. It is estimated that over two billion dollars will be required to do that. We do also require good organization and multi-disciplinary skills on the ground and good governance.

He expressed his aspiration saying that in the forthcoming technical sessions presentations from other countries will be made from which we will know the experience of other countries on the similar water problems and threats. I am very hopeful that lessons from today's workshops will give us some guidelines and way forwards.

Dr. Zafar Ahmed Khan, Secretary, Ministry of Water Resources, Bangladesh was present as Special Guest at the inaugural session. He said that Bangladesh is one of the largest deltas in the world and roughly 154,000 sq.kmland mass with about 160 million populations. There are 400 rivers of which 57 are trans-boundary. It is a low lying deltaic country in South Asia. River erosion, flood and coastal cyclone are major natural disasters. The country is extremely vulnerable to natural disaster because of its geographical setting, its flat deltaic topography and very low elevation makes it more vulnerable to natural disaster.



Dr. Zafar Ahmed Khan, Secretary, Ministry of water Resources, Bangladesh addresses at the inaugural session.

He stressed that climate related disaster results in large economic losses reducing economic growth and hindering the progress of poverty reduction. In 1998 flood inundated over 2/3rd of Bangladesh and resulted in losses of over 2 billion USD that is 4 to 8 % of GDP. Climate changes will alter and aggravate the natural conditions in these delta regions and elsewhere at a rate never before experienced by mankind. Climate change is expected to increase the severities of many of the problems faced in river deltas. Climate change Impact combined with increasing population, rapid urbanization, and economic development will require urgent attention to address the issues.

He outlined that knowledge must be developed in order to respond to the level of threats and climate that these regions have never dealt with it in the past. The water sector problem and the threats to the people in Bangladesh and other countries in South Asia can also be resolved by sharing lessons, experiences and information. Steps taken based on existing policies and technologies have not been very successful in addressing the present chronic poverty and economic condition of the poor living in the deltaic region of South Asia. Investments made in these phase of climate change measures need further reassessment of issues and proper evaluation and implementation strategy specially for deltaic region studies and research will help in resolving many complexities related to the problems.

He also opined that scarcity of water is a major motivation for accelerating water mining in many areas of South Asian countries including Bangladesh and India. Siltation in the Himalayan River has aggravated due to deforestation in the upper watershed. Hence basin wide approach in the Himalayan River could address water problem at the root level. Thus multi-country approaches to promote knowledge-base and solutions to these water problems in the Himalayan region are essential for mutual benefit.

Considering regional collaboration, he stated that problems are common in South Asian countries and collaboration among these countries are essential to resolve them. With increasing pressure from population growth, industrialization and changing climate, it is more important that we cooperate to conserve valuable vulnerable resources of this region by increasing our knowledge base to cope with the future challenges. Lastly he commented that water sector of the country needs to be addressed on the basis of scientific management, scientific data, not with any political slogans and there is no other way to

resolve these problems. Therefore on this basis and in the context of Bangladesh as one of the biggest delta regions a big challenge will be faced by our policy makers as well as those people who are involved in translating the knowledge into practice.



Mr. Shahidul Hassan, President, BWP addresses as the Chairperson of the workshop.

In his speech, **Mr. Shahidul Hasan**, President, Bangladesh Water Partnership and Chairperson of the workshop said that few beginning words of today's workshop that is 'sharing lessons and experience' demonstrates that cooperation is at the pivotal point for proper management of the region's water resources. This has also been reflected in speeches of

distinguished guests too. Mr. Hasan said the subject of discussion is well known to us and I hope that there will be elaborate discussion during the next two days on how can we move forward guided by our past lessons and experience. Lastly he expressed his sincere gratitude to the distinguished guests and participants for attending the workshop.

5 TECHNICAL SESSIONS

During the two day's workshop, four Technical sessions were held where 12 case studies were presented from the participating countries, of which one paper was from India, one from Sri Lanka, one from Nepal, one from Pakistan and the rest eight case studies were from Bangladesh. The case studies highlighted different aspects of water resource management and climate change. The issues addressed in the case studies included river basin management, international water sharing, flood management, drought, irrigation, water supply, groundwater, water management in the coastal zone, participatory water management, gender, environment, ecology and wetland etc. Each Technical Session was followed by an 'open discussion' session.

Brief outline of the case studies are presented in the following sections.

5.1 Presentation Outline

5.1.1 Lessons and Experiences on Current Water Management Issues in Bangladesh: Opportunities and Challenges

Dr. M. Monowar Hossain, Executive Director, IWM

Prof. Dr. M. Monowar Hossain, Executive Director IWM gave a vivid presentation on the present state water management in Bangladesh. He said that most of the land area of Bangladesh comprises of low-lying Gangetic Delta. Due to its geographical location, Bangladesh receives huge amount of sediment and about 93% of the annual river flows has its origin outside of the country with concomitant inland runoff. Moreover, this transboundary flow is controlled by upper riparian country which leaves little management control for Bangladesh. The country is also subjected to recurrent and periodical water related hazards. Natural disasters such as floods, droughts, erosion, salinity intrusion, cyclones, and storm surge etc. predominates the life in the country causing impaired growth rate and development. On the other hand the population growth rate in this disaster prone country is alarming. Natural disasters combined with booming population is a major challenge to meet the water and food security of this large population.

Dr. Hossain also said that due to rapid industrialization and indiscriminate discharge of industrial effluents and domestic sewage to the surface water, renders it to be almost “biologically dead” during dry period. Thereby the only source of usable water is groundwater which on the contrary is depleting at a considerable rate for the reason of over-exploitation. Irrigation cost in Bangladesh is almost 4 times higher than India, 6 times than Thailand and Vietnam because of the over-dependency on GW. He opined that something different should be thought to make the surface water usable.

He informed the workshop that due to the geographical location as a lower riparian country at the confluence of the world renowned mighty Ganges-Brahmaputra-Meghna (GBM) river systems, Bangladesh is considered as one of the most vulnerable countries being affected by climate impacts. He quoted some reasons as to why Bangladesh is a vulnerable country with flat and low-lying topography having no control over the water flows and volume. All river flows drain to the Bay of Bengal, which accounts for over 93% of the total run-off generated annually during the five months monsoon season while in dry period the country faces droughts. As a consequence widespread poverty, poor economic infrastructures, limited adaptive capacity etc. threatens the development sector.

Prof Monowar also indicated that the impacts of climate change may have manifold effects. This may have lead to the scourge of Arsenic contamination of GW, increase of ecological threats leading to loss of world heritage like the Sundarban and of course increase in climate induced migration. Causes may also include increase of risks to human health and nutrition as well as threats to fisheries and live stocks sector etc. He also pointed out some mitigation options such as structural and nonstructural measures. Structural measures may include Impact Assessment for Planning Interventions, Optimization of Planning Option, Providing Hydraulic Design Parameters, Supporting to EIA/SIA; Survey and Monitoring, Impact Assessment of Climate Change. Non-structural measures may include Flood Risk/Vulnerability Mapping, Flood Forecasting and Warning, Climate Change Impact. Finally Dr. Monowar indicated that regional cooperation is needed for proper water resources management through concerted efforts of a Joint Task Force for Regional cooperation at the basin level.

5.1.2 Lessons and Experiences on Current Water Management Issues: Opportunities and Challenges in Mahaweli River Delta

KusumAthukorala, Chair, Sri Lanka Water Partnership

MsKusumAthukorala from Sri Lanka Water Partnership gave a vivid presentation on state-of-situation on 'Sharing Lessons and Experiences on Current Water Management Issues, Opportunities and Challenges from Deltaic Regions–Mahaweli Delta in Sri Lanka'. The presentation started with introduction of the Trincomalee port, the Mahaweli River, which is the longest river in Sri Lanka. It has a total length of 335 km and has the largest drainage basin covering almost 1/5th of the country. The introduction also covers the national and regional importance of the Trincomalee Harbor.

The presentation then discusses the formation, features and characteristics of the delta. The features and farming conditions along with the state of farmers as well as the potential for economic activities, agriculture and fisheries were highlighted. The conflict situation regarding water resources among various factions was also discussed and presented. The conflict scenario includes elephants and humans utilizing the same water resources. More often than not, elephant habitats are disturbed. Drying up of the tanks also results in the spreading of various invasive species affecting native flora and fauna.

Impacts of climate change were also discussed along with climate related factors. The presentation then discussed at length on the 'Emerging Water & Climate Related Challenges' and delineated the stakeholders involved. The presentation ends by highlighting the ongoing activities which were only listed but not focused in slides and the lastly the need for IWRM approach for a sustainable water management environment in the basin.

5.1.3 Lessons and Experiences on Current Water Management Issues: Opportunities and Challenges in Deltaic Region of Eastern India- West Bengal & Odisha

Anurag Danda & Anand Kumar

Mr. AnuragDanida&Mr.Anand Kumar, from India Water Partnership (IWP) gave a Presentation on "Opportunities and Challenges in deltaic regions of Eastern India: Lessons and experiences from West Bengal and Odisha.At the introduction the presenter gave an introduction on Indian Water Partnership (IWP) and carried out highlighting its activities, salient features and characteristics. After that the Water & Climate Change Resilience Program (WACREP), its characteristics and work packages were discussed.

After brief introduction they briefly discussed on the GBM basin. The presentation then moved onto an introduction of the Bengal Delta, Bengal Sundarban and its eco-region (1830s through 1940s), Indian Sundarban forest (since 1943) and delta. Biodiversity of Indian Sundarban, its ecosystem resilience, climate variability and consequent changes in Sundarban, impacts of climate change on Sundarban were presented as well.

The presentation highlighted the effects of water extraction from the Ganges and its subsequent impacts. It also discussed the effects of Ganges water diversion. The presentation discussed on responses to the effects of climate change in the short-term which includes salt-tolerant agriculture and preparedness, and in the long-term which includes planned retreat. The presentation also delineated development challenges in the

Indian Sundarban Delta and the necessary activities to ensure adaptation and sustainable development in the Indian Sundarban.

5.1.4 Lessons and Experiences on Current Water Management Issues: Opportunities and Challenges

Shital Babu Regmee, Nepal Water Partnership

Mr. Shital Babu Regmee from Nepal Water Partnership gave a vivid presentation on state-of-situation of 'Water Management Issues, Opportunities and Challenges from Deltaic Regions' in Nepal. The presentation started by explaining formation of Delta, Alluvial Fans (Coarse Delta) and introducing the deltas and fans in Nepal.

The presentation went on to introduce and discuss the features of the Koshi River Delta (Mega Fan), Karnali Delta, Tinao Delta/Fan with relevant photos. These included photos of Butwal city on the alluvial fan deposits where the river has been trained but is still disaster prone and picture of the alluvial fans in central Terai of Nepal.

The presentation highlighted water management issues in various water resource related sector such as Irrigation, Water Supply, Hydro Power and Ground Water. Water induced disasters were also highlighted. This was followed by the presentation of opportunities and the challenges related to the water resources and management in these fans and deltas. The conclusion of the presentation described the potential benefit as well as problems of these river deltas.

5.1.5 Lessons and Experiences on Current Water Management Issues: Opportunities and Challenges

Parvez Amir & Shaheen Akhtar

Mr. Pervaiz Amir from Pakistan Water Partnership gave a presentation on 'Water Management Issues, Opportunities and Challenges from Deltaic Regions in Pakistan including Impending Climate Change Impacts'. The presentation introduced Indus Valley at the beginning along with photos of the Indus River. It then went on to demarcate the Indus Delta-Geography including population, Crops, Species, Quick Statistics and special features.

The Indus Delta, being the 5th largest in the world, has a major influence on the local and surrounding lives of flora, fauna, environment and climate. The presentation next introduced the rivers of the delta and their geographical characteristics. The Indus River is one of the major rivers of the world that drains one of Asia's chief catchment basins, and is the locus of some of the earliest known human civilizations. The presentation also outlines information on its tributaries, their locations, catchment locations and their areas etc.

Hydrological structure harnessing the Indus was shown after that briefing. Different viewpoints namely, Upper lower riparian tensions, emerging realism, stay vs. exit strategy impacts on Karachi etc. were explored in detail. Along with the lessons learned such as dynamic nature of Delta, effects of investment, experience sharing, lack of low cost solutions for drinking water, the politics involved etc. were also explained. The challenges of water management implications including turning delta into an economic powerhouse, resolving

political stalemate, building water security, minimizing damage from extreme events and creating water resilience through IWRM were explained.

Following these details few slides delineated the changing thermal regime in Indus delta and its effect, including the vulnerabilities of the Indus Delta to Climate Change, Sea Water Intrusion etc. These affects were accompanied by relevant pictures in the presentation. The presentation then discussed on actions for enhancing climate resilience initiatives. These included CBA, low cost tree plantation campaigns, early warning and innovation in rehabilitation, encouraged and planned resettlement, mass capacity building and communication facilitation and livelihood enhancement for self investment.

Research agenda were also included addressing new disease complex, sea water intrusion, fresh water interface–different stories need to put forth unified thesis. Sociological and psychological impacts of extreme events, study III and implementation impacts,delta as the sump-water quality impacts on health, agriculture, investment study on regional development and BS from upstream developments were also presented to project the potentials in the future.

The presentation then tackles with activities required such as creating awareness based on empirical evidence and avoids rhetoric, ensuring delta water requirements through small dams/barrages. It also address first delta security to address lower riparian issues, preserving ethnicity and culture linked to water regimes, addressing E-flows as a national and trans-boundary paradigm. Lastly it addresses in creating an international voice with the local population exposed to best practice and new opportunities.

5.1.6 Problems and Challenges in coastal polder of Bangladesh and possible solutions including Climate ChangeImpacts

Md. Sarafat Hossain Khan, Project Coordinator, CEIP.

Engr. Md. SarafatHossain Khan, Project Director,CEIP-I, BWDB, gave a vivid presentation on state-of-situation of water management in the Coastal Polders of Bangladesh. He gave an outline on the coastal landscape of Bangladesh including its area and population shown in a map. Before 1960, some critical features of coastal regions were shown such as salinity problem, food production scarcity, inundation problem etc. Some features regarding the polders constructed by BWDB since 1960 was also discussed and shown in maps.

He then revealed some problems and challenges regarding coastal polders which were identified such as, trans-boundary monsoonal & tidal flooding, climate change induced sea-level rise, land subsidence caused by tectonic & sediment load. He also indicated of groundwater extraction, cyclonic storm surges and water logging etc among the challenges. His presentation also displayed monsoon flooding; sea level projection and vulnerability of Bangladesh to sea level rise are shown in maps.

His presentation also displayed as the sediments pile up in one part of the delta, the rivers courses switches to fill in other areas. Sediment distribution in the Bengal Basin was also illustrated in map. GPS network in Bangladesh including permanent and continuous stations, subsidence from GPS were discussed and shown in slides. He then reflected on coastal vulnerabilities, cyclones tracks in the recent years (Sidr, Bijli&Ailya) and coastal flooding due to storm surge discussed vividly through maps. Impacts of these storms were also shown for different areas.

Mr. Hossain then gave a comparison of Polder no. 32 in 2008 and 2010 in his presentation. Some problems related to coastal polders such as damage, overtopping, salinity intrusion etc. were discussed through photos of the polders and maps. A pragmatic approach considering climate change was also illustrated and some factors consider for designing embankment crest level. Some Climate Resilient Coastal Polders (Polder no. 35/1) were also described through displaying their detailed cross section. Lastly he gave an output of drainage modelling and drainage improvement option discussed for polder no. 17/2.

5.1.7 Status and challenges of Ecosystem and Wetlands of Dhaka and its suburbs

Motaleb Hossain Sarker, Director, Ecology Division, CEGIS.

Mr. Motaleb Hossain Sarker, Director, Ecology Division, CEGIS Ecology gave a vivid presentation on state-of-situation 'Status and Challenges of Ecosystem and Wetlands of Dhaka and its suburbs'. At the onset he cited on Ramsar Convention (1972) which was an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation of wetlands. He stated that by becoming a party to the Ramsar Convention, Bangladesh obliged to formulate and implement planning to promote the conservation of the wetlands following convention rules.

He presented a summary of wetland and water bodies' area in Bangladesh in his presentation. After this he outlined the location, area and source of water of Hakaluki Haor and Tanguar Haor. Then he reflected on some wetland management initiatives in Bangladesh by citing ECA declarations on the 4 secondary rivers surrounding Dhaka City. These initiatives included 'Management of Aquatic Ecosystem through Community Husbandry (MACH) Project, Community Based Haor and Floodplain Resource Management (CNHFRM), Connecting Community Conservations (CCC) etc. Some functions and services of wetland such as protection of biodiversity and habitat, hydrological function and water quality functions were listed in his presentation.

Then he described explicitly on tangible and intangible value of wetland in Dhaka city and its periphery. Problems and challenges of wetlands of Dhaka were also outlined by him. A WARPO case study on 'Degradation of Wetland of Dhaka' was also discussed. The objectives of this study were to determine the wetland degradation status, identify the causes & impacts of degradation and suggest possible remedial measures for sustainability of wetland around Dhaka city.

Mr. Motaleb resorted to present the permanent wetland losses analyzed from Landsat, RADARSAT and Corona Mar1 images which were utilized. Seasonal wetland changes were also shown in graphical form. Wetland status and changes in Built-up area such as in DND area, Eastern and Western areas were also shown. Locations of *Khals* (canals) of Dhaka City were also listed and shown in figures. Impacts of wetland losses such as increased drainage congestion and urban flooding, which diminishes the ecological balance and biodiversity was shown in the presentation.

He also reflected on decreasing groundwater level and increase in water scarcity during dry seasons, increased water pollution, sanitation problems destroying of the urban ecosystem and increase in air pollution etc. in his discussion. Statistical summary on wetland reduction was thus finally shown at the conclusion. Finally, some recommendations such as awareness development, appropriate legislation, re-establishment of connectivity of khals, urgent inventory of wetlands of DAP area and development of web-based and real-time dynamic

wetland monitoring system to protect wetlands etc. was stated as way forward in his presentation.

5.1.8 Salinity Problems in the Coastal Delta of Bangladesh: Status and future challenges

Mr. Zahirul Haque Khan, Director, Coast, Port and Estuary Management Division; IWM.

The presentation commenced with an initial introduction of the Geographical location of Bangladesh. It then moved on to discussing the Coastal zone, tide and upstream flow dynamics, the river network of southeast region and water flow in Meghna River. The dependency of upstream freshwater flow on the salinity of the south-west zone and the importance of Ganges Water Treaty in ensuring adequate flow for salinity control in the south-west zone of Bangladesh was delineated as the effect of Transboundary Flow on Salinity Intrusion in the South-West Zone was discussed. The before and after condition of Gorai river resulting from the sedimentation and restoration activities were discussed. This was followed by discussion about the effect of Gorai River flow on the salinity of Khulna and the effect of fresh water flow on the salinity in the Gorai-Noboganga River. Seasonal variation of salinity and its dynamics was presented along with model generated maps. Outputs of External Drivers and generation future scenarios were highlighted. The presentation also demarcated the effects of Climate Change, Transboundary flow and Sea Level Rise on 2ppt Salinity Front on the south-west zone of Bangladesh. It then, moved on to discussing adaptation measures which include Salt Tolerant Rice, Storing and Diverting Dry Season Flow through Gorai, Hisna, Kobadak-Bhairab and other Ganges distributaries, Adaptation of existing tools for new situations and sharing etc.

5.1.9 Water Management in Barind Area by Barind Multipurpose Development Authority

Mr. AhsanZakir, Executive Director, BMDA, Bangladesh

Engr. AhsanZakir gave a presentation on the state-of-situation concerning water management in the Barind area of Bangladesh. Barind area is located in the North-West region. This particular region used to be in a dry and perched state prior to 1985. Due to water scarcity, single cropped cultivation practice used to take place. In 1985 BMDA started its activities in the region. In his presentation, MrZakir briefly informed the goals and objectives of BMDA, main activities undertaken by BMDA and present state of water resources management and agricultural development.

He informed that the main goal of BMDA are (i) to convert Barind Area into a granary of Bangladesh; (ii) to arrest desertification through massive plantation, (iii) make best use of all available water resources, (iv) marketing of agricultural product through development of rural communication; and (v) to improve livelihood of the people. To achieve the set goals, BMDA undertook various activities relating to (i) Installation of Deep Tube wells; (ii) Irrigation System through under Ground Pipe Line; (iii) Pre-paid billing system for irrigation fee; (iv) Drinking water distribution from Overhead Tank Through Pipe Line; (v) Lab Testing of Drinking Water, arrangement of Dug well with pulley to lift Drinking Water were outlined, (vi) development of rural infrastructures etc.

Mr. Zakir said that prior to commencement of BMDA's activity there was severe water scarcity in this region that severely hampered agricultural productivity, drinking water supply and the overall life and livelihood. Rainfall is very low in the region compared to other parts of the country and little scope for conserving surface water. At that time it was believed that geological formation is also unsuitable for development of groundwater in the region. In

1985 BMDA started working in the region on a pilot basis through installation of DTWs for irrigation and the success was unbelievable. Inspired by the success BMDA implemented several other water development projects over the last two decades which included groundwater irrigation through DTWs, canal and pond re-excavation, rainwater harvesting, drinking water supply, rural infrastructure development etc. Till now BMDA has installed 8500 nos DTWs, 10662 km buried pipe line for irrigation, re-excavated 1235 km khala and 2924 ponds, providing drinking water to about 1.00 million people from 1029 DTWs and constructed 95 nos. dug well for drinking water supply. Due to BMDA's effort, water scarcity has significantly reduced in the area and provided irrigation to about 110500 ha boro crops and supplementary irrigation to about 80000 ha land. As a result a significant part of land has turned into three cropped area from single cropped land.

5.1.10 Groundwater management in Deltaic Bangladesh in the face of impending Climate Change

Dr. Anwar Zahid, Deputy Director, Groundwater Hydrology, BWDB

Dr. Anwar Zahid, Deputy Director, Ground Water Circle, BWDB, gave a vivid presentation on state-of-situation of Groundwater Management in Deltaic Bangladesh in the Face of Impending Climate Change. He stated that abundance of water during the monsoon causes flood. In dry season, there is little water to meet requirement that leads to drought. The total Ganges-Brahmaputra-Meghna [GBM] basin area is approx 1.75 million sq. km. Groundwater is the water (mostly from precipitation) that flows through the soil and rocks beneath the surface. It is a valuable resource but susceptible to depletion and pollution.

He cited comparison on surface water irrigation projects with that of low cost tube well installation methods which he showed in figures. Groundwater (GW) irrigation in vicinity of rivers was also illustrated by photographs which show uncontrolled withdrawal of ground water even though SW was available. Status of irrigation development by shallow and deep tube well from 1985 to 1996 was also presented for its wide applicability. He showed aquifer systems and groundwater development zones in Bangladesh suitable for irrigation. Various BWDB field activities, locations of BWDB test holes, aquifer pump test sites, GW table monitoring well, GW contour maps etc. were illustrated in figures.

However he also brought to notice the rates of declining ground water table of different area in Dhaka shown in graphs. Arsenic contamination and salinity in shallow groundwater and different types of filters to mitigate the scourge was also shown. In this regard, rainwater harvesting, dug well and pipeline for community supply could be a solution to arsenic problem. Desalination plants in coastal belts and surface water purification could be a solution to the salinity problem there he cited.

He then showed slides to introduce climate change and its anticipated impacts in Bangladesh which includes temperature rise, drought, floods, sea level rise, cyclone and storm surge, drainage congestion etc. Major objectives of GW and climate change projects were also listed in short. In coastal area, the drainage system is characterized by tidal rivers. Major components of GW monitoring network and their unit and quantity were displayed as found from study. Proposed and Installed Locations of Monitoring Setup for the project were also shown in maps.

He stressed of capacity building which was a major issue of the project. On-the-job training was provided during the project. Cross sections of installed observation well nests were shown in figure including their litho logs. Satellite images of aquifers in floodplain and delta were shown to portray the terrain of the project. Aquifer test results for hydraulic

connectivity with weather aquifers found from project was also shared. Images were also shown for ground water table measurements and slug tests. And then GW table hydrographs found from monitoring was discussed. Slug test analysis of drawdown data was illustrated in the figures and discussed as result of salinity intrusion. Maps for depth wise hydraulic conductivities found of coastal aquifers were also discussed. Measured physico-chemical parameters of water samples were also shown in tabular form and discussed. GW in coastal aquifers was shown in litho logs. Using hydro chemical methods, salinity sources were also determined. Finally impact of climate change and other factors was summarized to portray the present status of climate change influences in GW salinity in the coastal belt.

5.1.11 Small Scale Water Management projects, issues, challenges with focus on Climatic variability

Mr. Moshir Rahman, PD, LGED and Mr. ShahidulHaque, PD, LGED

Engr. Md. Moshir Rahman PEng & Engr. Md. ShahidulHaque, PD, LGED, gave a vivid presentation on state-of-situation in water management in the Small Scale Water Management Projects, Issues & Challenges with Focus on Climate Variability. They stated that over the years LGED has developed a partnership approach with farmers to the development of SSW schemes. They build what farmers want by listening to them, not telling them what they need. In this regards some project design features are shown.

They opined that training was an essential element and percentages of budgets of training of SSWRDP for different sectors were shown. The 38 steps of development towards fulfilling the objectives were discussed. They opined that technical and institutional development should go parallel step by step. Variations in crop production were then shown at different seasons and for different land types. Some subprojects were undertaken to address water resource constraints and enable farmers to cope with uncertain rainfall & flooding. These were listed, such as flood management, water conservation, drainage etc. and were shown in graph.

Flood Management reduces flood peaks and water Conservation increases water availability. Some photos were shown illustrating flood management, drainage, water conservation and command area development works. Evaluations of the projects were done based on yearly EME studies, long term BME, and grading assessments. External evaluations were also done by BUET and Planning Commission. Some positive impacts on crop & fish production, establishing Micro-credit & income generation activities were also discussed. Strategies of SSWRD regarding climate change were then discussed. Some issues and opportunities were discussed which includes high transaction cost such as better targeting of efforts. These included improved use of GIS and streamlining development process, preventing sedimentation in khals, ensuring sustainability and interagency cooperation etc.

5.1.12 Drought management in Bangladesh: Issues and Challenges

Dr. WaisKabir, Retd Executive Chairman, BARC

Dr. WaisKabir, Retd. Executive Chairman, Bangladesh Agricultural Research Council [BARC], gave a vivid presentation on state-of-situation in water management on Drought Management in Bangladesh: Issues and Challenges. He stated that climate change is a long-term change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. In this regards some factors are focused on food security. In recent years he showed changes in groundwater (GW) table variation in Pabna, Rajshahi from the year 1985 to 2009. He also gave some backdrops of agriculture in Bangladesh in a listed form.

Dr. Kabir projected challenges such as increase crop production to fulfill population requirement. Some inter-dependant dimensions of food security were focused concerning individual, household and national food security. He opined climate change as uncertainty of rainfall and uneven temporal and spatial distribution in Bangladesh are the main reasons behind the vulnerability of crop agriculture in this country. Some impacts of climate change were listed such as temperature increase, increase in precipitation in monsoon and decrease in winter, increase in evaporation which lead to prolonged drought. Occurrence of natural hazards and their significance with cropping seasons were shown in figure for illustrations. And then he showed areas affected by droughts in Bangladesh in map.

He stated that IPCC predicted on climate change such as more floods, more droughts, more salinity intrusion etc. Changes in maximum temperature in April, precipitation in Rabi season and pre-kharif season at 1990, 2030 and 2070 were illustrated. Kharif drought prone area and Rabi drought area is found to be 2.2 million hectares and 1.2 million hectares respectively. Flood prone area is found to be about 80% of total area and about 1.06 Mha of land is salinity affected.

He cite climatic variability, uneven distribution of rainfall, increased temperature, disease incidence, sheath blight, ear-cutting caterpillar and other pest as the main impacts of climate change on agriculture. He also listed temperature range for different crop production. Due to temperature increase, agro-economist must make some adaptation to maintain the temperature within these threshold ranges. Climate resilient crop such as heat resistant cereals can be a solution to this problem. Variation of rice production and yield with year from 1971-72 to 2011-12 was shown in graph as illustrations. Some institutions were also listed which manages droughts.

About climate resilience crops such as boosting rice's photosynthesis, drought tolerances were discussed and crop suitability of Boro and Wheat in Bangladesh shown in maps. Some factors regarding future crops in Bangladesh were also listed. Bangladesh Agricultural Research Institute (BARI) has recently developed some technology to address food security. Basic principles of Conservation Agriculture (CA) system were then discussed in some slides. CA can promote sustainable agriculture system by stabilizing widespread soil degradation, enhancing natural resource base, increasing crop productivity etc. Weed mulching, rain water harvesting etc. were depicted to be helpful to mitigate drought problems.

5.2 Open Discussion

At the end of each technical session, open discussion was organized on the presentations for further clarification of different issues presented in the case studies and papers, sharing experience, comments and suggestion from the participants for future consideration.

Observations and questions of the participants and response from the concerned presenters are presented in Annex-2.

6 CONCLUDING SESSION

In the concluding session, group discussion was organized to discuss critical issues that demand immediate attention for future research for the delta region of South Asia and to develop proposals for Phase-II. Three thematic issues were chosen for group discussion, they were (i) Regional Flood management, (ii) Drinking Water & Water Quality in South Asian Delta, and (iii) Agriculture, Water and Climate Change: Regional Issues. The participants were divided into three groups, detail discussions were held in each group and the following suggestions were made by the participants.

6.1 Theme I: Flood Management

Coordinator: Mir Sajjad Hossain, Member Joint Rivers Commission, Bangladesh

The participants identified that two broad categories of flood occur in the region, namely (i) Flash flood-that develops in the hilly regions and adjoining plain lands due to sudden and intense rainfall in the hills, and (ii) River flood- that develop due to over topping of river bank by water level. For flood management in the region the following suggestions were put forward by the participants.

- ❖ Non-structural Measures:
 - i) Flood Early Warning System extended up to the whole GBM basin.
 - ii) Data sharing and exchange.
 - iii) Creating more room for the river to increase river conveyance capacity.
 - iv) Development of regional model for flood forecasting.
 - v) Generation of Satellite-based information.
 - vi) Regional climate model.
 - vii) Organization of regional workshop.

- ❖ Structural Measures:

For the GBM Basins:

 - i) Upstream storage of monsoon water
 - ii) Revival of river systems
 - iii) Watershed management

Social aspects associated with the structural measures are

 - Resettlement and rehabilitation of displaced people,
 - Equitable share of benefit and cost

For the Indus Basins:

 - i) Watershed management.
 - ii) Flood water retention area.

- ❖ Promote Establishment of River Basin Commission for IWRM

6.2 Theme II: Drinking Water & Water Quality in South Asian Delta

Coordinator: Dr. M. Monowar Hossain, Executive Director, IWM

With regard to drinking water supply and water quality in the region the group identified the following issues;

- Both quantity & quality are to be looked into from both national and regional perspective.
- Identify vulnerable spots (hotspots), reasons of quality deterioration and decrease of water availability, formulate remedial measures.
- Assess Impact of Climate Change on both water availability/quantity & Quality issues.

- ❖ Main Pollutants causing water pollution:

GW: Arsenic, Salinity, Chemicals

SW: Industrial, Agriculture, Municipals, domestic pollution due to water included disaster (cyclone ingress)

Suggestions:

- ❖ Strategy to addressing the problems:

Investigation

- Mapping of polluted zones-spatial & temporal scale (Level of Pollution)
- Mapping of fresh water zones
- Regular monitoring
- Rain Water Harvesting (RWH) as source of drinking water

Remedial Measures:

- Awareness building
- Implementation of 3R/4R/5R in light of IWRM
- Conservation of fresh water
- Regional Co-operation for addressing & resolving the issue
- Conservation of water bodies
- Enactment of Laws & regulations
- Institutional capacity building
- Collaborative management of Quality of TW
- Knowledge Sharing
- Technology Transfer

6.3 Theme III: Agriculture, Water and Climate Change

Coordinator: Dr. Khondaker Azharul Haq, Vice President, BWP

To address the impact of climate change on water and agriculture, the participants identified various areas related research and development, cooperation, capacity building, improved water management etc. as outlined below;

- ❖ Research and development
 - Accelerated research activities for developing climate smart agriculture
 - Initiate research activities to reduce agricultural yield gap in the regional countries.
 - Introduce low water consumption crops/ High value Crops
 - Weather forecasting for crop planning by farmers
 - Crop insurance
 - Promote IPM and other technologies for pest-diseases management
 - Fertilizer use efficiency improvement

- ❖ Improved land and water management
 - Enhance economic use of water and improve water productivity, particularly in the agricultural sector.
 - Enhance re-use and recycling of water through waste water management
 - Promoting Consumptive use of surface, ground and rain water use in agriculture with emphasis on increased use of surface water
 - Agricultural mechanization
 - Adopt/ Promote soil conservation
 - Enhanced ground water recharge
 - Further increase in cropping intensity
 - Reduce harvest and post-harvest loss

- ❖ Institutional mechanism
 - Market value chain development
 - How we handle feminization of agriculture
 - Farmer to farmer knowledge exchange in agriculture
 - Use of electronic & mass media for agricultural awareness development
 - Land use Policy and protection of agricultural land through legal procedure
 - Capacity Building of young professional in agriculture
 - Capacity building of women farmers.

- ❖ Motivation and awareness building
 - Promoting and recognizing contribution of women in homestead production system
 - Crop Production rationing by crops

7 RECOMMENDATIONS

The workshop came up with few specific recommendations to carry on in future for well-being of the region, the recommendations are (i) environmental flow that is required for restoration and preservation of the ecosystem, (ii) flood water and rain water harvesting, (iii) water quality and sanitation and lastly (iv) regional cooperation.

Environmental flow is essential for restorations and preservation of the aquatic as well as terrestrial of the river basin. For some rivers such quantification has been done in some countries, IUCN, IWMI etc. is also working on this. The existing knowledge can be utilized by others and research activities could be accelerated for better understanding of the issue. Once such environmental flow quantification is done or it is there, policy makers could be persuaded to make available such flows through bilateral and multilateral cooperation. Without an estimation of the environmental flow quantification, discussion on regional cooperation might not progress well.

Rain water and flood water harvesting could be further strengthened to augment water availability in the crisis prone areas. Compared to rain water harvesting, activities on flood water harvesting is less, although few cases have been tested in Thailand. It has problems of underground reservoir for retention of flood water. There are doubts for applicability of it in many countries; however research could be geared up to make it effective. About rain water harvesting, there are policy guidelines in many countries for rain water harvesting, but they are yet to be operationalized in large scale.

Water quality aspect is emerging as a burning issue in all the countries. Over the last few decades there has been tremendous investment and development on traditional water resources management such as flood control, irrigation, hydro-power. The water quality issue was less attended. With the growth of population and economic activity, availability of fresh water for different uses, particularly for drinking and sanitation use, is alarmingly decreasing. Restoration of water quality requires expensive technologies. Recently a new technology is piloted in India. It is a solar power toilet technology where the fecal matter is burnt to charcoal that ultimately prevents water pollution and funded by Bill & Melinda Gates Foundation. Similar research could be extended in other countries also to make quality water available to the people.

The issue of regional cooperation has been widely discussed by the participants and many has opined that a fruitful regional cooperation would help to overcome and resolve many unsolved and seemingly impossible water related problems prevailing in the region. Such a cooperation would not only solve many existing problems rather would prevent many problems that otherwise may grow up. To accelerate the present pace of regional cooperation in water sector, prevailing regional bodies such as SAARC, can play a vital role to convincing the decision making level that regional cooperation would be a win-win situation for all.