ASIAN DEVELOPMENT BANK
WATER RESOURCES PLANNING ORGANIZATION

VOLUME 1: FINAL REPORT AND ROADMAP

REGIONAL TECHNICAL ASSISTANCE (RETA) SUPPORTING IWRM (BANGLADESH)

(ADB RETA PROJECT NO. 39199: PROCESS DEVELOPMENT FOR PREPARING AND IMPLEMENTING INTEGRATED WATER RESOURCES MANAGEMENT PLANS)

JULY 2009

WARPO
পানি সম্পদ পরিকল্পনা সংস্থা

ADB

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ACRONYMS

ADB	Asian Development Bank
BADC	Bangladesh Agricultural Development Corporation
BBS	Bangladesh Bureau of Statistics
BDT	Bangladesh Taka
BIDS	Bangladesh Institute for Developmental Studies
BIWTA	Bangladesh Inland Water Transport Authority
BMDA	Barendra Multipurpose Development Authority
BWDB	Bangladesh Water Development Board
CBO	Community Based Organization
CEGIS	Center for Environmental and Geographic Information Services
CERP	Coastal Embankment Rehabilitation Project
CWASA	Chittagong Water and Sewerage Authority
CWRAS	Country Water Resources Assistance Strategy
DAE	Department of Agriculture Extension
DLIAPEC	District Level Inter-Agency Project Evaluation Committee
DMB	Disaster Management Bureau
DOF	Department of Forest
DPHE	Department of Public Health Engineering
DTW	Deep Tube Well
DWASA	Dhaka Water and Sewerage Authority
EMIN	Environmental Management Information Network
FAP	Flood Action Plan
FCDI	Flood Control, Drainage, and Irrigation
FPCO	Flood Plan Coordination Organization
GBM	Ganges-Brahmaputra-Meghna
GDA	Ganges Dependent Area
GEF	Global Environment Facility
GNP	Gross National Product
GOB	Government of Bangladesh
GPWM	Guidelines for Participatory Water Management
HTW	Hand Tube Well
HYV	High Yielding Variety
ICZM	Integrated Coastal Zone Management
IWM	Institute for Water Modeling
IWRM	Integrated Water Resource Management
JMREMP	Jamuna Meghna River Erosion Management Project
LGED	Local Government Engineering Department
LLP	Low Lift Pump
MEF	Ministry of Environment and Forests
MPO	Master Plan Organization
MWR	Ministry of Water Resources
NWMP	National Water Management Plan
NWPo	National Water Policy
NSAPR	National Strategy for Accelerated Poverty Reduction
NWRC	National Water Resource Council
O&M	Operation and Maintenance
STW	Shallow Tube Well
WARPO	Water Resources Planning Organization
WASA	Water and Sewerage Authority

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VOLUME II: ANNEXURES

FOREWORD

Introduction

To stimulate the adoption of a more strategic and sustainable approach to water resource development, ADB with financial support from the Government of the Netherlands, has prepared Technical Assistance (TA) to promote effective and efficient preparation of Integrated Water Resource Management (IWRM) plans.

The TA Team consisted of an International Water Management Specialist (2 pm), and a Water Sector Advisory Group (WSAG) consisting of four specialist: Policy and Institutional Development (2.5 pm), IWRM (2.5 pm), River Management (2.5pm), and Water Supply (1.5 pm). Further inputs were provided by Specialists for Designated Agendas as follws: Water Management Policy and Institutional Specialist (4pm), IWRM (9pm), Water Supply Policy and Institutional Specialist (4 pm), and Water Management (9pm).

The specific outputs of the TA Team were to (i) contribute to an IWRM Implementation Plan, (ii) support specific actions (in the context of the plan) that promote IWRM and improved service delivery, and (iii) conduct stakeholder workshops to disseminate information and solicit feedback.

This Final Report is designed to (i) describe the water related natural resource base along with sector policy and institutional framework within Bangladesh, (ii) summarize the Teams present understanding of IWRM associated activities and issues, and (iii) provide a road map and potential investments to promote IWRM.

During the Project, the TA Team received excellent support from and coordination with the Water Resources Planning Organization (WARPO). This support included provision of office facilities, the designation of a contact person within WARPO to interact with the Team, and guide the organization of the Team's activities through a series of meetings that included the Director General WARPO. Meetings were also held with Director General of the Bangladesh Water Development Board (BWDB) and senior staff including among others Additional Director Generals, Chief (Planning), Chief (O&M). The DG assigned a working group to interface with the Team. The Team also met with the Chief Engineer of the Local Government Engineering Department (LGED) and key staff within the LGED IWRM Unit. Here too, a working group was assigned to interact with the Team.

Key Activities

The TA Team prepared a draft Inception Report in mid-2007, which was presented at a workshop in September 2007 and subsequently finalized. As part of the inception process, a number of areas/initiatives were identified that subsequently guided the Team's activity over the course of the subsequent months. These activities are summarized in accordance with the three pillars of IWRM as follows:

Pillar 1: Enabling Environment

- Bangladesh Water Act. A preliminary draft was available. The TA Team expanded this draft and engaged a legal specialist to review and amend the document, to shepherd the document through a consultation process, and to finalize the draft for enactment through parliament.
- Water Resources Planning Act. The TA Team reviewed with WARPO the need for revising the Act, recommended that this be undertaken, and suggested issues that needed consideration in revising the Act.

Pillar 2: Institutional Framework

- Bangladesh Water Development Board (BWDB). The TA Team worked with a Government of the Netherlands financed Twinning Mission to provide input for strengthening day-to-day management. Two workshops were held jointly with the Twinning Mission, then the TA Team conducted a separate workshop that addressed management issues within BWDB[1].
- Interagency Coordination. Water management, planning, and implementation cut across a number of agencies. The efficacy of the Memorandum of Understanding (MOU), a commonly used tool to promote data sharing, was reviewed through two workshops and it was concluded that the MOUs need to also incorporate the role of WARPO acting as a clearing house.
- Water Resources Planning Organization. As with BWDB, the TA Team coordinated their support to WARPO with the Netherlands financed Twinning Mission. Since WARPO was the key point of contact for the TA Team, there were numerous meetings and on-going interaction with WARPO leadership and staff. Nevertheless, one specific initiative that was supported by the TA Team was the finalization of WARPOs Organizational Development Plan and to support WARPO in promoting the Plan with the Ministry.

Pillar 3: Management Instrument Related

- Data Management Systems. The TA Team reviewed the steps being undertaken by the Water Management Improvement Project to improve data systems. Through discussions with various agencies involved in collecting and managing data, modernization of these systems was explored..
- National Water Management Plan (NWMP). When the NWMP was completed and approved in 2004, it was envisaged that the Plan would be updated every five years to reflect social, physical, and political change. The TA Team worked with WARPO to develop an updating process.
- Water Tariff and Cost Recovery. The existing system was analyzed and, based on discussions with WARPO, amendments were proposed.

Final Workshops / Meetings

- On 21 June 2009 an Open Forum Workshop was held to solicit input and comments from interested NGOs. Representatives from 8 NGOs participated in the discussion, which was to a large extent focused on the Draft Bangladesh Water Act.
- On 22 June 2009 a meeting of the Steering Committee reviewed issues related to the draft final report and approved the document subject to revisions necessitated by document review and comments.
- On 25 June 2009 a final workshop was held involving key stakeholders in the water sector. The workshop provided for an in-depth review of the draft final report.

In addition to the workshops, comments on the draft final report were received from numerous stakeholders. These comments and the Study Teams response to these comments have been posted on the WARPO web site at http://www.warpo.gov.bd/index.htm . To the extent practicable, this final document incorporates changes in response to the comments.

[1] The joint workshops were conducted on 11 March and 29 May of 2008. The TA Team workshop on management issues was held on 18 August 2008. Minutes of the latter workshop are provided in Attachment 1.

Overview of This Document

The material in this document is generally organized in accordance with the three pillars of IWRM followed by a final chapter which presents a road map and investment opportunities. To some extent, the material builds on the information that was presented during inception. Specifically, the information is presented as follows:

- Chapter 1 reviews basic principles and approaches of IWRM, highlights the changing global challenges in water management, and summarizes key water management challenges in Bangladesh.
- Chapter 2 reviews the current status of water resources within Bangladesh.
- Chapter 3 examines the enabling environment, provides policy analysis for the various water using subsectors, outlines progress on key issues and recommends next steps.
- Chapter 4 reviews the institutional framework through which policies, strategies and legislation are being implemented. Institutions are briefly described and analyzed in terms of their strengths and weaknesses. Based on this review, the TA Team, formulated a number of recommendations.
- Chapter 5 assesses management instruments, focusing on those addressed by the TA Team, describes the outcome of the work that was done and recommends further steps.
- Chapter 6 assembles the recommendations into a road map with a time line and provides a summary of initiatives that would improve IWRM within Bangladesh.

I. BACKGROUND

A. The Study

1. The water policy of the Asian Development Bank (ADB), approved in January 2001, promotes national water sector reforms, integrated water resources management (IWRM), and improved water services for the poor[2]. In addition, the policy commits ADB to regional and sub-regional cooperation by helping to assess the water sector and to exchange data, enhancing awareness and understanding of water sector issues, and supporting water partnerships and exchanges in ADBs developing member countries.

2. In 2002, the World Summit on Sustainable Development called for all countries to develop IWRM and water efficiency plans by the end of 2005. During the summit a number of governments and financing institutions, including the Ministry of Foreign Affairs of the Netherlands, committed financial assistance to encourage institutionalization of changes designed to promote more strategic and coordinated decision-making. The Ministry of Foreign Affaires of the Netherlands made a financial contribution to ADB for supporting development of IWRM plans in Bangladesh and several other countries. These countries then requested ADB for technical assistance for preparation of IWRM plans and programs.

B. IWRM[3]

1. Introduction

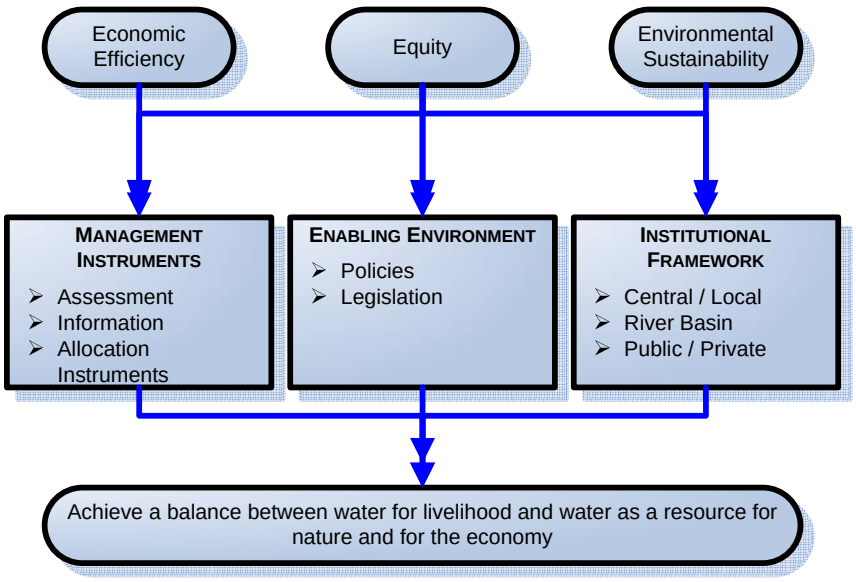
3. IWRM is a comprehensive approach to water development and management. GWP (2002) defines IWRM as "*a process which promotes the coordinated development and management of water, land, and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems*".

4. A critically important element of IWRM is the integration of various sectoral views and interests in the development and implementation of the IWRM framework. An overview of this process is provided in Figure 1. A recent document spells out what is needed to translate the concept into practice (GWP 2003). The following sections, based on this document, describe basic features of IWRM.

[2] ADB, 2001, Water for All: The Water Policy of the Asian Development Bank, Manila

[3] After GWP IWRM Toolbox Version 2.

Figure 1: IWRM Overview



Source: ADB 2008, Adapted from Draft Final Report and Proposed Road Map for IWRM in Orissa

2. Essential Features of IWRM

a. The "Three Pillars" of IWRM

5. Implementing an IWRM process consists mainly of following the "three pillars" described below:

- The **enabling environment** comprises policies, legislative framework, and financing and incentive structures.
  - Policies set the national objectives for managing water resources and water service delivery within the framework of overall development objectives.
  - Legislation establishes the rules that will be followed to achieve the policies and objectives including ownership of water, permits to use (and pollute), transferability of those permits, and regulatory norms such as conservation, protection, and priorities.
  - Financing and incentive structures provide the means to achieve the objectives.
- The **institutional framework** comprises the organizational framework and the institutional capacity.
  - The organizational framework for water management may comprise a range of organizations that include planning and centralized service delivery, trans-boundary institutions, basin organizations, local authorities, local water management institutions, and non-government organizations.

- Institutional capacity building involves upgrading the skills and understanding of public decision-makers, water managers, and professionals and building capacity for empowerment of civil society groups.

- **Water management instruments** may include water resources assessments and management plans, regulatory and economic instruments, information management and exchange, and conflict resolution.
  - Water resource assessments involve collecting hydrological, physiographic, demographic, and socio-economic data, and supporting systems for data assembly and reporting.
  - Water management plans combine development options, resource use, and human interaction and entails the comprehensive assembly and modeling of data from all relevant domains. The planning should recognize the need for parallel development of the management structures.
  - Regulatory instruments allocate water and establish water use limits. This include regulations that cover water quality, service provision, land use and water resource protection.
  - Economic instruments involve the use of price and other market-based measures to provide incentives for efficient water use and avoidance of pollution.
  - Information management and exchange involves implementing data-sharing methods and technologies to increase stakeholder access to information.
  - Conflict resolution involves managing disputes to ensure water is equitably shared.

b. Role of Government

6. As the main regulator and controller in the water sector with its associated infrastructure Government has to play an important role in the implementation of IWRM. Governments working with civil society must raise awareness of the importance of improved water resources management among policy makers and the general public, but they can only fulfill their responsibilities if they involve all stakeholders in developing and implementing the framework.

c. Cross-sectoral Integration as an Essential Element

7. A critically important element of IWRM is the integration of various sectoral views and interests in its development and implementation. This includes the natural system with its critical importance for resource availability and quality, and the human system which determines resource use, waste production and pollution.

8. IWRM should build on and be consistent with government policies and national or sector development plans and/or budgets. It is therefore important to understand the links of IWRM with plans and processes at the national and sectoral level and to take these into account in the planning process.

9. IWRM is a cyclical process of planning and management: The cycle starts with the planning processes and continues into implementation of the frameworks, action plans and monitoring of progress. At any time it can be decided whether new needs have appeared or whether reform processes have led to expected improvements. If not, the cycle must be repeated.

d. Stakeholders' Participation

10. Two feedback loops from stakeholders are particularly important. The first concerns prioritization of water resource issues and the status of the management system, taking account of international developments. Priority setting and commitment to reform requires political will, raised awareness and active stakeholder dialogue. The second loop concerns preparation of the "plan". This requires extensive policy consultations and stakeholder involvement. The final action plans need agreements on the highest political level, acceptance from the main stakeholders, and raising of the necessary finances from domestic and international sources.

C. Changing Global Water Challenges

11. Challenges to managing water have been evolving throughout the world. The "old" or traditional challenges generally consisted of:

- Continued need to increase food supplies[4],
- Escalating costs of water investments with only marginal increases in the allocation of financial resources,
- Deterioration of the irrigated land base and the coastal ecosystems,
- Subsidies and distorted incentives in the water sector that resulted in inequitable and unsustainable water use, and
- Unsustainable dependence on ground water.

12. While these traditional challenges continue, "new" challenges are also emerging:

- New and sharply increasing demands on water resources – from
  - industries
  - domestic users[5]
  - environmental demands and in-stream flow needs
  - fish culture
- Deteriorating water quality
- Where living standards improve water and energy demands increase.
- Competition for water from biofuel production (sugarcane, maize, etc.). It takes between 1,000 and 4,000 liters of water to create a single liter of biofuel and biofuel production increased by more than 60% over the past decade.
- Climate variability and climate change
- A strong link between poverty and water resources. The number of people living on less than US$1.25 per day coincides with the number of people without access to safe water.

13. These challenges have led water planners and managers to conclude that a more comprehensive and inclusive approach is required if water-related issues are not to become the dominant constraint affecting nations economies and development. The preferred approach at the present time has been defined by the Global Water Partnership as Integrated Water Resource Management (IWRM).

[4] Global food production needs to be increased by 50% over the next 30 years.

[5] Globally, agriculture uses about 70% of all fresh water resources. Urban use is small but growing rapidly.

II. THE WATER RESOURCES SECTOR

A. Demographics and the National Economy

14. In 2008, Bangladesh had a population of about 150 million and has continued to record impressive economic and social gains since the 1990s. Steady economic growth of 5 – 7% annually[6], relatively low inflation, and fairly stable domestic debt, interest, and exchange rates. The population growth rate has declined from 2.5% in the 1980s to 1.7% in 1990 – 2004, which in turn has led to annual doubling of the per capita GDP growth, from 1.6% in the 1980s to 3.3% in 1990 – 2004.

15. Bangladesh has in place an aggressive set of development targets based on the Millennium Development Goals (MDGs), which have a target date of 2015. The targets include: eradicating hunger, reducing the number of people living below the poverty line by 50 percent, universal primary education, eliminate gender disparity in primary and secondary education, reduce infant and under five mortality rates by 65 percent, reduce the proportion of malnourished children under five by 50 percent, reduce maternal mortality rates by 75 percent, reduce social violence against the poor and disadvantaged, ensure all have access to reproductive health services, and ensure prevention of environmental degradation and sound management responses to disasters.

16. So far, primary enrollment has increased from 72% in 1980 to 98% in 2001 and the target of eliminating gender disparity has been achieved. Infant mortality has declined from 145 per 1,000 live births in 1970 to 46 per 1,000 live births in 2003 and is on track to achieve the MDG target. Food security has improved and the proportion of the population in poverty declined from 59% in 1990 to 50% in 2000. To achieve the goal of reducing the number of people below the poverty line by 50 percent will require a sustained GDP growth rate of about seven percent per year for the next 15 years (Economic Relation Division 2003).

B. Regional Context

17. Bangladesh has a total area of 147,000 km^2 and a net cultivable area of about 80,000 km^2. The two primary sources of water are local annual rainfall amounting to about 250 km^3 and annual transboundary flows amounting to about 1,000 km^3 with the latter derived mainly from the Ganges, Brahmaputra, and Meghna, Rivers. The total catchment of these three basins is 1.72 million km^2 of which Bangladesh occupies only 8% or 138,000 km^2 .

18. Although the population living within the Ganges-Brahmaputra-Meghna basin is estimated at about 700 million people (2008), the economy is sluggish and poverty levels are high, a growing population and associated economic activity place considerable pressure on the hydrologic system. Rivers are channelized to reduce flooding as human settlements encroach on floodplains, dry season discharges are diverted for irrigation and industrial purposes, and pollution loads become higher every year. Impacts on Bangladesh are that flood discharges are conveyed downstream more rapidly exacerbating existing flood problems, low season discharges are declining due to upstream withdrawals reducing irrigation potential and increasing salinity intrusion, and deteriorating water quality impacts people's health and livelihood and threatens the security of aquatic resources. These factors combine to create irreversible environmental degradation.

[6] For the past 4 years, GDP growth rates were recorded as 5.5%, 6.6%, 6.5%, and 6.2% respectively for FY 05 through FY08.

19. In addition to the Ganges, Brahmaputra, and Meghna Rivers there are an additional 51 transboundary rivers. Issues related to all 54 transboundary rivers are managed by a Joint Rivers Commission consisting of representatives from both India and Bangladesh. At present, a formal treaty on resource sharing exists only for the Ganges River. However, the Joint Rivers Commission is now actively considering sharing agreements other rivers including the Teesta, which has major diversion structures on both sides of the border..

20. There is some recognition that developing and managing the water resources of these basins through a cooperative regional approach would serve the economic and social interests of the entire population. Mutual benefits could include more hydro-electric power through increased hydro-power, improved navigation routes, and improved water quality. Some benefits would also arise from cooperation in mitigating disasters. However, a major stumbling block continues to be a bias towards bilateral agreements and mistrust among the regional countries (Ahmad et al., 1994; Verghese, 1999).

C. Water Management in Bangladesh – Milestones

21. Until mid–20th century, major water-related infrastructure was provided under the *zamindar* system,[7] whereby the *zamindars* financed it and collected tax revenues from the local population. Local bodies such as district and union boards supplemented this role. However, the services were inadequate and the Department of Public Health Engineering was established in the 1930s following a series of epidemics related to drinking water. The *zamindar* system was abolished in 1952.

22. Following severe flooding in 1954 and 1955, a United Nations Technical Mission recommended establishing a Water and Power Development Authority.[8] Other recommendations were to: examine the feasibility of embankments along the major rivers, implement smaller flood control, drainage, and irrigation projects, examine the feasibility of a barrage on the Teesta River, raise homestead platforms in flood affected areas, implement zoning to restrict construction of economic infrastructure where flood control could be ensured, and work with other riparian countries to establish better flood forecasting in the common rivers. The then East Pakistan Water and Power Development Authority was created in 1959.

23. The preparation of the 1964 Water Master Plan was a major milestone. The Plan envisaged 58 large projects including three barrages on major rivers, with a focus on water for agriculture. While the Plan was never approved by Government, by the mid 80s many of its components had been implemented. Possibly the most significant outcome was protection of the coastal zone from tidally-induced flooding. However, this plan disregarded potential impacts on fisheries, navigation, biodiversity, salinity, and water supply. It over-emphasized large-scale publicly financed surface water developments, over-estimated public sector capability, and overlooked the country's groundwater resources.

24. In 1972, the World Bank supported preparation of a Land and Water Sector Study. This study promoted a radical shift in strategy from large public-sector flood control and irrigation projects to numerous minor developments using low-lift pumps to irrigate with surface water and tube-wells to irrigate with groundwater. This study also promoted small-scale flood control and drainage schemes in shallowly flooded areas. As with the Water Master Plan, this Study was not approved by Government. Nevertheless, the approach guided Government and donor support and the result was a dramatic expansion of irrigated area using ground water; mainly

[7] Zamindars were large land-lords.

[8] Krug Mission.

financed by the private sector. Also about this time, an Integrated Rural Development program promoted the concept of harmonizing water resources planning and development with that of other rural infrastructure through the local government structure. The resulting plan books integrated local water management, transportation, and communication infrastructure. Unfortunately, the initial focus on integrated planning gave way to implementation of minor irrigation projects.

25. In 1995, Government approved The Bangladesh Water and Flood Management Strategy. This Strategy was based on an extensive program of work undertaken as part of the National Water Plan, Phase I (1981- 83) and Phase II (1986-88) and by the Flood Action Plan (1990-94). The Flood Action Plan (FAP), financed by 16 major donors, consisted of 26 separate components and was a World Bank coordinated response to the severe flooding of 1987 and 1988. The 1995 Strategy proposed a range of structural and non-structural measures to deal with flooding, but more importantly, it set in motion changes in the way the water sector was managed. The FAP triggered an unprecedented level of public scrutiny and, in combination with poor results from some FAP evaluation studies, led to the realization that investments in water resource management were unsustainable without meaningful participation by local stakeholder institutions. The Strategy promoted a broader technical approach to water resource planning with more attention to fisheries and environmental considerations. The Strategy also promoted a reduced public sector role and advocated new functions for some key service delivery institutions: The Water Resource Planning Organization (WARPO) and the Flood Plan Coordination Organization (FPCO) merged to form a new national water resources planning organization, and a new structure and role were envisaged for BWDB. Finally, the strategy identified the need for a National Water Policy and a National Water Management Plan guided by that Policy.

26. Scientists began finding evidence of arsenic contamination of untreated ground water in the 80s, but the general public only became aware of this crisis in the mid 90s. Over the previous two decades, untreated tube well water was heavily promoted as a safe and environmentally acceptable alternative to untreated surface water. Although considerable work has been done subsequently to address this issue, knowledge about occurrence and mitigation of arsenic contamination remains incomplete.

27. In December 1996, the Ganges Treaty was signed between India and Bangladesh. The Treaty, having a 30 year duration, sets out a framework for sharing the low season discharges of the Ganges River.

28. In 1998 the Government adopted the National Policy for Safe Water Supply and Sanitation which promotes:

- Demand rather than supply driven approach to development.
- Private sector participation.
- User participation through increased involvement of local government institutions and community organizations.
- Building capacity at all levels from service providers to users.
- Increased involvement of women in water and sanitation services.

29. In 1999 the Government declared the National Water Policy (NWP), prepared after extensive consultation with representatives from all water-using sectors. The Policy is comprehensive, forward looking, and sets out a framework for the water resources sector. It defines sector objectives, elaborates the roles and responsibilities of various sector institutions, and sets out administrative, economic, financial, environmental and social guidelines to be followed.

30. An important outcome of the National Water Policy was the preparation of the following documents that guide and direct investments in water resources management:

- **Bangladesh Water Development Board Act**. Recognizing the need for improved service delivery, this Act was promulgated in 2000. The Act addresses Board power and responsibility, Board functions, Board composition, power and responsibility of the Directors and the Director General, implementation and management aspects of future projects, transfer of the ownership and management of existing projects, funding, budget, responsibilities towards stakeholders and so on. The Act separates policy and oversight functions from operational management and resulted in changes to the BWDB organizational structure.
- **National Water Management Plan (NWMP)**. Prepared by WARPO and approved in 2004, the NWMP presents 84 programs in eight clusters, with an indicated investment of $18 billion over a 25 year time frame. The Plan promotes the coordinated development of water and related resources. In the short-term, the NWMP focuses on strengthening the institutional framework to improve the efficacy of the proposed investment programs. It is intended that the NWMP be updated every five years. A more detailed assessment of the NWMP and the updating process are discussed later in this document.
- **Guidelines for Participatory Water Management**. Prepared by an inter-agency task force in 2000, this document establishes a methodology for promoting public and local stakeholder participation in water management schemes.[9] The guidelines represent a significant divergence from the central planning approach historically adopted by water resources agencies. Nevertheless, there is a need to re-examine the participatory process from the perspective of encouraging service agencies to respond to local stakeholders rather than the reverse, which is at the heart of the current approach.
- **Irrigation Service Charge Imposition, Collection, and Usage Regulation (2003).** Prepared by BWDB, this regulation details how to establish and collect service charges and ensures that the funds collected are applied to local O&M requirements.
- **District Water Resource Assessments**. Prepared under the auspices of LGED within the Second Small Scale Water Resources Development Sector Project, these Assessments review the resource base, examine water resource related issues and problems, identify and evaluate existing infrastructure, and suggest appropriate small-scale interventions that would alleviate identified constraints.[10] These District-level assessments are prepared within the framework of the National Water Management Plan and provide a systematic approach to alleviating local issues.

31. While not so directly related to the NWP, other key developments in the policy and strategic framework since 2000 include:

- **Cooperative Societies Ordinance**. Originally legislated in 1984, this Ordinance was revised in 2000 to better accommodate water user groups. Key changes are (i) individuals can now belong to more than one cooperative, (ii) registered water users cooperatives can exact an irrigation service charge from both members and non-members provided that all benefit from the irrigation services, and (iii) the

[9] Participating agencies included Bangladesh Water Development Board, Local Government Engineering Department, Ministry of Livestock, Ministry of Fisheries, and Department of Agriculture Extension.

[10] The Second Small Scale Water Resources Development Sector Project receives financial support from ADB and the Government of the Netherlands.

Department of Cooperatives cannot take direct action against a water users group without the concurrence of the sponsoring agency. Together, these changes effectively removed earlier barriers to establishing and nurturing water users groups.

- **National Poverty Reduction Strategies (I and II)**. The first Poverty Reduction Strategy Paper was introduced for the period from 2005 to 2007. This was extended by one year and a second Poverty Reduction Strategy Paper was prepared and became effective in 2008. Both Strategies were prepared on the basis that accelerating social development and reducing poverty are the most important long-term goals of Bangladesh. Consistent with the Millennium Development Goals, they aim to halve the number of poor people by 2015 and emphasize the importance of multiple routes to address the underlying causes of poverty. The Strategies were developed through wide-ranging consultative process, establishes poverty reduction and sector development targets, and present comprehensive sector and thematic strategies, which include water resource management as a priority for targeted pro-poor growth. These are discussed in more detail in subsequent chapters.

32. During the past several decades, Government has consistently worked towards pro-active and integrated water resource management with the result that a reasonably comprehensive suite of policies has been put in place. Significant changes have also been introduced to service delivery agencies to promote improvements. In general, the concepts of Integrated Water Resource Management promoted by the Global Water Partnership are well reflected in the development of the water sector in Bangladesh. Nevertheless, as described later in this document, the current study emphasizes selected IWRM aspects and identifies means to further promote IWRM.

D. Resource Base

1. Land Base

33. Bangladesh has a total area of about 147,000 km^2 and a net cultivable area of about 80,000 km^2. Most of the country has an elevation of less than 10 m above sea level. The National Water Management Plan classifies the land base as shown in Table 1, and forecasts an absolute decline of agricultural land of 16,400 km^2 by 2050 (a reduction of 20% of the current area). This loss in agricultural land is due to various factors, but mainly increased area occupied by urban and rural settlements and expansion of fish production on to agricultural land. Even to maintain current production, yields will need to increase annually by 20 percent to compensate for the loss of agricultural land.

2. Climate / Temperature

34. There are three fairly distinct seasons in Bangladesh. The warm season extends from March through May, with a mean temperature of about 30^oC and occasional highs above 40^oC. The monsoon season begins in June and continues into October, with maximum temperatures usually in the 30's with high humidity. The cool season begins in November and extends through February with temperatures ranging from 5^oC to the low 30's.

Table 1: Land Classification

Land Type	Area (km^2)	Description
Rivers	4,641	The area, including the meander belt, occupied by the main rivers as well as the area of other rivers of widths down to 20 m.
Other	3,440	Char lands and land between embankments and the rivers' edges.
Water	7,367	Beels, baors, and ponds remaining flooded into February as observed on the February 1997 imagery.
Forest	20,237	Land designated as state reserve forest by the Forestry Department, excluding mangrove plus other official forest, fruit trees etc.
Mangrove	4,581	Mangrove areas.
Urban	9,196	Towns and growth centers, infrastructure (such as roads, railways canals), and industrial land outside settlements.
Rural	8,818	The 60,000 villages scattered throughout rural Bangladesh.
Agriculture	80,534	Land cultivated at least once a year; fallow and cultivable waste.

Source: National Water Management Plan, 2001

3. Climate / Rainfall

35. Rainfall originates from three sources: The westerly depressions of winter which account for about five percent of the total; the early summer thunderstorms (Northwesters) which account for about 15 percent of the total; and the summer monsoons which account for about 80 percent. Rainfall is less than 1,500 mm in west central Bangladesh and increases northward eastward and southward. The highest rainfall, more than 4,800 mm, is in north eastern Bangladesh.

4. Water and Flooding

36. The two primary sources of water in Bangladesh are trans-boundary inflows amounting to about 1,000 km^3 annually derived mainly from the Brahmaputra, Meghna, and Ganges Rivers, and local rainfall amounting to about 250 km^3 annually. Since peak discharges in the trans-boundary rivers coincide with the period of heaviest local rainfall (July through September), the excess rainfall cannot drain. So, in addition to overbank flooding from the trans-boundary rivers, a much wider area is flooded because drainage of the excess local rainfall is impeded until water levels in these rivers recede. The result is that in an average year, about 20 percent of the country is flooded. About once every 10 years, more severe flooding occurs to the point that more than 60 percent of the country becomes inundated. These and other modes of flooding throughout the country are described in Table 2.

Table 2: Sources of Flooding by Region

Region	Major Source of Flooding
Southwest	Tides and cyclonic rainfall.
South Central	Tide, cyclonic rainfall, surges, and overspill of Lower Meghna.
Northwest	Local intense rainfall, impeded drainage, breaches in Teesta and Brahmaputra Right Embankments, breaches in internal polder embankments, and drainage congestion preceded by high flows in the major rivers.
North Central	Local intense rainfall, impeded drainage, spillage from the Brahmaputra, and congested drainage on the Meghna.
Northeast	Flash floods on trans-boundary rivers, local intense rainfall, impeded drainage, and drainage congestion on the Meghna.
Southeast	Flash floods on trans-boundary rivers, local intense rainfall, impeded drainage, and drainage congestion on the major river.
Eastern Hills	Flash floods and cyclonic rainfall.
Rivers and Estuary	High inflows through the Ganges and Brahmaputra and surges.

Source: National Water Management Plan, 2001

5. Water Balance

37. There is a surplus of water between July and September, and a shortage between January and March. Short interruptions in rainfall in the wet summer months may mean that crops require supplementary irrigation, but the main problem during this period is shortage of means to irrigate. The scenario in the winter months is quite different – there is inadequate surface water to meet irrigation requirements. Groundwater is available but may be unusable due to arsenic contamination. A water balance was prepared as part of the National Water Planning process (2002). However, subsequent analysis calls into question the results. An updated water balance would be an outcome of updating the National Water Management Plan.

E. Chittagong Hill Tracts

38. The Chittagong Hill Tracts (CHT) region is situated in the south-east of Bangladesh and consists of three hill districts: Khagrachari, Rangamati, and Bandarban. Its total land area is just over 13,000 km^2 of which 90% are sloping lands, about 6% valley bottom lands and the remaining 4% covered by villages, rivers, and townships. The region's population is made up of tribal peoples from 11 distinct groups and Bengalis, most of who have settled from plain areas. The main occupation of the CHT population is agriculture (including horticulture and livestock). Over 60% of the rural households are involved in agriculture. About 40% of all families do not own their homestead land and of those who do, only 35% own cultivatable cereal land. Agricultural land use in the CHT is divided into shifting cultivation (jhum) in the lower and upper hills (upland), intensive valley crop (mainly paddy) production and horticulture on lower slopes and valley bottoms (lowland).

39. Food security is an imminent issue in the CHT for several reasons. First, only 6% of CHT land is cultivatable and its generally poor soils and steep contours severely limit the productivity. Second, the creation of Lake Kaptai, a hydroelectric dam lake, in 1960 took 40% of the CHT's prime cultivatable lands and left CHT to become a permanently food deficit area. Third, Government-led in-migration of about 250,000 Bengalis from the heavily populated plains exacerbated the pressures on the remaining agricultural land. Fourth, a two-decade insurgency stemming from a land conflict between the migrants and the indigenous people damaged much

of the rural infrastructure and depleted the natural resource base. Finally, as population and land pressures increased, land has been intensively used with shortened fallow periods causing land degradation. Consequently, a jhumia farmer can now barely obtain 3-4 months of food per year from their own production.

40. Water scarcity is a problem in most parts of the CHT, especially in the upland. In a typical hill area, 80% of the rainfall occurs during the monsoon period, the remaining eight months are more or less dry. Poor land management has led to increased water problems in the region; deforestation has increased surface runoff and reduced groundwater replenishment. Thus, there is much demand for interventions such as improved water harvesting (collection, storage, and use of run-off water), irrigation, and land management to reduce the run-off and soil erosion.

41. There are, however, several factors compounding the complexity. First, unique governance structure of the CHT requires special attention. Under the CHT Accord in 1997, the CHT Regional Council (CHTRC) was created to coordinate all development activities. Under CHTRC are the Hill District Councils (HDCs) which possess administrative authority over the staff of many of the line ministries in their area and are responsible for activities associated with environmental management, jhum cultivation and water resources management (except Kaptai lake and irrigation). In addition, there are traditional governing structures and traditional usufruct and ownership rights that have influence over water and land use.

42. Second is the interrelationship between the upland and lowland areas and multipurpose uses of water for irrigation, fisheries and consumption. Change in cultivation pattern in the upland can provide benefits to the lowlands in terms of improved water quality. However, this may incur short-term opportunity costs for the upland communities, who are poorer than those in the lowland. Some safeguard measures need to be sought for the upland so as not to exacerbate the fragile harmony that exists between different ethnic groups residing in the two regions. Third, shortage in arable land is changing the traditional cultivation arrangements among different ethnic groups, complicating the social power dynamics. For example, the landless in the valleys are taking up shifting cultivation in the uplands, and better-off Bengali communities are taking up plantation in the uplands. Fourth, women in different ethnic groups have different roles.

F. Water and the Economy

43. Water is important to the following economic sectors:.

- Agriculture's share of GDP has been declining as the economy grows but still represents about 14 per cent of the total. As of 2008, agriculture employs 45 per cent of the labor force[11].
- Fisheries sector accounts for about 4.5 per cent of GDP and about 4.4 per cent of commodity exports[12]. Inland capture fisheries have been declining because of loss of dry season aquatic habitat. Inland and brackish water aquaculture have continued to expand, so exports have increased on average more than 25% per year over the past 5 years. The forecast annual growth rate for aquaculture in Bangladesh is

[11] Bangladesh Bureau of Statistics: GDP of Bangladesh 2008; Labor Force Survey 2005-06

[12] Bangladesh Bureau of Statistics, GDP of Bangladesh 2008; Export promotion Bureau FY03 – FY 07

between 3.5 and 4 per cent[13]. Fisheries employ about 2.2 per cent of the country's labor force[14].

- Transportation share of GDP was about 10 per cent in 2006, of which navigation represents 8 per cent.

44. Sanitation coverage is estimated at 81 per cent of households in urban areas and 46 per cent in rural areas. Improved drinking water sources are available to 85 per cent of urban households and 78 per cent of rural households. The delivery of water and sanitation services has considerably improved over the past decade, but slum dwellers continue to lack access in disproportionate numbers: only 30 per cent have access to piped water and 20 per cent to sanitary latrines. Half the people living in slum areas spend more than 30 minutes per day collecting water while about 7 per cent spend two hours or more. Research also suggests that some slum dwellers pay significantly more for water (as much as 25 times the unit rate) then middle and high income families.

45. A review of Gross Domestic Product (GDP) for periods including severe flooding indicate that its impact is less than might be expected (Figure 2).[15] Severe flooding impacts most strongly on agriculture so as agriculture's share of GDP declines, the impact of flooding on the overall economy reduces[16]. Nevertheless, as agriculture continues to employ almost half the labor force the impacts on people are very broad.

46. Water plays a significant but unquantified role in industrial contributions to the economy. In general, the net water requirements of industry and commerce are

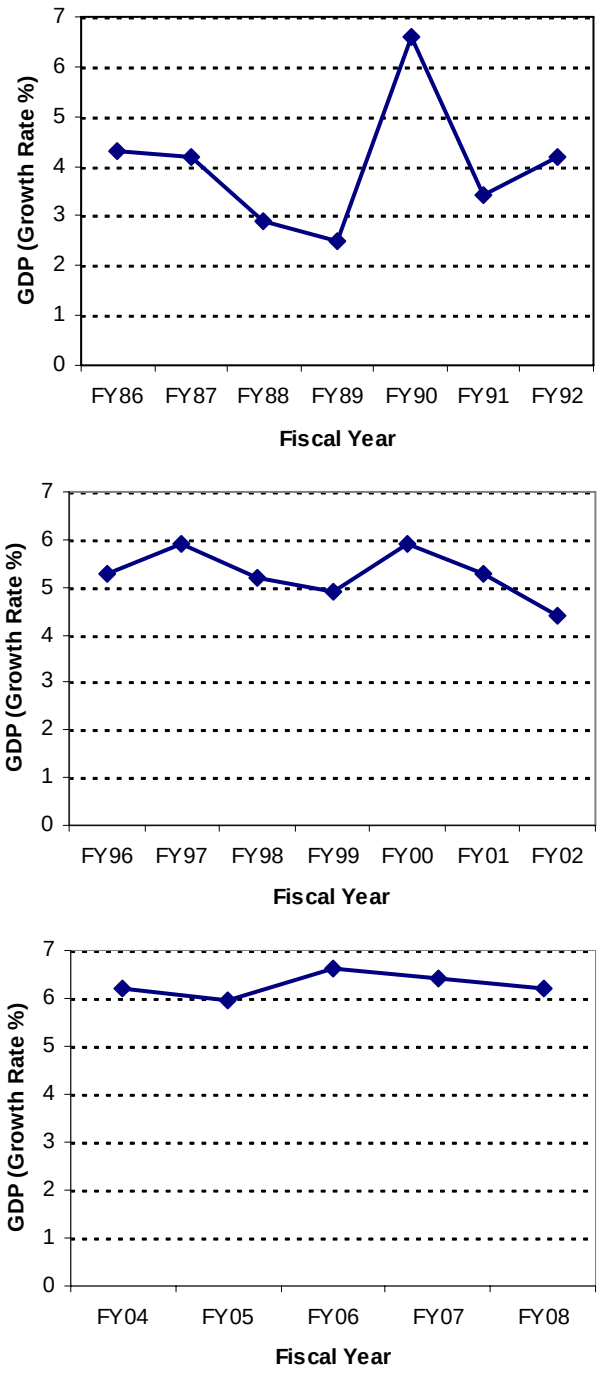


Figure 2: Changes in GDP - Severe Flooding Occurred in 1987, 1988, 1998, 2004, and 2007

[13] Global Aquaculture Outlook in the Next Decades – an ana… 2030, FAO 2004

[14] Labor Force Survey 2002 – 2003, BBS.

[15] GDP values are at constant market prices and abstracted from Statistical Yearbooks of Bangladesh for the relevant years.

[16] It is also noted that farmers respond to damaging floods by increasing production in the subsequent crop season, which on an annual basis off-sets the impact of the flood damage.

relatively low and there is little evidence that water is a constraint. Constraints relate more to inadequate delivery services. Water quality is an issue in Khulna, where dry-season surface-water salinity is too high for most industrial uses and industries have installed deep tube wells. Water quality is also a problem in the rivers surrounding Dhaka. Industries contribute importantly to polluting these rivers.

G. Future Water Challenges Facing Bangladesh as Key IWRM Issues

47. Historical water challenges have included: flooding, seasonal water shortages, deteriorating water quality, providing adequate services for water supply and sanitation, maintaining navigation routes, mitigating river erosion and its impacts, and addressing arsenic contamination of groundwater. These challenges are being aggravated, shaped by driving forces that will shift priorities or expose new challenges including the following:

- **Population**. The National Water Management plan forecasts an increase in population to about 220 million by 2050 from 144.5 million in 2008 with urban centers absorbing most of the increase[17]. Urban populations are forecast to grow from 36.7 to about 130 million and rural populations from 107.8 to 110 million[18].
  - The 2050 population will require potable water amounting to something over 35,000 million liters per day. As of 2006, delivery systems provided about 10,000 million liters per day.
  - The human excreta load will increase from the present 1,500 metric tons per day to about 6,000 metric tons per day while solid wastes will increase from 4,500 to 19,000 metric tons per day.
  - To maintain food security, an incremental increase of about 20 million metric tons of cereals will be required by 2050 and this will impact water resources in two ways (i) increases in irrigated area will increase the demand for water, particularly during the winter season, and (ii) increased fertilizer and pesticide residues will degrade fresh water supplies.
  - The demand for fish will increase from 2.8 million metric tons to about 7 million metric tons by 2050. Such an increase will need substantially increased production per unit area and increased land area under aquaculture.
- **Natural Hazards**. Although Bangladesh has historically been subjected to water-related natural hazards, the increasing population density means that more people are affected by any given event. Between 1980 and 2008, 219 disasters affecting 317 million people were recorded[19]. Of these, 167 were water related – mainly storms (102) and floods (63)[20]. Flooding was responsible for the greatest economic damage and affected the greatest number of citizens but storms were responsible for most of the deaths.
- **Riverbank Erosion**. Eroding river bank lines are not generally reported as disasters, but they have profound effects on dwellings, communities, and infrastructure. In addition to direct damage, the mere threat of erosion constrains

[17] Current population as reported by BBS appears consistent with the medium fertility decline scenario outlined in the National Water Management Plan projections.

[18] Present population Statistics are abstracted from BBS data and are for July 2008.

[19] These events resulted in the deaths of an estimated 191,000 people and economic damage of about USD 16.8 million.

[20] http://www.preventionweb.net/english/countries/statistics

investment and development. Over the past 30 years about 800 km^2 of land has been lost to river bank erosion, displacing or rendering homeless about one million people (See Volume II, Annex C: Managing River Erosion – The Adaptive Approach).

- **Environment**. Upstream withdrawals are impacting the natural ecosystems of the Sundarabans. An agreement on environmental flows in the major rivers is required. Climate change may further exacerbate the problem. The Fourth Assessment Report of the International Panel on Climate Change (IPCC 2007) suggests a decrease in winter precipitation on the Indian subcontinent. Further analysis will be necessary to determine the feasibility of adaptation measures.
- **Competition**. Historically, agriculture was the dominant consumptive user of water and there was little intra-sectoral competition. However, water use patterns are changing with rapidly increasing domestic and industrial use. Rapid urbanization combined with a high degree of (mostly industrial) pollution around urban centers will mean that groundwater supplies will become inadequate and surface water will need to be conveyed from more distant sources. This increased urban demand and a need to maintain environmental river flows will limit quantities available to other consumptive users.

III. ENABLING ENVIRONMENT

A. Policy Framework

1. Preamble

48. During the past two decades Government has formulated policies intended to deal with various aspects of water resources management in the context of the National Development Objectives, which aim to (i) alleviate poverty and provide sustainable economic growth, (ii) provide food security, (iii) promote public health and safety, and (iv) protect the natural environment. These policies are described below in chronological order.

2. National Wetlands Policy (draft 1988).

49. Defines wetlands in very broad terms and aims to promote sustainable use of wetland products, measures to maintain biological diversity; and the integration of wetland functions.

3. National Policy for Safe Water Supply and Sanitation (1988).

50. Adopts the following key principles: consumers to pay total recurrent cost of water, consumers share in investment costs, responsibility devolved to local government, increased autonomy for Water and Sewerage Authorities (WASAs) and pourashava water supply organizations, priority assigned to under-served areas, and urban storm drainage and solid waste disposal extended.

51. Likely in part because this policy preceded many of the others, it is not properly linked with them and does not acknowledge water supply and sanitation as part of the larger water resources sector. As with many other policies, various of its elements have not been implemented. The policy was promulgated more than two decades ago, and there is a need to review it in light of subsequent changes in background conditions.

4. National Environment Policy (1992).

52. Provides directives on the legal framework and institutional arrangements required to regulate activities that pollute and degrade the environment, in 15 sectors. The Policy also calls for an environmental audit of existing flood control and drainage projects.

5. National Forestry Policy (1994).

53. Proposes the afforestation of 20% of the area of the country by 2015, with special emphasis on new char lands, denuded state forests, fallow lands, transport corridors, and flood embankments.

6. National Fisheries Policy (1998).

54. Supports both capture and culture fisheries, maintaining an ecological balance within fish habitat, and conserving fish habitat by preventing further encroachment on standing water bodies. This policy is not linked to other natural resource policies including the National Wetlands Policy (2 above) and the National Water Policy (8 below). This may partly account for failure to implement various policy elements.

7. National Agriculture Policy (1999).

55. Promotes food self-sufficiency and increased production through diversifying crops, expanding biotechnology, and promoting crops for agro-industry and export. Environmental concerns are addressed by promoting integrated pest management, and social concerns by protecting the interests of small and marginal farmers.

8. National Water Policy (1999).

56. Defines objectives for the water resources sector and provides broad guidelines along with an institutional framework. The objectives are to: (i) promote equitable and efficient management of surface and ground water; (ii) ensure water availability to all stakeholders, especially poor and vulnerable people; (iii) develop sustainable public and private water delivery systems; (iv) promote institutional changes to decentralize water resource management; (v) develop legal and regulatory instruments to support decentralization, environmental management, and private sector involvement; and (vi) promote holistic and participatory planning by enhancing the knowledge base and institutional capacities.

57. The Policy was developed through extensive dialogue with a broad range of stakeholders and takes an integrated approach involving a range of sectors including transportation, drinking water supply and sanitation, fisheries, agriculture and so on. An important outcome has been the preparation of the following key directives: (i) Guidelines for Participatory Water Management (GPWM), which establish the methodology for promoting public and local stakeholder participation, and (ii) Irrigation Service Charge Imposition, Collection, and Usage Regulation (2003), which details how to establish and collect service charges and ensure that they are applied to local O&M.

9. National Policy for Arsenic Mitigation (2004).

58. Presents a plan that calls for: (i) screening and monitoring of all tube wells, (ii) public awareness campaigns describing the effects of drinking arsenic-contaminated water, alternative and safe sources, remedial measures, and the inappropriateness of socially excluding people affected by arsenic poisoning, (iii) making surface water the preferred source of potable water, and (iv) use of piped water systems wherever practicable. This Policy conforms to the principles of the National Policy for Safe Water Supply and Sanitation (3 above) and was followed by the National Arsenic Mitigation Implementation plan.

10. Coastal Zone Policy (2005).

59. Government approved a Coastal Zone Policy (CZPo) in response to a recognition that:

- the coastal zone lags much of the rest of the country in terms of socio-economic development,
- people are vulnerable to many coastal hazards and the physical environment is deteriorating, and
- the coastal zone has the potential to contribute significantly to national development.

60. The CZPo considers the coastal zone as a special management area, establishes an integrated planning and policy framework through agreed common principles, and creates an enabling environment. The latter defines the institutional, legal and regulatory framework as well as the processes for harmonization and coordination. The CZPo initiates a process that

commits various ministries, departments and agencies to harmonize and coordinate their activities in the coastal zone and elaborates the basis for a firm coordination mechanism.

61. Like the National Strategies for Accelerated Poverty Reduction, the CZPo focuses on poverty reduction as a central goal. The CZPo is unique in that it transcends sectoral perspectives so the focus here is on the aspects of the CZPo that relate to water.

62. The CZPo framework is articulated through eight development objectives. Of these, four include water-related issues:

- **Meet basic needs and enhance livelihood opportunities**. The water focus here is on sanitation, safe drinking water, and measures to facilitate coastal navigation. While the NWMP adequately addresses the first two, there is no direct reference to coastal zone navigation, which is important for commerce and communication in that region.
- **Reduce Vulnerabilities**. The vulnerabilities identified with the coastal zone mainly relate to water and include drought, erosion, floods, cyclones, and storm surges. There is a need to integrate the coastal aspects of the CZPo into the "Comprehensive Disaster Management Plan" as well as the national strategies for accelerated poverty reduction. The emphasis of the CZPo is on the vulnerability of the poor so for example, while the NWMP addresses provision of effective erosion management measures (on main rivers), unlike the CZPo it is silent as to the impact on the victims and falls short of recommending (or costing) rehabilitation of these victims.
- **Sustainable management of natural resources**. The water issues identified under this objective are specific to the coastal zone and include ensuring adequate discharges to preserve the coastal estuary ecosystem, capturing tidal water by constructing small reservoirs for minor irrigation, rainwater harvesting, excavating ponds and tanks combined with local technologies for water treatment to increase safe water supply, and managing ground water in a sustainable manner.
- **Conservation and enhancement of critical ecosystems**. As with the NWMP, CZPo identifies the requirement for sewage treatment plants for major cities in the coastal zone. However, it also identifies the need to deal with discharge of bilge water and oil spills according to international conventions, and the need to monitor sea level rise with contingency plans designed to deal with related effects.

63. The CZPo specifies a range of measures that are not taken account of in the NWMP. Importantly, the CZPo also recognizes that it is at odds with earlier policies and strategies and as such dictates that coastal zone management will be mainstreamed. Specifically, that existing policies are to be harmonized and that coastal issues are to be incorporated in all future policy and strategy documents.

11. Conclusion

64. Together, these policies appear to promote participatory and sustainable development of the water sector as a whole. However, there are two general problems. Firstly, these policies are not judicially enforceable according to the Constitution of Bangladesh, although they may guide and influence concerned ministries and agencies. Secondly, policies – other than for water, fisheries, and agriculture – have been developed primarily from a sectoral approach, so that they overlap in certain areas and implementation is limited to whatever control the authoring

ministry can exercise. Although advances have been made in integrating the approach to water management, work remains at the policy level.

65. Nevertheless, the National Water Policy (8 above) sets out follow-on tasks in a number of areas. Key tasks are:

(i) Enact a National Water Act revising and consolidating the laws governing ownership, development, appropriation, utilization, conservation, and protection of water resources.

(ii) Formulate a framework for institutional reforms to guide all water-related activities and periodically review the mandates of all water sector institutions and redefine their roles as necessary.

(iii) Gradually transfer irrigation schemes with command areas over 5,000 ha to private management, either through leasing, concession, or management contracts arrived at by competitive bidding, or through joint management by the implementing agency along with local government and community organizations.

(iv) Update the National Water Management Plan every five years to ensure that proposed strategies remain relevant to changing environments.

B. Legislative Framework

66. There are 41 pieces of legislation that in some way address water management (Box 1). Legislation considered most directly relevant is reviewed below.

1. Groundwater Ordinance (1985)

67. The ordinance specifies that no tube well shall be installed in any place without a license granted by the Upazila Parishad and that no application shall be entertained by the Upazila Parishad unless it is accompanied by fees.

2. Water Resources Planning Act (1992)

68. This Act simply announced the creation of a new organization describing its mandate in general terms but without a set of rules to make it effective. This Act requires amending to ensure that WARPOs role and staff composition is consistent with evolving requirements of the sector (See Volume II Annex D: The Case for Revising the WARPO Act).

3. Bangladesh Environment Conservation Act (1995)

69. This Act was promulgated to provide for conservation of the environment, improvement of environmental standards and control and mitigation of environmental pollution. The Department of Environment owes its origin to this Act.

4. WASA Act (1996)

70. Promulgated in 1996, this Act provides increased autonomy to Dhaka WASA. The Act reconstituted and strengthened the Board, introduced commercial regulations, bestowed power and authority on the Board and Dhaka WASA management and reduced government's role and interference in management.

71. The provisions of the Act notwithstanding, government interference continues. The Act exclusively empowers the Board and the Management in matters such as staffing, hiring and firing of officers; budget approval; appointment of Managing Director and Deputy Managing Director; appointment of other staff; freedom to set and adjust tariff but the government has not allowed them to exercise those powers. This has severely reduced Dhaka WASA's authority to run the organization on a commercial basis – which was the major objective of the Act.

5. Environment Conservation Rules (1997)

72. These rules enable Department of Environment to provide environmental clearance to projects within various ministries. However, the Department of Environment has inadequate human resources to do this. The Rules also designate the Department of Environment as responsible for enforcing Environmental Impact Assessment (EIA) procedures outlined in the Rules, and specifies legal procedures to be followed for implementing the EIA process. The Rules do not provide any direction for drainage or irrigation projects.

6. BWDB Act (2000)

73. The act governing the Bangladesh Water Development Board covers power, responsibility, function, administration, composition of the Board of Directors, responsibilities of the Director General, implementation and management of future projects, transfer of ownership and management of existing projects, fund, budgets and so on.

Box 1: Existing Water-Related Legislation

- Revenue Sale Act (1859)
- Land Registration Act (1876)
- The Bengal Irrigation Act (1876)
- Ferries Act (1878)
- Courts of Wards Act (1879)
- Transfer of Property Act (1882)
- Local Self-Government Act (1885)
- The Embankment Act (1888)
- Estates Partition Act (1897)
- Ancient Monuments Preservation Act (1904)
- Registration Act (1908)
- The Excise Act (1909)
- Public Demands Recovery Act (1913)
- Agriculture & Sanitary Improvement Act (1920)
- Waste Land Manual (1936)
- Bengal Land Improvement Act (1939)
- State Acquisition and Tenancy Act (1950)
- Embankment and Drainage Act (1952)
- Inland Water Transport Authority Ordinance (1958)
- The Agriculture Pesticides Ordinance (1971)
- Statute of the Indo-Bangladesh Joint Rivers Commission (1972)
- Bangladesh Water and Power Development Boards Order (1972)
- Bangladesh Fisheries Development Corporation Act (1973)
- Territorial Waters and Maritimes Zone Act (1974)
- Local Government Ordinance (1976)
- The Environmental Pollution Control Ordinance (1977)
- Acquisition and Requisition of Immovable
- Property Ordinance (1982)
- Local Government (Union Parishads)
- Ordinance (1983)
- Bangladesh Irrigation Water Rates Ordinance (1983)
- Groundwater Management Ordinance (1985)
- Land Administration Manual (1987)
- Land Management Manual (1990)
- Water Supply and Sewerage Authority (Amendment) Act (1990)
- Water Resources Planning Act (1992)
- Water Supply and Sewerage Authority Act (1996)
- Environment Conservation Act (1995)
- Environment Conservation Rules (1997)
- BWDB Act (2000)
- Environment Protection Act (2000)
- Preservation of Wetlands and Open Space Act (2000)
- Bangladesh Water and Power Development Boards Order 2000

74. The act requires BWDB to perform the following functions.

- Structural Functions
  - Managing rivers and basins, planning, constructing, and operating reservoirs, barrages, embankments, regulators and other infrastructure for flood control, drainage improvement, irrigation and drought prevention;
  - Augmenting water flows for irrigation, pisciculture, navigation, wildlife conservation, reforestation and overall environmental enhancement by re-excavating river ways, canal/khal/beels and so on;
  - Reclaiming land within the estuary through measures that promote accretion and establishing conservation measures;
  - Managing river bank erosion to protect towns, growth centers, as well as places of historical and national importance;
  - Protecting the coast line and constructing coastal embankments;
  - Preventing intrusion of saline water and mitigating the impacts of drought;
  - Harvesting rain water for irrigation, environment, and water supply.
- Non-Structural and Supportive Functions
  - Flood and drought forecasting and warning;
  - Hydrological investigation data collection, compilation and dissemination;
  - Reforestation and fisheries programs within BWDB projects, in cooperation with relevant government agencies;
  - Road construction on embankments;
  - Research and application;
  - Organize and ensure local stakeholder participation for sustainable management of BWDB projects.

75. The provisions of the Act notwithstanding, BWDB has not been provided with the specified autonomy and has to a certain extent been unable to exercise the mandate imposed by the Act.

7. Playground, Open Place, Garden, and Natural Water Conservation Act for City, Divisional, and District Town Pouroshava Act (2000)

76. This Act specifies that Master Plans be followed with respect to any development. Violation is punishable with a maximum 5 years imprisonment and a fine of Tk.50,000.

77. As of 2008, a Master Plan exists only for Dhaka city, and it is not followed properly. Within Dhaka City, khals, rivers and wetlands are being filled to build homes, and playgrounds have been converted to housing. Master plans need to be prepared for more of the larger communities and the provisions of the Act need to be enforced.

8. Bangladesh Water Act [21]

78. This proposed Act would translate the National Water Policy into law and thereby ensure integrated management, development, and equitable utilization of the countries water resources. The current draft has undergone an extensive review process and is considered

[21] The Bangladesh Water Act was drafted by a legal specialist engaged within the ADB financed RETA Project No 39119. The starting point was an early draft of a water act.

ready for submission to Parliament. (See Volume II: Annex F: Draft Bangladesh Water Act). It is expected to become law in 2010.

9. Conclusion

79. Although there are already 41 pieces of legislation related to the use and administration of water, three additional pieces of legislation appear to be required on a priority basis:

- The **Bangladesh Water Act**, described above, would enable implementation of the National Water Policy. The process for enacting this legislation is in progress.
- A revised **Water Resources Planning Act**.
- A **National Water Code**. The latter term has frequently been used interchangeably with the Bangladesh Water Act but is considerably different in purpose. A code, covering the complete system of law within the water sector would assemble all of the various pieces of legislation to ensure consistency and synergy in application. No work has yet been initiated to this end.

IV. INSTITUTIONAL FRAMEWORK

A. Context

80. A recurring theme in all three National Strategies for Accelerated Poverty Reduction is that good governance is an essential precondition for economic development and poverty reduction.[22] The current (2009 – 2011) National Strategy for Accelerated Poverty Reduction (NSAPR 2) sets out the following vision for good governance:

> "… *to develop capable and accountable institutions that can devise and implement sound policies, provide public services, set the rules governing markets and combat corruption, thereby helping to reduce poverty*".

81. NSAPR 2 identifies the following intervention to bring efficiency, transparency, and accountability to public service management:

- Strengthening recruitment including strengthening and reforming the role of the Public Service Commission (PSC).
- Adopting a more modern human resources development approach within the public service.[23]
- Evolving institutional mechanisms to reduce patronage, political pressure, and nepotism. This would include making politicians responsible for policies and civil servants for implementation.
- Making procedural changes so that civil servants work with clear terms of reference, job descriptions, and transparent accountability arrangements.
- Increasing pay-scales and relating these to skills and responsibilities.

82. Public sector arrangements in Bangladesh are among the most centralized in the world. It is estimated that only 3 to 4% of total public spending goes to delivery of local services.[24] Strengthening local governance through fiscal transfers, community participation, and oversight has been identified as an important element of the NSAPR 2. The following actions are proposed:

- Introduce a clear mandate of authority and responsibility, including job descriptions for all members of Local Government Institutions (LGIs).
- Reward and recognize commendable work, with incentives for mobilizing resources locally.
- Build capacity through training including leadership training.
- Encourage partnerships between LGIs and local Non-Government Organizations (NGOs) and Community Based Organizations (CBOs).
- Ensure uniform application of rules and procedures.
- Gradually introduce e-governance at the local level.

[22] Interim Poverty Reduction Strategy Paper, 2003; Unlocking the Potential – National Strategy for Accelerated Poverty Reduction, 2005; Moving Ahead – National Strategy for Accelerated Poverty Reduction 2009 – 2011, 2008

[23] This would include training, postings that match job requirements with competency levels, defining a code of conduct, mechanisms to address grievances, and so on.

[24] Comparable figures for Indonesia or South Africa (decentralized in the last decade or so) are 34% and 52% respectively.

- Ensure users full access to information on service delivery.
- Audit financial and operational performance of LGIs.
- Make certain that central government departments provide technical support to the LGIs
- Promote local planning and budgeting.

83. Finally, NSAPR 2 identifies a need to improve capacity for project implementation. A review of progress on Annual Development Plan Implementation indicated that only 30% of financial targets were met in the 8-month period between July 2007 and February 2008. It made the following recommendations:

- Improve quality of expenditure with priority on activities that reduce poverty and help women's advancement and rights.
- Reduce politicization of the selection process.
- Delegate authority to project directors.
- Simplify and streamline disbursement procedures.
- Strengthen procurement through special training.
- Provide more robust management information systems with regular reporting so that implementing agencies can be held accountable.

84. The foregoing applies to the public service system in general. Water-related agencies are affected by many of these recommendations. Despite institutional reforms introduced over the past decade, difficulties persist.

B. Institutional Changes Envisaged in National Policies

1. National Water Policy

85. The National Water Policy addresses governance and institutional change explicitly by clarifying roles and coordination mechanisms. The National Strategies for Accelerated Poverty Reduction have remained consistent with the policy, which in general terms indicates as follows:

- ***Decentralization***. Central Government agencies need to progressively withdraw from activities that can be accomplished by local institutions and the private sector.
- ***Restructuring***. The role of central agencies will change over time and some restructuring will inevitably be required, involving changes in staff numbers and mixes and re-training. Ultimately, increased performance levels and accountability will be required but this will be accompanied by greater financial autonomy.
- ***Capacity Strengthening***. Local organizations need to be strengthened to fulfill their established mandates. They need to be financially sustainable and be provided with direct access to funding.
- ***Municipalities Responsible for Water Services***. Municipalities and urban water and sewerage institutions should be empowered to regulate the use of water and prevent waste and pollution.
- ***Devolution***. A mix of Local Government Institutions, community-based organizations, and the private sector should undertake activities at the *Zila* (District) level and below.

2. National Policy for Safe Water Supply and Sanitation

86. Recognizing the need for sector reform and coordination, Government adopted the National Policy for Safe Water Supply and Sanitation (1988) and the Arsenic Mitigation Policy (2004). The salient features of these policies as they relate to institutional change include the following:

- Recognize and encourage private sector participation;
- Emphasize user-participation through increased involvement of local government bodies and community organizations;
- Build capacity at all levels from service provider to user;
- Emphasize behavioral change through social mobilization for optimum use of water, hygiene and sanitation; and
- Increase involvement of women in water and sanitation services.

C. Key National Water-Related Institutions

1. Summary Description

87. The National Institutions relevant to the water sector comprise some 35 central Government organizations affiliated with 13 different Ministries. The key National agencies and their main responsibilities are as follows.

- *National Economic Council* – The highest executive body in the Government's overall planning process, responsible for policy decisions on the basis of recommendations from its Executive Committee (ECNEC)
- *Planning Commission* – This is a technical body responsible for advising and assisting the National Economic Council on development planning. The Planning Commission produces the Poverty Reduction Strategy Paper, the Three Year Rolling Plan and the Annual Development Program.
- *National Water Resources Council (NWRC)* – The highest national body reporting to Cabinet on all water policy issues, including oversight of the NWMP and updates, resolution of inter-agency conflicts, and adoption of common standards. The NWRC's Executive Committee (ECNWRC) provides directives and guidance to water management institutions.
- *Ministry of Water Resources (MoWR)* – Responsible to the Government for most of the water sector including flood control, irrigation, conservation, surface and groundwater use, and river management.
- *Water Resources Planning Organization (WARPO)* – Responsible for water sector planning at national level, acts as secretariat of the NWRC, and is also responsible for establishing and maintaining the National Water Resources Database and for coordinating water sector developments.
- *Joint Rivers Commission* – Responsible for dealings with India and other co-riparian countries through similar organizations in those countries.
- *Bangladesh Water Development Board (BWDB)* – Responsible for planning and executing medium and large-scale water resource projects, river dredging and training, flood forecasting, surveys, data collection and sundry activities.
- *Bangladesh Inland Water Transport Authority (BIWTA)* – Located in the Ministry of Shipping and responsible for maintaining the main inland waterways.

- *Ministry of Agriculture* – Responsible for overall agricultural development, including minor irrigation. In addition it oversees the BADC, SRDI, all Agricultural Research Institutes and the Department of Agricultural Extension (DAE) which provides advice on farm water management through 13,000 block supervisors.
- *Bangladesh Agricultural Development Corporation (BADC)* – Located within the Ministry of Agriculture, BADC pioneered the introduction of mechanized minor irrigation, laying the foundation for the rapid expansion that has since occurred through the private sector. It was withdrawn from minor irrigation in 1993 and is being restructured.
- *Department of Fisheries (DoF)* – Located within the Ministry of Fisheries, is responsible for both capture and culture fisheries.
- *Ministry of Local Government, Rural Development and Cooperatives (MoLGRDC)* – Sets policies for rural development and oversees local government at all levels through its Local Government (LGD) and Rural Development and Cooperatives Divisions (RDCD). It has statutory responsibility for the water supply and sanitation (WSS) sector. Functional responsibility is delegated to DPHE, the Local Government Engineering Department (LGED), city corporations, pourashavas, and in Dhaka and Chittagong, Water Supply and Sewerage Authorities (WASAs). DPHE is responsible for planning, designing and implementing water supply and sanitation services in rural and urban areas except Dhaka and Chittagong. LGED is responsible for urban and rural infrastructure and small scale water resource infrastructure (<1,000 ha).
- *Department of Public Health Engineering (DPHE)* – Currently the most important government body dealing with water supply and sanitation, responsible for planning, designing, and implementing water supply and sanitation services in rural areas, and in urban areas outside Dhaka and Chittagong. Historically, DPHE has been directly involved in the construction of water supply and sanitation facilities, and to some extent in maintenance of urban WSS schemes. The department contracts private firms for construction, but DPHE engineers supervise and inspect the work. Recent policies imply that DPHE in future should play a different role by facilitating and monitoring projects undertaken by local government, autonomous utilities, non-governmental organizations, and the private sector. DPHE is organized at regional (Administrative Division), District and Upazila levels and has central planning, monitoring and logistic circles to support implementation of national projects. Recently DPHE established six regional zonal laboratories to monitor water quality, and one reference laboratory at Dhaka.
- *Local Government Engineering Department (LGED)* – is an attached department of LGD and is responsible for rural infrastructure development and management; small scale water resource development and management within net benefited area of 1,000 ha; urban infrastructure development; employment generation at the local level; and to provide technical and institutional support to strengthen the Local Government Institutions both in the rural and the urban areas. In addition, LGED is entrusted with planning and implementing physical infrastructure development projects/activities of other ministries and sectors. LGED is currently involved in the rehabilitation and improvement of urban water systems, drainage, and solid waste management through the following six projects: Urban Governance and Infrastructure Projects 1 and 2 (ADB supported), Secondary Towns Integrated Flood Rehabilitation Project 2 (ADB supported), Emergency Disaster Damage Rehabilitation Project (ADB supported), Municipal Services

Project (IDA supported), and Urban Partnership for Poverty Reduction Project (UNDP and DFID supported).

- *Water Supply and Sewerage Authorities (WASAs)* – Statutory responsibility for water supply and sanitation in Dhaka and Chittagong rests with their Water Supply and Sewerage Authorities (WASAs). Since 1990, Dhaka WASA also covers Narayanganj Town. Dhaka WASA plans, implements and operates water supply, subsurface drainage and water-borne sewerage services, whereas Chittagong WASA has so far limited its activities to piped water supply. The WASAs fall under the authority of the Water Supply Wing of the Local Government Division.
- *Ministry of Environment and Forests (MoEF)* – Sets policies for environmental protection and management and is responsible through DoE for enforcement of environmental rules and guidelines for all sectors.
- *Department of Environment (DoE)* – Within MoEF, is mandated to regulate and enforce environmental management including control of water pollution and to ensure that Environmental Impact Assessments are adequate.
- *Soil Resources Development Institute (SRDI)* – Responsible for monitoring water related soil erosion in 20 districts.
- *Bangladesh Haor and Wetland Development Board* – Responsible for monitoring, coordinating and integrating the haor area schemes of other agencies in the wetland areas.
- *River Research Institute* – Responsible for physical modeling activities related to river behavior.
- *Department of Forests* – Responsible for controlling forested watershed areas in Sylhet, Cox's Bazaar, Chittagong, Rangamati, Khagrachari and Bandarban Districts.
- *Barind Multipurpose Development Authority* – Develops ground-water sources for irrigation and improves traditional surface water storage by rehabilitating and constructing ponds and canals in the Barind Tract. These sources are also used on a limited scale for supplying drinking water to nearby settlements.
- *BARD, Comilla and RDA Bogra* – These two rural development academies are involved, in a limited way, in research and development for irrigation and domestic water supply in rural areas.

2. Selected National Agencies

88. Key national water agencies include WARPO, BWDB, LGED, and DPHE. The National Water Management Plan envisaged that:

- WARPO would provide leadership in all aspects of national water resource planning.
- BWDB would operate on a regional basis maintaining close interaction with Local Government Institutions and being responsive to local stakeholders.
- Local government would be strengthened and increasingly assume responsibility for managing the delivery of water services at the local level, for agriculture, water supply and sanitation, urban and peri-urban services, and cyclone protection shelters.

a. Water Resources Planning Organization

89. The WARPO Act (1992) created a new organization, specified financing arrangements, set out the management structure, and described the mandate. The management structure consists of a Board of Directors, an Executive Council, a Director General supported by two Directors, and a Technical Committee. The Act also deals with powers, responsibilities, and liabilities.

90. Several subsequent policies expanded on the role of WARPO. The National Water Policy (1991) assigned certain responsibilities to WARPO, and the Coastal Zone Policy (2005), added others. Resulting activities include: (i) clearing water sector projects, (ii) advising ECNWRC and NWRC, (iii) overseeing National Water Management Plan implementation, and (iv) promoting an Integrated Water Resource Management concept throughout the country.

91. These additions to the initial WARPO mandate were never formalized by changes to the WARPO Act, so that expectations of various stakeholders as to responsibilities, and authority of WARPO have become somewhat disappointed. WARPO has prepared an Organizational Development Plan to enhance the staffing profile, clarify roles, and demonstrate that they can fulfill additional responsibilities.

92. The role and mandate of WARPO in terms of the WARPO Act (1992) was reviewed (See Annex D: The Case for Revising the WARPO Act). A key recommendation from this review is that the Act be revised. A revised Act needs to consider:

- Broadening the mandate to accommodate the various tasks assigned to WARPO subsequent to the Act of 1992,
- Re-positioning WARPO within Government to more appropriately reflect the responsibilities of WARPO as the key national water planning agency.
- Incorporating lessons learned from the establishment and financing of CEGIS and IWM to provide for the needs of highly qualified technical specialists that WARPO needs to fulfill its mandate.
- Establishing a recruitment and promotion system based on merit, commitment, and accomplishments.

93. WARPO can still become the organization that was originally envisaged, providing strong direction and leadership to water resources planning. However, specific actions are first required. Revising the WARPO Act would be a first step: subsequent steps would be largely up to the organization's leadership.

94. A Twinning Mission task force that has been working with WARPO for the past several years has identified the following areas that need strengthening:

- Improving communications and information dissemination.
- Providing continuity of management and expertise.
- Strengthening cooperation and coordination with other Ministries, Departments, Agencies, Sectors and Donors.
- Recognizing that updating the National Water Management Plan every five years is the core business of WARPO.
- Obtaining approval of the Organizational Development Plan (ODP) is required for WARPO to function effectively across a range of responsibilities associated with its mandate.

95. WARPO is also receiving assistance through the World Bank supported Water Management Improvement Project, for:

- Core organization improvement and development activities to include consultancy for institutional support as well as local and international training.
- Maintenance, updating and dissemination of the National Water Resources Database.

b. BWDB

96. BWDB has responsibility for planning and executing medium and large-scale water resource projects, river dredging and training, flood forecasting, river surveys, monitoring the use of and exploring for ground water, and data collection. BWDB is a key service delivery agency and has been responsible for spending most of the nearly $3 billion that donors have invested in water management over the past three decades. However, BWDB has been increasingly criticized on the grounds that its organizational culture has been slow to adapt to changing priorities.

97. The original mandate of BWDB focused on providing infrastructure for flood control, drainage, and irrigation. Subsequently, the Bangladesh Water Development Board Act (2000) required it to be guided by the National Water Policy and the National Water Management Plan, requiring attention to integrated water resource management, conservation of the eco-system, more equitable access to water, local stakeholder participation, and sustainable O&M. Specifically the Act called for:

- The transfer of BWDB projects covering up to 1,000 ha to local authorities;
- The gradual transfer of the management of existing projects between 1,000 ha and 5,000 ha to beneficiary organizations;
- Management of schemes over 5,000 ha by a joint committee comprising beneficiaries, BWDB, and other water-related agencies.

98. There is also provision in the Act for BWDB to transfer ownership of existing projects of any size to other public agencies or local authorities and to contract out management of any project to a private agency where expedient.

99. In response to the revised mandate, BWDB institutional reforms have included: (i) a restructuring of the Board of Directors into a Governing Council that includes stakeholder representatives; (ii) increasing the authority of the Governing Council to provide increased autonomy to BWDB; (iii) staff reduction (from more than 18,000 in 1999 to less than 9,000 in 2008; (iv) longer tenure of top leadership; (v) merging the implementation wing with the O&M wing; (vi) re-formulating job descriptions and delegating administrative and financial powers; and (vii) strengthening the accounting system through the implementation of regional accounting centers.

100. While these reforms have contributed to some improvements in efficiency, challenges remain. These include the need to: (i) meaningfully involving stakeholders in management, operation, and maintenance, (ii) developing mechanisms to work with autonomous organizations and NGOs, and (iii) providing effective operation and maintenance of infrastructure for the benefit of local stakeholders.

101. There is a desire among BWDB staff to improve the agency's operational performance and reputation. This was apparent in the response to a recent workshop on management issues aimed at mid-level BWDB staff (See Attachment 1). In general, there is a perception that the BWDB Act (2000) is not adequately serving the needs of the organization, that there is no

long-term vision,[25] and that the management is too centralized, with too many steps in the decision-making process[26]. It is pertinent to these concerns that:

- About 13% of BWDB staff (1,300 or so) are headquarter based (this excludes the Dhaka field division also based in HQ). This high proportion of headquarter based staff almost certainly contributes to centralization of decision-making.
- The 8,600 BWDB staff administer a budget of about USD 150 million annually, or about USD 17,000 per staff member.[27]

102. There is some concern that down-sizing from about 18,000 persons to 8,600 has left the organization with insufficient staff to carry out its mandate. While this may or may not be the case, the revised mandate imposed by the BWDB Act should determine the type of skills that are recruited in the future.

103. Through the Water Management Improvement Project, BWDB is being provided with support to:

- prepare a BWDB reform plan,
- prepare a BWDB needs-based staffing plan, and finally to
- prepare a Human Resources Development (HRD) Plan.

104. On-going institutional support continues to be provided to BWDB through a twinning arrangement financed by the Government of the Netherlands. Among other things, the Twinning Missions have:

- Assisted in the preparation of a 5 year strategic plan.
- Established a Strategic Plan Implementation Unit (SPIU).
- Arranged management training for BWDB staff.
- Assisted in modifying the organization chart. In this process, BWDB is also considering recruiting additional officials and has been examining this from a need-based perspective.

c. Local Government Engineering Department (LGED)

105. Located within LGD, this Department is responsible for:

- Rural infrastructure development and management;
- Small scale water resource development and management within net benefited area of 1,000 ha;
- Urban infrastructure development;
- Employment generation at the local level; and
- Provide technical and institutional support to strengthen the Local Government Institutions both in the rural and the urban areas.

106. In addition, LGED is entrusted with planning and implementing physical infrastructure activities within other ministries and sectors. LGED is currently involved in the rehabilitation and

[25] This was also a conclusion of the ADB 2003 Bangladesh Water Sector Road Map.

[26] So for example, while the creation of the Regional Accounting Centers stream lined the accounting system, it also resulted in additional steps in the decision process.

[27] LGED, with 9,000 staff, annually spends USD 700 million or about USD 78,000 per staff. 4% of LGED staff are HQ based.

improvement of urban water systems, drainage, and solid waste management through six projects,

107. LGED has been involved in small scale water resources development for several decades. This involvement was initiated in the early 60s under the Thana Improvement Program (TIP) and the Rural Works Program (RWP) and subsequently through the national canal digging program (mid 70s) and then through a number of small-scale focused projects to improve water management within selected Upazila. This early experience helped LGED to recognize the need for a stakeholder responsive integrated approach to water management. Subsequently, with the support of ADB and the Second Small Scale Water Resource Development Sector Project, LGED undertook strategic restructuring to position the organization to accommodate a more integrated approach to water management.

108. LGED initiated IWRM activities with the establishment of an IWRM unit in early 2003 headed by a Superintending Engineer (now additional Chief Engineer). The Unit started with a small revenue-based staff supported by Project Consultants and over a three-year period, the Unit has been strengthened with the addition of staff at the District and Upazila levels of whom about 50% are non-engineers. At Headquarters, the IWRM Superintending Engineer is supported by three Executive Engineers and a multidisciplinary team comprising an Agriculturist, Sociologists, and Fishery Biologists. The Unit fulfills several important functions:

- Preparing District Water Resources Assessments (DWRAs). This work is contracted to local private sector consulting firms with a mandate that requires a defined level of stakeholder interaction and approval from an Inter-Agency Consultative Group headed by the DG, WARPO. The IWRM Unit within LGED manages the process, provides technical oversight and ensures quality control.
- Monitoring completed projects and ensuring that they are being operated and maintained in accordance with agreements signed between LGED and local stakeholders, and providing maintenance support. The monitoring framework includes monitoring the health of the Water Management Cooperative Associations as well as the operability of the infrastructure.
- Planning and design for new water resources projects. Under this arrangement, the actual construction of infrastructure and the first year operation and maintenance is the responsibility of the LGED Project Director but all activities on either side of construction are the responsibility of the IWRM Unit. This ensures a standard process and protocols are followed for service delivery.
- Providing support to Water management Cooperative Association members through a Livelihood Improvement Trust Fund that has been established by LGED.

109. While this expansion is a positive development, the role of the Unit is generally confined to water management for agriculture and given that LGED is also involved in rural water supply and sanitation projects, it would seem appropriate for the Integrated Water management Unit to have a role with these aspects of water management as well.

3. Institutions for Water Supply and Sanitation

a. National Level

110. At the national level, the Local Government Division (LGD) of the Ministry of Local Government, Rural Development and Cooperatives (LGRD&C) has overall responsibility for water supply and sanitation. The Department of Public Health Engineering (DPHE) and the

Water and Sewerage Authorities (WASAs) are under the administrative control of LGD. DPHE is responsible for implementing water supply and sanitation projects in the public sector in rural and urban areas not covered by the WASAs. In addition to DPHE, the Local Government Engineering Department (LGED), also under LGD, implements water and drainage projects in urban areas as part of urban infrastructure development projects.

111. The LGD has instituted a Policy Implementation and Arsenic Section to oversee the implementation of the 1998 policy and to guide work on arsenic mitigation; also a Forum for Sector Coordination and Policy Implementation with representation from relevant ministries, government agencies, donors, non-government organizations (NGOs) and the private sector.

112. LGD recently established two separate funds that directly finance the local government institutions. The Bangladesh Municipal Development Fund provides Pourashavas with funding for infrastructure development (including WSS). The Union Parishad Development Fund allocates development funds directly to the Union Parishads.

b. Urban Areas

113. In urban areas, DPHE was originally responsible for water and sanitation services, but gradually the Pourashavas and the City Corporations are becoming more involved in planning, implementing, and managing the water systems. WASAs were established in 1963 in the cities of Dhaka and Chittagong with the responsibility for water supply, sewerage and drainage. Since 1990, Dhaka WASA also covers Narayanganj Town.

114. These vary in their institutional capacities and responsibilities. Dhaka WASA is responsible for water supply, subsurface drainage and sewerage, whereas Chittagong WASA deals only with water supply. Dhaka City Corporation is responsible for solid waste management and on-site sanitation, whereas Chittagong City Corporation is responsible for drainage as well. Rajshahi, Khulna, Sylhet and Barisal CCs are responsible for drainage, solid waste management and maintenance of water supply facilities installed by DPHE or LGED. The municipalities are responsible for solid waste management and maintaining a sanitary environment within their boundaries. Provision, operation and maintenance of water supply are statutory responsibilities of municipalities, but these have limited technical competence and rely on DPHE (or LGED) for design and construction.

115. Despite their assigned responsibilities the WASAs and the municipalities lack sufficient autonomy to take important decisions on planning, implementation, tariff, staffing and other aspects of water supply and sanitation service. Tariffs have to be approved by central government and do not reflect the cost of water production. The government has introduced some reforms to improve situation in Dhaka WASA: these involve reconstituting the Board with members drawn from both the public and private sectors, redefining the Board's role on policy matters relating to corporate planning, tariff setting, appointment of staff and remuneration, and making management accountable for meeting operational and financial targets. Notwithstanding these changes, the central government still maintains a firm grip on the affairs of DWASA.

c. Rural Areas

116. DPHE is the dominant agency for water and sanitation in rural areas. The Union Parishads are beginning to play an important role in hygiene education and community mobilization as well as in the formation of Union Water and Sanitation Committees. There is a trend of allocating a minimum number of female representatives in the various parishads and other committees. This is meant to strengthen women's involvement in the sector, but the social

status of women and the fact that sector agencies are almost exclusively a male preserve are likely to inhibit their involvement.

117. Provision of rural water services is channeled through the Union Water Supply and Sanitation Committee. New tube wells are allocated according to a set of selection criteria. DPHE contractors install the tube wells. Communities participate in site selection and make cash contributions depending on the type of water point installed. Operation and maintenance of water points are the responsibility of the users: caretakers undertake minor repairs but major repairs are done by DPHE or private-sector mechanics. The government's service delivery mechanism has been successful in achieving physical targets, but sustainability is jeopardized by the highly subsidized service provision and the continued public involvement in local level service planning and implementation.

4. Analysis of WSS Institutions

a. Department of Public Health Engineering

118. The institutional arrangement of WSS services is highly centralized, being mostly dependent on annual development plans and available resources. The sector is mostly supply driven and does not respond well to user needs. Government Agencies within the Ministries have many overlapping functions with little coordination. Lack of ownership by the end users tends to hinder sustainable operation of the systems.

119. Nevertheless, in rural areas DPHE with assistance from UNICEF has successfully transferred to users the responsibility for operation and maintenance of about 10 million hand pumps. Also, rural sanitation service, delivered in partnership with the union parishads, has gradually improved, and community participation has proven effective in moving towards the target of universal sanitation coverage by 2015.

120. DPHE has been unable to recruit professional staff at the entry level, and has operated with temporary staff. The lack of a sense of ownership and of incentives for career advancement result in a frustrating situation in the organization. DPHE finds it difficult to make policy shifts towards empowerment of local governments, decentralization, and demand-driven planning. While it is not necessary for DPHE to be equally adept at all disciplines, it is essential to include a mix of skills besides engineering and to create appropriate partnerships for planning, implementation and management.

b. City Corporations

121. Most City Corporations do not have the capacity to deal with technical aspects of planning, designing and inspecting water supply and waste water infrastructure. Resource allocation is highly politicized and ad hoc, with inadequate consideration of long term planning, institutional development, environmental issues, feasibility analysis, cost sharing and improved service delivery. The absence of master plans for WSS in urban centers is leading to serious environmental degradation and health risks.

c. Water and Sewerage Authorities

122. Dhaka WASA is facing a serious water shortage. Over-exploitation of groundwater has reached critical levels and is causing serious environmental problems. Surface water in rivers is heavily polluted from industrial and domestic wastes. However, several projects to increase water supplies are being studied.

123. Since 2000, DWASA has made advances in revenue management and loss reduction. Nonetheless, further institutional reform and capacity building is necessary to improve decision-making, technical management, transparency and accountability. Annual floods pose an additional burden on DWASA. There is a need to work with stakeholders to prevent unauthorized land grabbing, closure of natural channels and retention basins, and improper solid waste disposal. Flood control measures with assistance from BWDB may provide scope for an IWRM initiative, which demands mutually agreed action plans. The World Bank is formulating a project for pollution abatement and environmental improvement in Dhaka.

124. Chittagong WASA has institutional problems in addressing landslides that destroy natural drainage channels in the city's hills. About 35% of total water supply remains unaccounted for and this needs to be reduced through better management and tariff collection.

d. Local Government Institutions in Municipal Towns

125. Water supply in municipal towns depends mostly on groundwater. Intermittent piped water supply is available but water pressure is generally low, so that consumers have to pump water into overhead tanks. Service coverage through house connection and street taps is estimated at around 65% of the total requirement. Only 100 of the 309 municipal towns have piped water supply, which in smaller towns is limited to the core areas while people in outlying areas depend on hand tube wells. Institutional capacity needs to be improved through reforms in technical services and tariffs.

D. Conclusion

126. As is typical in most countries, Bangladesh has a range of institution involved in water resources management. Presently some of the key organizations are experiencing both institutional and structural change, reflecting a national desire for greater efficiency and improved performance. It is also clear that there is considerable support being provided to the key agencies to support the reform processes that they are undergoing. Apart from the on-going support that is being provided to the change processes, an area that has been identified that requires follow-on actions is the revision of the WARPO Act (1992).

V. MANAGEMENT INSTRUMENTS

A. Strategies

1. National Water Management Plan (2004)

127. The National Water Management Plan (NWMP) was intended to translate the National Water Policy into an operational strategy. The Plan, which has a 25 year planning horizon, presented 84 programs grouped into 8 clusters with an indicated cost of $18 billion. The Plan placed a high priority on developing institutions, creating an enabling environment, rationalizing existing flood control, drainage, and irrigation schemes, and safeguarding the natural environment and aquatic resources. It also assigned priority to provision of water supplies and sanitation (including arsenic mitigation) but assumed that investment would be sufficient to allow the back-log to be eliminated by 2010. The Plan suggested that maintaining Government funding at current proportions of GDP would be sufficient to finance any of the short term (through 2005) Plan scenarios. However, to maintain targets through the medium term (2010), Government would need to more than double its contribution as a proportion of GDP, or identify alternative sources of funding.

128. WARPO is responsible for monitoring progress and updating programs of the NWMP through its Monitoring and Evaluation Section. As originally envisaged, this Section was to consist of one Principal Scientific Officer, one Senior Scientific Officer and two Section Officers. While even this level of staffing is insufficient for monitoring the required range of activities, the Section currently consists of only one recently assigned Principal Scientific Officer without any technical support. Before this, the Section was essentially dormant.

129. WARPO recognizes that the state of progress on the NWMP provides a basis for its updating. Accordingly, WARPO requested 11 water-related Government agencies for the status of work carried out in relation to the NWMP. Only BWDB and LGED responded. Many of the other agencies have their own sector development plans and monitor their work against them. WARPO has not very actively pursued this information and has little power to demand information. In reviewing the NWMP in 2003, ADB noted that “Once [the plan] is launched, its implementation needs to be continually monitored, and its contents regularly enriched and expanded on the basis of relevant sector operations”. This has not happened. A generalized and subjective review of the progress related to individual clusters is provided in Volume II Annex E: Towards an updated NWMP.

130. Recognizing the need to update the NWMP, WARPO has prepared a Preliminary Development Project Proforma / Proposal (PDPP) entitled National Water Management Plan II (see Volume II, Annex E, attachment 1). This document provides background to the planning process, defines the scope of work, and provides a cost estimate. The suggested schedule for this work is a July 2009 start with completion in 2012.

131. Several important issues need to be resolved:

- **Financing**. The PDPP does not identify a source of financing for this update. Setting financing in place requires time and so the intended start date is likely unrealistic.
- **WARPO Institutional Capacity**. While updating of the NWMP would provide some institutional strengthening, the budget estimate does not include the cost of strengthening the still understaffed WARPO. Some support is being provided to

WARPO through the Water Management Improvement Project, but a sustained increase in financial allocations is required for it to fulfill its mandate.

- **Monitoring.** There has been little if any effective monitoring of the implementation of the 2004 NWMP, because the required resources were not mobilized within WARPO. To ensure that key factors and constraints affecting implementation are understood, the updated Plan will need to have an evaluation phase.

132. While the PDPP is in the approval process, it is necessary to identify a source of financing and prepare terms of reference for international and local consultants who would helpt WARPO with the updating. Ideally, at some point the Executive Committee of the National Water Resource Council would review and approve the process. This is important because updating of the NWMP will have to be integrated across all water-using sectors.

2. National Strategy for Accelerated Poverty Reduction 2[28]

133. The first National Poverty Reduction Strategy Paper (2005) covered the period up to 2007. A second Paper (NSAPR 2) became effective in 2008. In general, its approach is similar, but it takes account of the following changed conditions :

- The increasing vulnerability of Bangladesh to natural disasters.
- The insufficient domestic production of food.
- The impact of the anti-corruption drive.
- The effects of alternative fuel production on international food prices and availability.
- The impact on the exporting sectors in Bangladesh of slower than expected growth in developing countries.

134. NSAPR 2's road-map for pro-poor economic growth contains five strategic blocks: (i) macroeconomic environment, (ii) critical areas of focus, (iii) essential infrastructure, (iv) social protection for the vulnerable, and (v) human development. These blocks have five supporting strategies: (i) ensuring participation, (ii) social inclusion and empowerment, (iii) promoting good governance, (iv) ensuring efficient service delivery, environment and tackling climate change for sustainable development, and (v) enhancing productivity and efficiency through technology.

135. Of the above-listed strategic blocks, the two most relevant to the NWMP are: (i) critical areas of focus, including water resources development and management; and (ii) human development including water supply and sanitation. The second is consistent with the approach of the first NSAPR and needs to be reflected in the updated NWMP.

136. Under the updated NWMP, water resource development and management could include the following activities:

- Expanding multi-purpose use of the main rivers through developments that include navigation and hydropower.
- Rehabilitating and maintaining flood protection and storm water drainage systems in a participatory manner.

[28] [28] Government of Bangladesh, Planning Commission, General Economics Division, Moving Ahead: National Strategy for Accelerated Poverty Reduction 2, 2008

- Managing the impact of disasters, including early warning and forecasting, cyclone protection, flood-proofing, managing river erosion and drought, reducing use of arsenic-contaminated groundwater, and adapting to climate change.
- Managing agricultural use of water through irrigation and improved flood protection and drainage.
- Protecting the natural environment and aquatic habitat by raising stakeholder awareness, reducing pollution, and providing for fishery needs.
- Strengthening institutions.

137. The strategy for water resource development - except for water supply and sanitation - presented in NSAPR 2 is somewhat open-ended. Given that the NSAPR's are being revised every three years or so, there seems to be a need for more careful focusing on achievable targets within that planning period.[29] An updated NWMP could provide strong direction to accelerated action on poverty reduction.

3. Coastal Development Strategy (2006)

138. The Coastal Development Strategy (2006) is designed to translate the Coastal Zone Policy (2005) into concrete actions also reflected in the National Strategy for Accelerated Poverty Reduction (2005), to initiate consultation with local stakeholders, and to take account of increasing urbanization, changing land use, declining land and water resources, unemployment and climate change. The planning period was 2005-10.

139. The Strategy has 9 priorities:

- **Safeguard availability of fresh water**. Main aims are to improve (i) drainage in Khulna region, (ii) water management for rural development in Noakhali region, (iii) groundwater management, (iv) sanitation and safe water supply in areas affected by arsenic and salinity, and (v) management of polders to serve a broader range of stakeholders.
- **Improve safety from hazards**. Main aims are to (i) strengthen, and maintain sea dykes, (ii) manage them in an integrated manner, and (iii) construct multi-purpose cyclone shelters.
- **Optimize coastal land use**. Main aims are to (i) establish a sustainable process for settling and developing accreting land, (ii) zone coastal lands, (iii) extend coastal agriculture, and (iv) develop coastal afforestation.
- **Promote economic growth – particular non-farm employment.** The aim is to develop small and medium enterprises based on coastal trade and tourism.
- **Manage natural resources.** Main aims are to (i) promote more environmentally and socially responsible methods of shrimp farming, (ii) develop alternative energy sources such as solar, wind, and tidal, (iii) improve marine and coastal fisheries, and (iv) develop social forestry.
- **Environmental conservation.** The aim is to defend against sea level rise by completing and maintaining sea dykes, improving security by strengthening the coast guard, and promoting forestry to protect the dykes.
- **Improve livelihoods.** Main aims are to: (i) focus on people living on chars and islands, (ii) support integrated development on the more remote islands, (iii) improve skills of women processing, and (iv) support victims of land erosion.

[29] It is understood that a third NSAPR will be prepared in 2009.

- **Empower through knowledge.** This ains to provide local stakeholders with better information through training and regional studies.
- **Improve the institutional environment.** The aims are to (i) establish a national program coordination unit, (ii) coordinate implementation through the district, (iii) support coastal management initiatives of NGOs, LGIs and the media, and (iv) train women members of the Union Parishad and pourishavas.

140. The Coastal Development Strategy is an important extension of the National Water Management Plan because it focuses on a critical region and is a stated agenda of the National Strategy for Accelerated Poverty Reduction. However, more resources are required to accelerate implementation of this strategy.

4. Pro-Poor Strategy for Water and Sanitation Sector (2005a)

141. This strategy elaborates on the promise in the National Policy for Safe Water Supply and Sanitation to provide a "safety-net for the hard-core poor," by describing tentative programs for allocating water and latrines to hard-core poor households. These households would still have to contribute 5% of the capital cost of water supplies or Tk.500 per household, whichever is less, and would pay only 50% of operation and maintenance costs as compared to 100% for other households. However, the strategy is only to be implemented on a pilot basis in a few areas first (UPI 2005a, p.2-6). It has not been approved at Cabinet level.

5. National Sanitation Strategy

142. This strategy supplements the National Policy for Safe Water Supply and Sanitation by setting a target of 100% coverage by 2010, and providing for emergency response. The emergency response clauses state that: (i) designated flood shelters must have adequate sanitation facilities, (ii) special programs to promote hygiene must be undertaken during emergencies, (iii) sanitation facilities must be built above flood levels, and (iv) facilities for emergency situations, such as trench latrines and mobile toilets, must be made available.

6. Bangladesh Climate Change Strategy and Action Plan (2008)

143. The Climate Change Strategy and Action Plan was developed by Government in consultation with civil society, including NGOs, research organizations, and the private sector. It is intended that the strategy and plan be reviewed and revised periodically as experience and lessons are gained. The Action Plan is:

- **Food security, social protection, and health**. Emphasizes the need to ensure that the poorest and most vulnerable communities are protected from the impacts of climate change and that programs focus on the needs of these groups.
- **Comprehensive Disaster Management**. Aims to strengthen the countries already proven disaster management systems.
- **Infrastructure**. Focuses on the maintenance of existing coastal and riverine assets and additional urgently needed infrastructure such as cyclone shelters and urban drainage.
- **Research and knowledge management**. Seeks to predict the likely scale and timing of climate change impacts on different sectors of the economy and socio-economic groups; to underpin future investments; and to ensure Bangladesh is networked to the latest global thinking on climate change.

- **Mitigation and low carbon development**. Plans to evolve low carbon options and implement these as the economy grows over the coming decades.
- **Capacity building and institutional strengthening**. Endeavors to enhance the capacity of government, civil society, and the private sector to meet the challenges of climate change.

144. An initial set of 37 programs has been defined that enable the action plan and as noted above, these initiatives will evolve as experience is gained with their implementation.

B. Information Systems

1. Data Management Systems[30]

a. Background

145. Water resources assessment requires systematic collection, assembly and reporting of hydrological, physiographic, demographic and socio-economic data. Physical measurements at measurement stations need to be taken with designated frequency and accuracy. The existing network of stations for rainfall, evaporation, discharge, sediment transport and water quality meets the standards of the World Meteorological Organization (WMO 1974).

146. The National Water Policy (NWPo) of January 1999 required Water Resources Planning Organization (WARPO) to establish and maintain a National Water Resources Database (NWRD) by assembling information from various authorized data collecting agencies (DCAs). Generally, quality control is the responsibility of each data collecting agency, which has its own equipment and staff provided from its own budget, often supplemented by project funds. The National Water Resources Database team has prepared a draft document "Spatial Data Quality Standards and Evaluation Principle and Guideline for National Water Resources Database Data Quality Management", designed to promote rigorous quality control by the DCAs.

147. The National Water Management Plan (NWMP) approved in 2004 was supposed to be updated every five years to suit the National Poverty Reduction Strategy Paper (NPRSP) and the Millennium Development Goals (MDGs) and to include issues not previously covered. To ensure implementation of NWMP programs under the NWMP, it is important to continue and not cut back on data collection.

b. Data Collection and Storage

148. The resources of the various DCAs are often inadequate to collect, process, and publish data in a timely manner. BWDB closed some water-level stations as well as ground water observation wells when gauge readers retired. Also, many non-departmental gauge readers under BWDB are no longer interested to work under the old remuneration package. However. the Bangladesh Bureau of Statistics (BBS) data collection system receives adequate support from the government, as it is important to national strategic planning. Hydro-meteorological data also plays a key role in the planning and design of development projects and further support to these data collection systems would be justified. There is an opportunity to outsource the collection and storage of hydrometric data to agencies that include IWM and CEGIS as well as to other private sector firms but there is clearly a need to ensure that hydrometric data collection continues.

[30] For more detail see Volume II Annex B: Review of Data Management Systems

149. Most water sector projects have their own form of data collection, processing, and presentation. There is no formal requirement that the reports or data be forwarded to a central archive. As a result, some valuable research information may be lost or unavailable to other users. WARPO should work with the DCAs and formulate a set of steps to improve data collection, storage and access.

150. New technologies for gathering information should be adopted as soon as practicable, as they often involve less effort, greater safety, and improved accuracy. Remote sensors can collect, store and / or transmit data without human error. Calibrated hydrodynamic models allow interpolation of water levels and flows within a sparse observation network.

151. NWMP noted that various DCAs overlap in the data they collect. BWDB and BMD collect meteorological data, BWDB, BIWTA, IWM and CEGIS collect water level and morphological data. BWDB, DPHE and BARC all collect groundwater data. This situation has changed little over the past decade, resulting in duplication of some work, gaps between data collected and user needs, inconsistent data formats, and needless expenditures. It appears desirable to shift attention from project-based data collection to support of the National Water Resources Database by all DCAs.

c. Quality Control

152. At present, there are no national standards for water resources data quality. Problems of quality control affect even the most basic data and the entire data collection system. To be effective, quality control must be conducted by the data collection agency, which needs adequate and trained staff for this purpose. Other measures to support quality control include:

- Centralizing quality control – then incoming data can be assessed against a broader set of criteria at less cost.
- Obtaining feedback from users.

153. The NWRD team has prepared a draft “Spatial Data Quality Standards and Evaluation Principles and Guidelines for NWRD Data Qualify management”, designed to promote a rigorous standard of quality control. This draft document needs to be accepted and used by all DCAs.

154. In preparing the 2001 NWMP, data from the period 1966-95 were checked for completeness and consistency. Subsequent data need to be checked in connection with updating the National Water Management Plan. The Government should finance this.

d. Data Storage and Archiving

155. Large quantities of stored data are currently spread over many organizations, which often lack adequate backup and archiving policies corresponding to evolving computer technologies. This problem results partly from insufficient financing, which reflects the relatively low priority placed on raw data.

156. It is recommended that any agency involved in primary data collection and storage adopt a robust policy for backing-up and archiving, as a precondition to financing data collection.

e. Dissemination of Information

157. As noted in the National Water Management Plan, it is necessary that legislation be in place to allow open supply and exchange of data, particularly to the NWRD and from there to

the public. While a related issue is cost recovery, the NWMP concluded that for a number of reasons, financing of data collection should remain within the public sector.

2. Conflict Resolution

158. Conflict management is central to successful IWRM. Areas of potential conflict include: interdependence of people, functional overlap, competition for scarce resources, and so on. Conflict resolution is an ongoing process in the context of water resources development and management in Bangladesh due to its strategic location as the lower riparian country of the major rivers. Conflict occurs at the international, national, regional and local levels. The National Water Management Plan envisages a sector that is regulated under law with new independent regulatory bodies formed to ensure conflict management.

159. At present, limited arrangements for negotiating water-related disagreements are as follows:

- The Joint Rivers Commission works to negotiate agreements and settle disputes on international rivers that Bangladesh shares with India.
- Inter-agency resolution of local conflicts takes place through District Level Inter-Agency Project Evaluation Committee (DLIAPEC) meetings, where staff from all relevant line agencies are invited to participate.
- In some cases, water users organizations established to manage investments have resolved local disputes.

160. A draft National Water Act defines the rights and obligations of water users and provides a legal framework for dispute settlement.[31] It also tasks Water User Associations with arbitrating local disputes within their jurisdiction.

C. Allocation Instruments

1. Regulatory Instruments

161. The draft Bangladesh National Water Act establishes water rights and regulatory instruments and in that context addresses:

- Rights to ownership, appropriation, and water use
- Existing lawful use of water
- General authorization and licensing for water use
- Control over water
- Conservation and protection, and
- Access to and rights over land.

162. The draft Act establishes a comprehensive system of water regulation along with necessary institutional mechanisms to ensure implementation of the provisions of the draft Act. The draft needs to be enacted into legislation.

[31] See Volume II, Annex F: Draft Bangladesh Water Act.

2. Regulatory and Economic Instruments for Pollution Control

163. A combination of user/emission charges and investment subsidies would be appropriate. Steps in introducing a system could be as follows:

- Promote effective implementation of existing DoE pollution control standards and regulations in combination with (i) an awareness rising campaign to sensitize both the industries and civil societies, and (ii) the provision of subsidies and other measures for pollution control,
- Introduce permit fees during this stage to recover costs including GoB administrative and other pollution control costs,
- Introduce a pollution levy (emission charges) or user charge system, so that polluters are charged according to the economic cost of the pollution they generate. The revenues collected would be recycled in the form of subsidies and other financial incentives for improved pollution control.

164. In parallel with the above stages, GoB could assist the industries to identify opportunities for re-use and recycling of usable polluting substances and for modification of industrial processes to reduce pollution levels and production costs.

165. As noted above, the draft National Water Act establishes the legal basis for water rights and regulation that contribute to regulatory and economic aspects of pollution management.

3. Cost Recovery and Cost Sharing

166. The draft National Water Act, in relation to financial aspects of water management, states that:

- Government will establish pricing policies for:
  - funding water resource management
  - water delivery at actual cost
- The pricing policy may differentiate between geographic areas and categories of water use.
- The pricing policy may provide different rates for waste discharge.
- Proposed pricing policies will be published in the Gazette inviting written comments and the comments will be considered before prices are finalized and published.

167. Where water use is for agriculture, the draft Act assigns responsibility for levying and collecting water use charges to the concerned water management institution and specifies that O&M charges are to be retained locally for provision of services within the project area. It also states that water use charges are charges on land and thus the land owner is liable for the charge.

168. The provisions of the draft Act notwithstanding, cost recovery is widely recognized as central to the problem of medium and large-scale irrigation schemes. It reflects the poor quality of irrigation services, procedural complexities, and weak enforcement mechanisms. A related issue is that Government financial allocations for operation and maintenance (required to make up the difference between revenue collected from beneficiaries and actual O&M costs) are far from sufficient to maintain the systems. Finally, the National Water Policy does not envisage

cost recovery for flood or coastal protection and this exception is reinforced in the draft Water Act. Given this position, it is incumbent on Government to provide sufficient financial resources for maintenance of flood protection infrastructure.

VI. IWRM ROAD MAP

A. Preamble

1. IWRM Process In Bangladesh – To Date

169. Bangladesh began the process towards IWRM early. The National Water Resources Council with its Executive Committee, in existence for more than a decade, represents all key water-related ministries and agencies and should provide an appropriate institutional framework to ensure that decisions affecting water resources cut across sectoral lines and to the extent practicable, reflect the interests of all stakeholders. The NWRC is in turn supported by WARPO as the multi-disciplinary national planning organization.

170. The National Water Policy, which is cross-sectoral and encourages participatory, demand-driven, and sustainable development of water resources, was formulated in 1999. One outcome of the Policy was the preparation of the 2004 National Water Management Plan, which addresses the entire spectrum of water management issues. The National Strategies for Accelerated Poverty Reduction incorporate water-related strategies where relevant The Coastal Zone Policy and subsequent Coastal Development Strategy, while focusing on a specific geographical area, address water needs in coastal areas from a multi-stakeholder, multi-disciplinary perspective. Similarly, in the Ganges Dependent Area work has been undertaken to address stakeholder needs across international boundaries and to plan integrated management of the entire Ganges watershed.

171. The responsibility for negotiating agreements on trans-boundary rivers rests with the Joint Rivers Commission, which promotes the interests of all stakeholders. IWRM-related communication and training within Bangladesh has been strongly supported by the Bangladesh Water Partnership, which also promotes regional cooperation on shared river basins.

172. The Bangladesh Water partnership has been active in advancing IWRM through a range of activities that have included: organizing broad-based stakeholder consultation on a range of national water issues, examining opportunities and constraints to promoting IWRM within the country, and was instrumental in formulating the Bangladesh Water Vision 2025 along with a Framework for Action and Programmes for Action[32]. In part because of the work of the Bangladesh Water Partnership, the Global Water Partnership ranked Bangladesh as first in the implementation of IWRM.

173. In summary, good progress has been made at the policy and planning level towards Integrated Water Resources Management in Bangladesh. However, much remains to be done to translate policies and plans into reality on the ground through the institutions responsible for service delivery. Nevertheless, IWRM has to advance in incremental steps and the Bangladesh water-related sector is clearly moving in the right direction.

[32] The overall vision for Bangladesh towards 2025 as stated in the Bangladesh Water Vision 2025 is “A nation which is democratic, economically self-reliant, driven by coherent, secure, just, and equitable principles, and consists of citizens whose capabilities and potential are developed to a high degree. The vision postulates a high level of progress in the management of the country’s water resources for uplifting the national economy and the living conditions of all its people on an equitable basis and maintaining ecological and environmental harmony”.

2. Constraints to Further Development of IWRM

174. Constraints to further advancing IWRM in Bangladesh include:

- Stakeholders' lack of information about the water situation and possibilities for change. More effort needs to be made at educating stakeholders leading to more informed dialogue.
- Compartmentalized administrative departments with insufficient dialogue and coordination between sectors and users. The National Water Resources Council, which should address this problem, has not been very active.
- Insufficient capacity at various levels tto address IWRM issues in ministries, planning agencies, service delivery agencies, and local government institutions.
- Separation of responsibility for surface water quality (DoE) and quantity (BWDB, LGED, DWASA).
- General administrative reluctance to provide stakeholders, including local government institutions, with management autonomy and financial control over larger water management systems
- The overly centralized and supply driven nature of public agencies, which tend to emphasize new construction rather improvement of services, leading to inequitable service distribution with the poor suffering most.

175. These constraints are not insurmountable and some, progress is being made. The following road map proposes measures to further advance IWRM.

3. Road Map Purpose

176. The purpose of the IWRM road map is to propose a set of measures designed to strengthen IWRM that can realistically be implemented over the next several years (by mid-2012). A summary of the road map is presented as Table 3.

B. The Road Map

1. Measures to address the enabling environment.

a. Update National Policy for Safe Water Supply and Sanitation

177. The Policy for Safe Water Supply and Sanitation, having been prepared in 1988, is not properly linked with later policies, so does not view water supply and sanitation as part of the larger water resources sector. Various elements have not been implemented, and some are no longer relevant because of changes in background conditions. The following specific actions and deadlines are proposed:

- Establish consultation process – Dec 2009
- Prepare draft policy – Dec 2010
- Approve policy – Jun 2011

b. Review and finalize National Wetlands Policy

178. A draft of the National Wetlands Policy was prepared in 1988 but has not been approved. Changes to the physical and policy environment indicate that this policy should be reviewed, finalized, and approved. The following specific actions and deadlines are proposed:

- Establish consultation process – Dec 2009
- Prepare draft policy – Dec 2010
- Approve policy – Jun 2011

c. Promulgate National Water Act to enable National Water Policy

179. A draft National Water Act, prepared after extensive public consultation, addresses a broad range of water sector issues including regulatory instruments, conflict resolution, cost recovery and cost sharing. Nevertheless, there is a need for some additional consultation with special interest groups such as the Chittagong Hill Tracts Regional Council. Following this, the draft will be readied for submission to Parliament. The following specific actions and deadlines are proposed:

- WARPO submits draft to Ministry – Sep 2009
- Ministry submits to Parliament – Dec 2009
- Parliament passes the Act into law.

d. Draft a National Water Code

180. Assembly of a code covering the complete system of law within the water sector would help to ensure consistency and synergy in their application. No work has yet been initiated to this end. The following specific actions and deadlines are proposed:

- WARPO prepares Terms of Reference – Sep 2009
- Legal team engaged – Mar 2010
- Draft code complete – Jun 2011

e. Legislation to facilitate access to data

181. The National Water Management Plan recommended legislation to allow open exchange of data between organizations, particularly to the National Water Resources Database and from there to the public. Although the Water Management Improvement Project is providing support to strengthen the NWRD and this is expected to continue, legislation is required to ensure that NWRD objectives are fulfilled. The following specific actions and deadlines are proposed:

- WARPO prepares Terms of Reference – Dec 2009
- Legal specialist engaged – Mar 2010
- Draft prepared for NWRC approval including limited consultation – Oct 2010
- Draft final for submission to Parliament – Dec 2010

2. Institutional framework

182. Presently, a significant amount of support is going into reforming and strengthening key water sector institutions involved with planning and delivering services. Much of this support is

project or program based, but nevertheless, is on-going. Consequently, only one new strategic action is proposed here.

a. Review and revise the WARPO Act (1992)

183. Since the WARPO Act was passed in 1992, a number of policies including the National Water Policy and the Coastal Zone Policy have expanded the role of WARPO. Because these policy additions were never formalized, expectations of various stakeholders as to responsibilities and authority have not been met. The Act should be revised to (i) formalize the expanded role assigned to WARPO by later policies, (ii) to re-position WARPO within the Government structure to more appropriately reflect its national planning responsibilities if this is the conclusion of the review process, (iii) take account of lessons learned from establishing other highly technical organizations (CEGIS and IWM), and (iv) strengthen Human Resources Development aspects of the organization. Proposed specific actions and timelines are:

- WARPO drafts Terms of Reference – Sep 2009
- Assemble a high-level (Government and private sector) team – Dec 2009
- Team provides recommendations and a draft revised Act to the National Water Resource Council – Jun 2010
- Final draft Act submitted to Parliament – Oct 2010

3. Management Instruments – Planning

a. Update NWMP

184. The National Water Management Plan, approved in 2004, was supposed to be updated every five years. For this purpose WARPO has prepared a Preliminary Development Project Proforma / proposal. The proposed specific actions and timelines are:

- Identify a source of financial support – Oct 2009
- Prepare background documentation including terms of reference – Mar 2010
- Ensure WARPO has appropriate staffing levels and engage supporting consultants – Jul 2010
- Complete final draft of updated NWMP including consultation – Jun 2012
- Obtain Government approval – Dec 2012

4. Management Instruments – Data

a. Outsource collection and preliminary processing of hydrometric data

185. As explained on page 40, the equipment, trained manpower and financial resources of data collecting agencies are often inadequate to collect, process, and publish hydrometric data in a timely manner. To correct this situation, it is envisaged that agencies such as IWM and CEGIS together with private firms could be engaged. Proposed specific actions and timing are:

- Prepare a scope of work for outsourcing of selected data collection – Sep 2009
- Engage a pre-qualified entity to undertake this work on a pilot basis – Dec 2009
- Expand the outsourced program progressively – through Dec 2011

b. Rationalize data collection activities

186. Documented overlaps in data collection result in duplication, gaps, inconsistent formats, and unnecessary expenditures. It is desirable to move towards systematic and coherent collection practices that would feed directly into the National Water Resources Database. Proposed specific actions and timing are:

- Establish a working group led by WARPO with representation from data collection agencies – Oct 2009
- Conduct workshops with stakeholders and draft recommendations – Mar 2010
- Submit to National Water Resources Council for approval, and finalize – Dec 2010
- Implement recommendations

c. Implement NWRD Data Quality Guidelines

187. Guidelines entitled "Spatial Data Quality Standards and Evaluation Principles and Guidelines" have been prepared towards development of the National Water Resources Database. Implementing these guidelines would improve data reliability - this involves obtaining agreement and then providing data collection agencies with appropriate training. It is proposed that the training could be completed by Dec 2009.

d. Backup and archiving of data

188. Large quantities of stored data are spread over many different organizations, which often have inadequate or outdated backup and archiving systems. Proposed specific actions and timing are:

- WARPO working with the NWRD Team prepare a draft policy for data backup and archiving including estimated costs – Dec 2009
- Draft policy incorporated into the operations of the various data collection agencies with WARPO monitoring – Jun 2010

Table 3: IWRM Road Map

Key Issues and Actions	Actions by	Timeframe	Performance Indicators
A. Enabling Environment			
1. Policies			
a. Update National Policy for Safe Water Supply and Sanitation	Ministry of Local Government	Jun 2011	Establish consultation process Dec 2009, Draft Policy by Dec 2010, Approve policy by Jun 2011
b. Revisit and Finalize the National Wetlands Policy	Ministry of Environment & Forests	Jun 2011	Consultation Process established Dec 2009. Draft policy completed by Dec 2010; Approved policy by June 2011
2. Legislative Framework			
a. Promulgate the National Water Act to enable the National Water Policy	MoWR / Parliament	Dec 2010	WARPO submits draft by June 2009; MoWR to Parliament by Dec 2009.
b. Draft a National Water Code	WARPO	Jun 2011	Prepare TORs by Sep 2009; Engage a legal team by Mar 2010; Complete for submission to Parliament by Jun 2011
c. Develop legislation to ensure access to data	WARPO / NWRC	Jun 2010	WARPO prepares terms of reference. Legal specialist engaged. Draft (including consultation) prepared for NWRC approves. Final draft for submission to Parliament
B. Institutional Framework			
WARPO			
a. Review and revise WARPO Act (1992) and recommend changes to MoWR	WARPO / ECNWRC	Oct 2010	Terms of Reference, Name high-level project team, Team provides draft act to NWRC, draft final Act to parliament.
C. Management Instruments			
National Water Management Plan			
a. Initiate NWMP II Project	MoWR	Jul 2010	Scope of Work finalized, funding in place, technical assistance fielded.
b. Complete NWMP II Project	WARPO	Jun 2012	Reviewed by NWRC
c. NWMPII Approved	MoWR	Dec 2012	

Data Management Systems				
a.	Initiate process of outsourcing collection and preliminary processing of Hydrometric Data	MoWR	Jul 2010	Terms of reference prepared, Procurement process complete.
b.	Prepare recommendations leading to rationalization of data collection activities to minimize overlap, and eliminate gaps	WARPO / NWRC	Dec 2010	Establish working group with representation from data collection agencies. Draft recommendations. Workshop with data collection agencies to approve. NWRC authorizes implementation.
c.	Operationalize NWRD "Spatial Data Quality Standards and Evaluation Principles and Guidelines"	NWRC	Dec 2009	Guidelines applied by data collection agencies.
d.	Data collecting agencies to put in place a policy for backing up data.	Data Collecting Agencies	Jun 2010	WARPO to monitor

ATTACHMENT 1: PROCEEDINGS OF WORKSHOP ON BWDB MANAGEMENT ISSUES

ATTACHMENT 1: PROCEEDINGS OF WORKSHOP ON BWDB MANAGEMENT ISSUES

18 August 2008

1. A Workshop on "BWDB Management Issues" was held at the BWDB Conference room, Wapda Building (level-4) on 18 August 2008 under the ongoing ADB funded Regional Technical Assistance (RETA) - Process Development for preparing and Implementing Integrated Water Resources Management (IWRM) Plans in Bangladesh. The workshop was chaired by Mr. Md. Inamul Haque, Additional Director General (Planning), BWDB. Mr. HS Mozaddad Faruque, Director General, BWDB and Mr. Md. Jalaluddin Md. Abdul Hye, Director General, WARPO, were present as Chief Guest and Special Guest respectively. A considerable number of BWDB officers of different disciplines and positions and RETA Consultant team members were present in the workshop. The list of participants is presented as Annex-I.

2. In the introductory speech Mr. HSM Faruque, the Director General, BWDB, initiated the discussion pointing that BWDB should be prepared to meet the modern management needs to fulfill the aspiration of policy makers, beneficiaries and international partners. He put the question on present authority of BWDB whether it is functioning as an autonomous entity. He further stated that the role of the Governing council and the ministry does not appear to be facilitating autonomous culture of the organization and in many occasions poses conflicting power sharing constraints to deliver decision making as earnestly needed. He further added that the Board can't fill up the vacant positions without clearance from the relevant authority of the Government. On the river bank erosion mitigation, Mr. Faruque further added that in the monsoon, river erosion causes public concern and being emergency and sporadic in nature BWDB cannot address the problem without having its operational budget for the selective interventions beyond its project wise budgetary limitations. An availability of block allocation or fund with local administration may be useful to address the problems of emergency. On the reform process of BWDB, he said that the staff strength had been drastically reduced from 19,000 to 8,800 putting the Board in unworkable situation. In his deliberations he also observed that PRS did not properly identify the role of BWDB, which should draw the attention of policy makers to maintain agricultural growth ensuring IWRM. Finally he requested RETA team to suggest a need based setup for the Board.

3. The Chairman requested Mr. Mukhles uz Zaman, Institutional Development Specialist, RETA team, to deliver his presentation on the BWDB Management issues. Mr. Zaman made a detail presentation of present BWDB Management Issues. In his presentation he highlighted the history of BWDB, its achievements, role of BWDB under NWPo and in the implementation of NWMP, BWDB's Mandate under the Act-2000, weakness in the present administrative setup, need for job oriented and management training, increasing communication skill, effective participation of beneficiaries in project management and the progress under ongoing reform process.

4. After the presentation, the Chairman opened the discussion and invited their view points on the institutional issues influencing functional efficiency of the organization and to restore earlier reputation and people's acceptance of their services. The following are the view points of several officials of BWDB responding to their expectations and institutional constraints which call for the attention of policy makers and the RETA-team in particular for an institutional review and recommendation.

- The Director General should be designated as "Chairman".

- The Governing Council may be discontinued and the autonomy of BWDB may be ensured through redefining the power and responsibilities of the chief executive and the members of the Board.
- BWDB Act-2000 has been in place for the last eight years with no significant improvement and no contribution to institutional efficiency. The Act should be revisited with the change scenario of ecological development in the rivers and agricultural demand.
- Present crisis of BWDB is the result of lack of common understanding of the Vision 2000, which was mostly influenced by donor driven perspective and lacks a long term perspective of water resource development priorities in the Bangladesh context. It is now appropriate to bring the issues to the policy makers to revisit the mandates and strategies and institutional reform may follow responding to revised mandates and decentralized strategies.
- BWDB Act-2000 should be recast with the revised perspective considering the Irrigation and Drainage Act.
- The delegation of financial Power as per PPR-2008 should be made effective.
- Administrative authority in the Board is too much centralized. All powers lie with the Director General. This need to be redistributed.
- Internal management of BWDB should be more efficient. There are too many steps and too much time taken in decision making and this should be drastically reduced.
- The role of Project Director does not appear to be effective and poses constraints in institutional management. This need to be resolved for project management to be efficient.
- Facilities for 'Research and Development' should be created in BWDB with adequate fund and ancillary facilities to continue research in water sector. Emphasized that environmental governance and coordination with research agencies must be improved.
- Local Government is now authorized to carry out water resources development as laid down in the policy statement, but such interventions demand technical and regulatory support to plan and implement regional water resources development plans and participatory endorsement by BWDB and Local Government. BWDB therefore needs to be represented at least at the Upazilla level to support local water resources development initiatives.
- The present budget outlay for O&M is inadequate. Adequate provision for O&M fund and Stakeholder participation is a must to ensure proper O&M of the BWDB infrastructure.
- Training leading to career planning is inadequate and trained personnel are not placed in appropriate positions after receiving specialized training.
- BWDB staff capacity should be strengthened through job oriented training in all levels and a Development Project Proforma should be made for training.
- The "Service Rules" of BWDB are not adequate fro the present institutional environment. These need to be reviewed.
- The delegation of administrative power is not enforced and there is a need to revisit the document.
- Guidelines for transfer and posting of officers should be revisited and enforced as per requirement.

- The role of the Design Directorate and its functional relationship with Project Managers is often not mutually effective. There is a need to establish clearer lines of responsibility to ensure smooth and effective working relationships.
- Providing general consultants for a long tenure may be more beneficial than individual project wise consultants for purposes of implementing IWRM.
- Improved and active relationship with the Development Partners should be developed to increase the levels of technical support in the interests of nation building.
- BWDB Engineers should be entrusted with Magistracy Power to evacuate encroachment on channels/embankments to facilitate proper functioning of those structures.
- BWDB has been facing procedural delays in trying to register cooperative associations. BWDB should revisit the organizational aspect of "Water Users Association" to improve the effectiveness of irrigation management. The difficulties of registering Water Users Association with the Department of Cooperative in three tiers should also be reviewed.
- BWDB's vision and mission should be reviewed and reformulated.
- MIS should be established in all the BWDB offices to maintain an inventory of BWDB projects including their operating conditions. Central data bases of assets should be established and updated regularly.
- The resources available in the trans-boundary and other rivers should be assessed properly.
- Various sectors have specific demand for water for its development and BWDB should take lead role to assess sector demand through consultative process and enhanced coordination among sectors. Flood management and drought management are specific issues to be addressed.
- In the District and Upazilla level committees, the representation of BWDB is absent or very weak. BWDB is experiencing displeasure of public due to litigation/disputes in carrying out irrigation works.
- A recent proposal to fund river training works through the Deputy Commissioners office may complicate work execution during emergencies. This need to be re-visited.
- All the activities of BWDB should follow the way to effective implementation of Integrated Water Resources Management (IWRM).
- BWDB should be able to fill all vacant positions without clearance from the Ministry of Establishment.
- There is a need to create 'Pani Sampad Cadre' to ensure professional service in water sector. BWDB engineers should be recruited through Public Service Commission and should be brought under cadre service.
- Decentralization of power is not implemented due to Ministry's interference, and DG can't exercise the delegated power. This should be resolved and measures be taken for quick decision making.
- BWDB's field office should be extended up to Union level to work with people at the grass root level.
- BWDB service rules should be updated in line with the proposed set up and responsibilities given to the Board. A draft set up for the Board has been

prepared to accommodate the present need and to implement and practice IWRM.

5. Mr. Jalaluddin Md. Abdul Hye, DG, WARPO said that people's participation should be ensured with bottom up planning approach and the issue of Governing body versus the MOWR should be resolved for better governance. He further stressed the need for efficient and adequately trained manpower in all stages of the Board for proper management and effective implementation of IWRM.

6. Finally, in his concluding speech, the Chairman noted that BWDB has become sluggish in its functioning and there is a weak linkage between the staff of BWDB in their understanding of duties and responsibilities. This situation needs to be improved to bring discipline in the water sector. He requested the RETA Team members to take note of the suggestions of the workshop and make a strong recommendation for the overall improvement of BWDB management. With these remarks, he closed the meeting with thanks to all participants.

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ATTACHMENT 2: PROGRAMME FOR THE OPEN FORUM WORKSHOP

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ATTACHMENT 3: PROGRAMME FOR THE DISSEMINATION WORKSHOP ON THE DRAFT FINAL REPORT