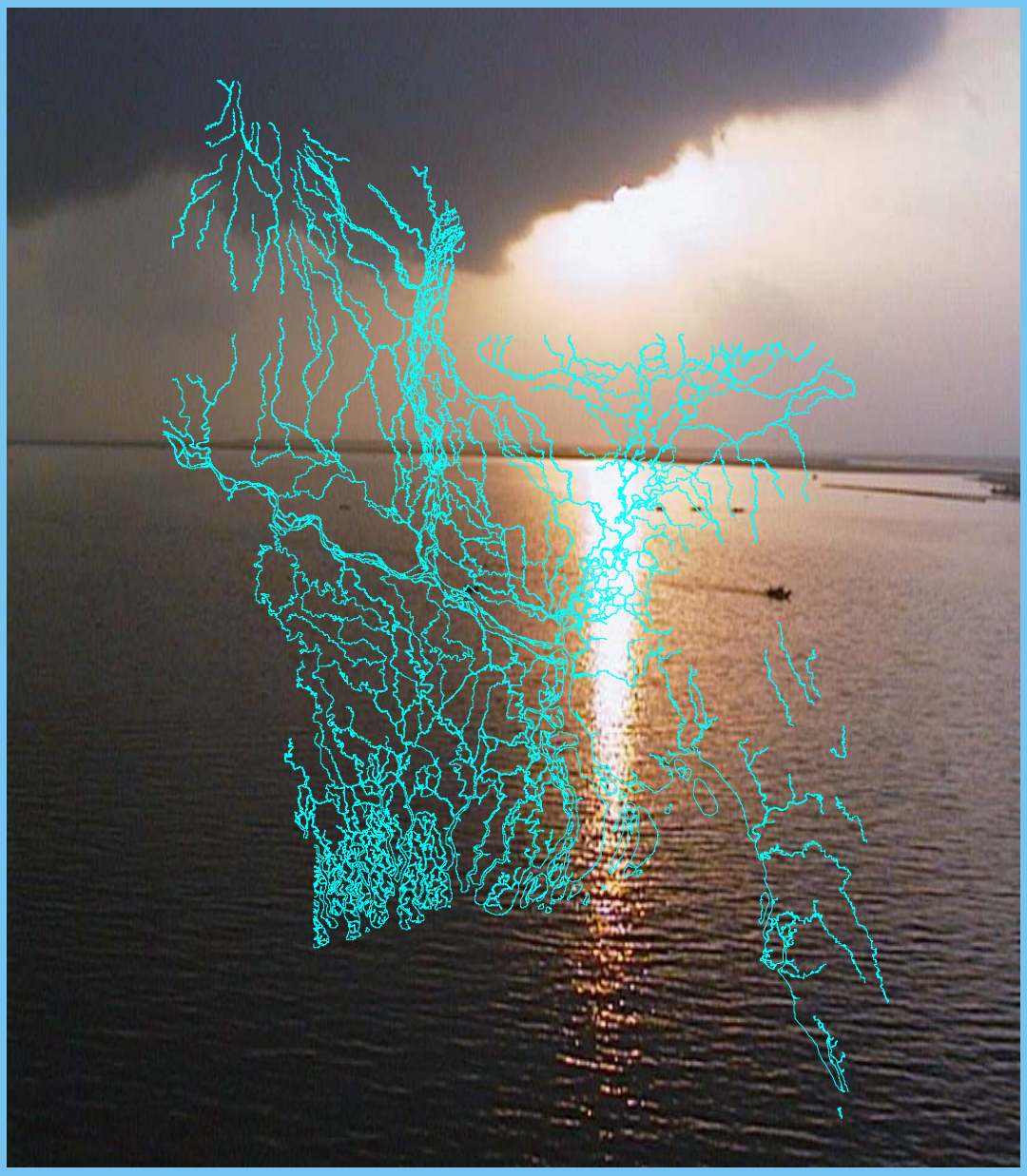
Government of the People's Republic of Bangladesh

Ministry of Water Resources

Annual Report

(July 2003 - June 2004)



WARPO

পানি সম্পদ পরিকল্পনা সংস্থা

Water Resources Planning Organization

DHAKA

DG, WARPO in a District level consultation workshop on ICZMP

Participation of women in local level consultation workshop on NWMP

Professionals of WARPO with other participants in a Regional meeting of National Water Sector Apex Bodies, held in Vietnam on May, 2004

Experts working in IT section of WARPO

Professionals and Researcher in WARPO Library

FOREWORD

The Water Resources Planning Organization (WARPO), established in 1991, is the exclusive government institution for Macro-level planning for management and integrated development of water resources of the country.

The overall tasks of WARPO flow from the mandate given to the organization through ACT 12 of 1992, the directives of the National Water Policy published in 1999, and the subsequent directives of the National Water Resources Council. Over the years, WARPO has made remarkable contribution in the field of planing of water resources. The accomplishments made by WARPO in the preceding year includes the preparation of National Water Management Plan (NWMP) which was approved by the National Water Resources Council (NWRC) on 31 March, 2004. The other major achievement is the preparation of (draft) Coastal Zone Policy.

Focusing on the activities and interventions initiated and/ or completed during July'2003 to June'2004 period, the Report covers such program areas as (a) water resources, (b) computer, IT and engineering, (c) economics, (d) environment and (e) administration and financial management.

I extend my heartfelt thanks and best wishes to all concerned for their significant contribution towards publication of the report with a hope that this report will be useful for different users.

H. S. Mozaddad Faruque
Director General
WARPO

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LIST OF ABBREVIATIONS

ADB	-	Asian Development Bank
AO	-	Accounts Officer
BAMWSP	-	Bangladesh Arsenic Mitigation Water Supply Project
BARC	-	Bangladesh Agricultural Research Council
BBS	-	Bangladesh Bureau of Statistics
BWDB	-	Bangladesh Water Development Board
CA	-	Contribution Arrangement
CEGIS	-	Centre for Environmental and Geographic Information Service
CSO	-	Chief Scientific Officer
CZPo	-	Coastal Zone Policy
DCA	-	Development Contract Agreement
DFID	-	Department for International Development, UK
DG	-	Director General
DIS	-	Document Information System
DMB	-	Disaster Management Bureau
DoE	-	Department of Environment
DoF	-	Department of Fisheries
DPHE	-	Department of Public Health Engineering
ECNWRC	-	Executive Committee of the National Water Resources Council
ERD	-	Economic Relation Division
FA	-	Financial Assistance
FAP	-	Flood Action Plan
FD	-	Forest Department
FP	-	Focal Point
FPCO	-	Flood Plan Coordination Organization
GIS	-	Geographical Information System
GoB	-	Government of Bangladesh
GPS	-	Global Positioning System
GUI	-	Graphical User Interface
ICZMP	-	Integrated Coastal Zone Management Plan
IRS	-	Indian Remote Sensing
IT	-	Information Technology
IWM	-	Institute of Water Modeling
IWRM	-	Integrated Water Resources Management
JRC	-	Joint River Commission
LAN	-	Local Area Network
LGED	-	Local Government Engineering Department
LGIs	-	Local Government Institutions
MPO	-	Master Plan Organization
NGOs	-	Non Government Organizations
NWMP	-	National Water Management Plan
NWP	-	National Water Plan
NWPo	-	National Water Policy
NWRC	-	National Water Resources Council
NWRD	-	National Water Resources Database
ODP	-	Organizational Development Plan
PA	-	Project Aid

PEST	-	Political Economical Social and Technological
PDO-ICZM	-	Program Development Office for Integrated Coastal Zone Management
PIP	-	Priority Investment Program
PSO	-	Principal Scientific Officer
RNE	-	Royal Netherlands Embassy
SO	-	Scientific Officer
SRDI	-	Soil Resources Development Institute
SSO	-	Senior Scientific Officer
TAPP	-	Technical Assistance Project Proforma
TC	-	Technical Committee
TF	-	Task Force
TM	-	Twinning Mission
UNICEF	-	United Nations Children's Fund
WARPO	-	Water Resources Planning Organization

1 THE ORGANIZATION

Introduction

The Water Resources Planning Organization (WAPRO) is an institution under the Ministry of Water Resources, the Government of the People's Republic of Bangladesh. According to National Water Policy, 1999 WARPO is mandated to act as the Executive Secretariat to the Executive Committee of the National Water Resources Council (ECNWRC). It is also the Apex organization dealing with nationwide macro level water resources planning and management. WARPO is a multi-disciplinary agency manned by 87 Staff, 42 of whom are skilled professionals, 5 of the Staff and Professionals are women.

Background

WARPO's origin can be traced to two government-owned bodies, viz., Master Plan Organization (MPO) and Flood Plan Coordination Organization (FPCO); established respectively in 1983 and 1989, MPO was responsible for preparing the National Water Plan (NWP). After the completion of National Water Plan, the Government of Bangladesh renamed MPO as Water Resources Planning Organization (WARPO) as the exclusive GOB Agency for macro-level water resources planning to manage country's water resources in a comprehensive, integrated and equitable manner.

After the disastrous floods of 1987 and 1988, FPCO was established, which undertook 26 studies. FPCO over-seeing the role of the FAP components since 1989 was merged with WARPO in 1996.

The Water Resources Planning Act-12, 1992, provides the legal framework of WARPO as a statutory GOB Agency.

Mandate

a. Act No. 12 of 1992

The mandate of the organization, as per Act No. 12 of 1992, includes the following:

(i) To formulate water resources master plans in an environmentally sustainable manner and to develop national water resources;

(ii) To draw up national work plans and policy relating to scientific utilisation and conservation of waters resources;

(iii) To advise other concerned organisations regarding the development, utilisation and conservation of water resources;

(iv) To co-operate with any institution in conducting surveys involved in the development of water resources, utilisation and conservation and if necessary, conduct special surveys regarding any such matter;

(v) To evaluate and analyse matters which develop due to the undertaking of measures by any institution involved in development, utilisation and conservation of water resources and to advise on such matters;

(vi) To develop standards of education, training and professionalism relating to the utilisation of water resources;

(vii) To collect and analyse information regarding the utilisation of water resources and to disseminate the same;

(viii) To organise and conduct national seminars, and having obtained the prior approval of the Government, international seminars, conferences and workshops regarding water resources;

(ix) To perform such other functions as may be conferred by the Government regarding water resources.

The Water Resources Planning Organization Act (Act No. 12 of 1992) provides the legal framework for WARPO as a statutory organization.

b. Mandates of WARPO, as per National Water Policy (NWPo), 1999

WARPO will be the exclusive government institution for macro-level water resources planning. Its principal responsibilities are:

(i) Providing administrative, technical, and legal support to the ECNWRC (Executive Committee of the National Water Resources Council).

(ii) Advising the ECNWRC on policy, planning, and regulatory matters of water resources and related land and environmental management.

(iii) Preparing and periodically updating the National Water Management Plan for approval of the NWRC.

(iv) Setting up and updating the National Water Resources Database (NWRD) and Information Management System.

(v) Acting as a "clearing house" for all water sector projects identified by different agencies and reporting to the ECNWRC on their conformity to the NWMP.

(vi) Undertaking any special study, as may be required by the ECNWRC, for fulfilling the objectives and program envisaged in the National Water Policy and the Bangladesh Water and Flood Management Strategy.

(vii) Performing any other function as may be assigned to it from time to time by the Government.

Functions of WARPO

Tasks of WARPO can be grouped as Core Tasks and Periodic Tasks.

Core Tasks:

- Maintenance, updating and dissemination of the NWRD and the MIS.
- Upkeep water resources assessments.
- Monitoring implementation of the NWMP and its impacts.
- Functioning as a “Clearing House”

- Monitoring of the follow up of implementation of the decisions of NWRC and ECNWRC meetings.
- Stimulate, co-ordinate and help in providing specialized, multi-disciplinary and cross-sectoral training in IWRM.
- Monitoring application of the guidelines of Participatory Water Management and update it.

Periodic Tasks:

- Updating the NWMP, at 5-yearly interval.
- Executing studies and R & D activities.
- Preparation of and advice on policy, strategy, institutional and legal issues.
- Assisting other agencies in planning, monitoring, studies and investigations.

Major Contributions

WARPO has to its credit a good number of technical papers and reports, numbering 60 plus, which includes those of MPO and FPCO, too. Reference is made hereunder to some of them:

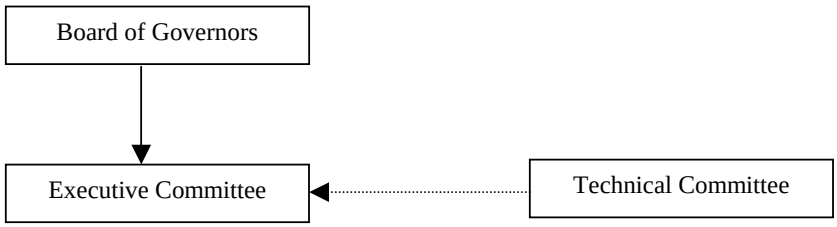
SL. No.	Title	Assignment Year
1	National Water Plan-I (NWP-I)	1987
2	National Water plan-II (NWP-II)	1991
3	Flood Action Plan (FAP) Studies	
4	Bangladesh Water and Flood Management Study	1995
5	National Water Policy (NWPo)	1999
6	NWMP Development Strategy Report	2001
7	Draft Guidelines for Environmental Assessment of Flood Control, Drainage and Irrigation Projects	2001
8	National Water Management Plan (NWMP)	2001
9	Options for Ganges Dependent Area (OGDA)	2002
10	Draft State of Water Resources Report	2002
11	Coastal Zone Policy (Draft : under ICZMP)	2003

In addition, WARPO undertook and completed the following as part of its mandated assignment:

- established the National Water Resources Database in 2001,
- adequately contributed to the preparation of the interim Poverty Reduction Strategy Paper (I-PRSP) in March 2003, and
- prepared the WARPO 3- year Rolling Plan (2003-2004-2005-2006) in 2003.

Management of WARPO

WARPO is being managed with the framework of two tire system and assisted by a Technical Committee.



Board of Governors:

i.	Minister, Ministry of Water Resources.	*Chairman*
ii.	Member, Relevant section of Planning Commission.	*Vice-chairman*
iii.	Secretary, Ministry of Water Resources.	*Member*
iv.	Secretary, Ministry of Agriculture.	*Member*
v.	Secretary, Local Government Division Ministry of Local Government, Rural Development and Co-operatives	*Member*
vi.	Secretary, Road & Road Transport Division Ministry of Communication	*Member*
vii.	Secretary, Planning Division Ministry of Planning	*Member*
viii.	Secretary, Ministry of Environment & Forest.	*Member*
ix.	Secretary, Ministry of Shipping.	*Member*
x.	Director General, WARPO.	*Member-Secretary*

Responsibilities: Overall governance of WARPO.

Executive Committee:

i.	Director General, WARPO	*Chairman*
ii.	Director-1, WARPO	*Member*
iii.	Director-2, WARPO	*Member*

Responsibilities: The Executive Committee will advise & assist the Governing Body and is responsible for the implementation of its decisions.

Technical Committee:

1.	Member (Agriculture), Planning Commission.	*Chairman*
2.	Chief Engineer, FPCO (Presently merged with WARPO).	*Member*
3.	Additional Director General (Planning), BWDB.	*Member*
4.	Executive Director, BARC.	*Member*
5.	Member, Joint River Commission.	*Member*
6.	Surveyor General, Survey of Bangladesh.	*Member*
7.	Divisional Chief (Agri.), Planning Commission.	*Member*
8.	Director General, WARPO.	*Member-Secretary*

Responsibilities: To advise WARPO on technical coordination among water-related agencies.

Web site

Water Resources Planning Organization (WARPO) has been maintaining a web site under the domain name www.warpo.gov.bd and it has recently been updated with current facts and figures relevant to National Water Resources Database (NWRD).

Maintaining worldwide contact by way of this website, WARPO is in constant touch with the experts and professionals home and abroad.

The Website facilitated the international Panel of Experts, irrespective of their location around the world, as well as the local professionals to offer their comments, suggestions, etc., in enriching the NWMP report.

Library Facilities

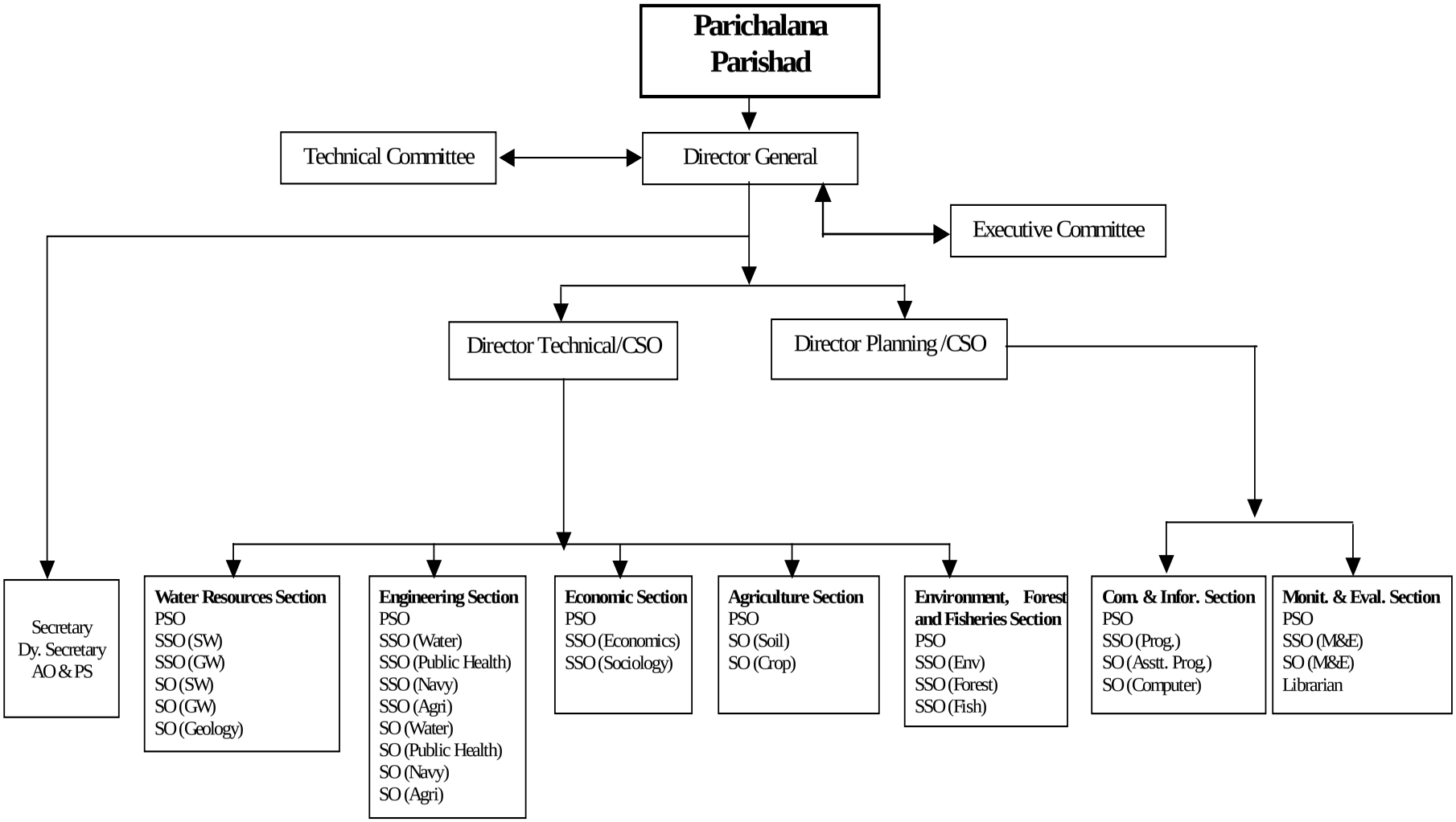
WARPO is well equipped with an organized and rich print resource center, its library, where one would find various important water sector study reports/ resourceful documents as well as findings and updates in connection with other allied sectors: agriculture, land, fisheries, environment, public health, climate change, flood, river-bank erosion, water and sanitation, and pollution.

WARPO Staff are engaged in maintaining an updated, web-friendly and easy-searching computerize catalogue for access of all concerned.

Office Accommodation:

The WARPO office is presently accommodated in a hired 5 storied building at Banani (House no. 103, Road no. 1, Banani, Dhaka.) The floor space is around 15,000.Sq.ft. The present available space is not sufficient to accommodate all the professionals, library, conference room and National Water Management Plan Database facility.

ORGANOGRAM OF WARPO



CSO : Chief Scientific Officer

PSO : Principal Scientific Officer/Superintending Engineer

SSO : Senior Scientific Officer/Executive Engineer

SO : Scientific Officer/Assistant Engineer

Total : 87 (Professional + Supporting)

2 ACTIVITIES

2.1 COMPLETED ACTIVITIES

2.1.1 National Water Management Plan

Introduction

Over the past decade or so, Water Resources Management in Bangladesh primarily focused on enhancement of country's agriculture production through implementation of *water resources development plans.*

Adoption of NWMP in 2001 has been a fundamental departure from the past approach, and calls for a more holistic, integrated, multi-sectoral but de-centralized and participatory approach in managing country's water-resources, with requisite emphasis on (a) sustainability and (b) environmental protection and conservation.

NWMP is practically a broad frame-work/ guide-line of actions within which the line agencies and other organizations are expected to prepare their own Plan of Actions and undertake various activities according to the plan in a coordinated manner, following existing Government rules regulation and procedures.

Background

Government declared the National Water Policy in 1999. The document provides necessary direction toward realizing an integrated water resource management in the country. The policy intents to implement its directives through fulfilling the six national goals of economic development, poverty alleviation, food security, public health and safety, decent standard of living for the people and protection of the natural environment.

Almost simultaneously the Government embarked upon preparation of the NWMP. In the course of this, a Development Strategy for the NWMP was subsequently approved in mid-2001. In accordance with policy and Development strategy, the NWMP was prepared by WARPO.

Status

The Water Management Plan prepared by WARPO was approved by the NWRC in its 7th meeting on 31st March 2004, with Hon'ble Prime Minister in the chair.

Goals and Objectives

The Overall Objectives of the NWMP are the objectives set in the NWPo to achieve the National Goals. Development Objectives as described in NWPo are:

i) To address issues related to the harnessing and development of all forms of surface water and ground water and management of these resources in an efficient and equitable manner.
ii) To ensure the availability of water to all elements of the society including the poor and the underprivileged, and to take into account the particular needs of women and children.
iii) To accelerate the development of sustainable public and private water delivery systems with appropriate legal and financial measures and incentives, including delineation of water rights and water pricing.
iv) To bring institutional changes that will help decentralize the management of water resources and enhance the role of women in water management.

v) To develop a legal and regulatory environment that will help the process of decentralization, sound environmental management, and improve the investment climate for the private sector in water development and management.

vi) To develop a state of knowledge and capability that will enable the country to design future water resources management plans by itself with economic efficiency, gender equity, social justice and environmental awareness to facilitate achievement of the water management objectives through broad public participation.

Since Development Objectives are derived from National goals and Policy, the Plan when implemented is expected to achieve goals, which would be pan-sectoral in nature rather than mono-sectoral.

The objectives expected to be achieved in the wake of focussed and pre-designed program interventions under NWMP, known otherwise as *Immediate Objectives*, can be discerned as follows:

- rational management and prudent utilization of country's water resources,
- equitable and safe access of the people to water for production, health and hygiene, towards quality improvement of their life and livelihood,
- availability of clean water in requisite quantity for multi-purpose use and preservation of aquatic and water-dependent eco-system.

Approach

A highly consultative approach was adopted alongside a comprehensive assessment of the spatial and sectoral inter-actions in the water sector. Three rounds of consultation were undertaken in 28 districts. Water-related issues that concerned people most were identified through meeting from Para (cluster of 20-25 families) to Thana (smallest administrative unit) and verified to explore possible options and reviewed at Thana and District levels. Workshops were held both regionally and nationally involving a wide range of audience comprising NGOs, donors, academics, Government staff, and media representatives. The Agencies involved in National level consultation is presented below:

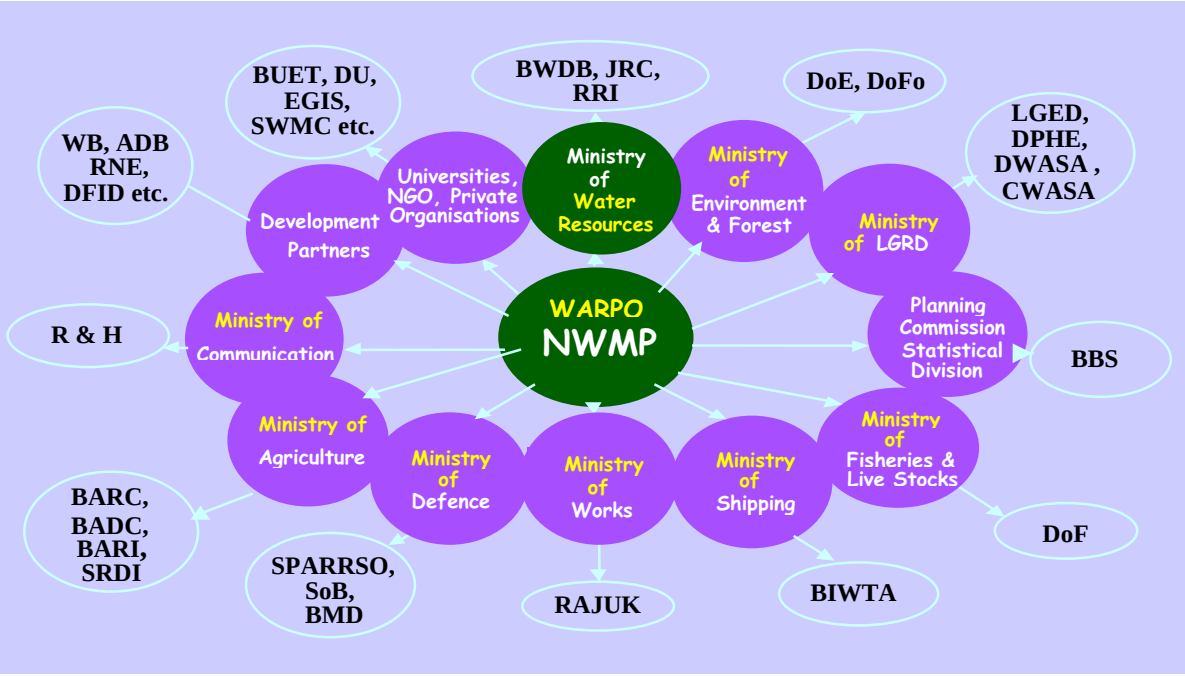


Figure: Agencies Involved in National Level Consultation on NWMP.

Stakeholders Participation in a Consultation Programme on NWMP

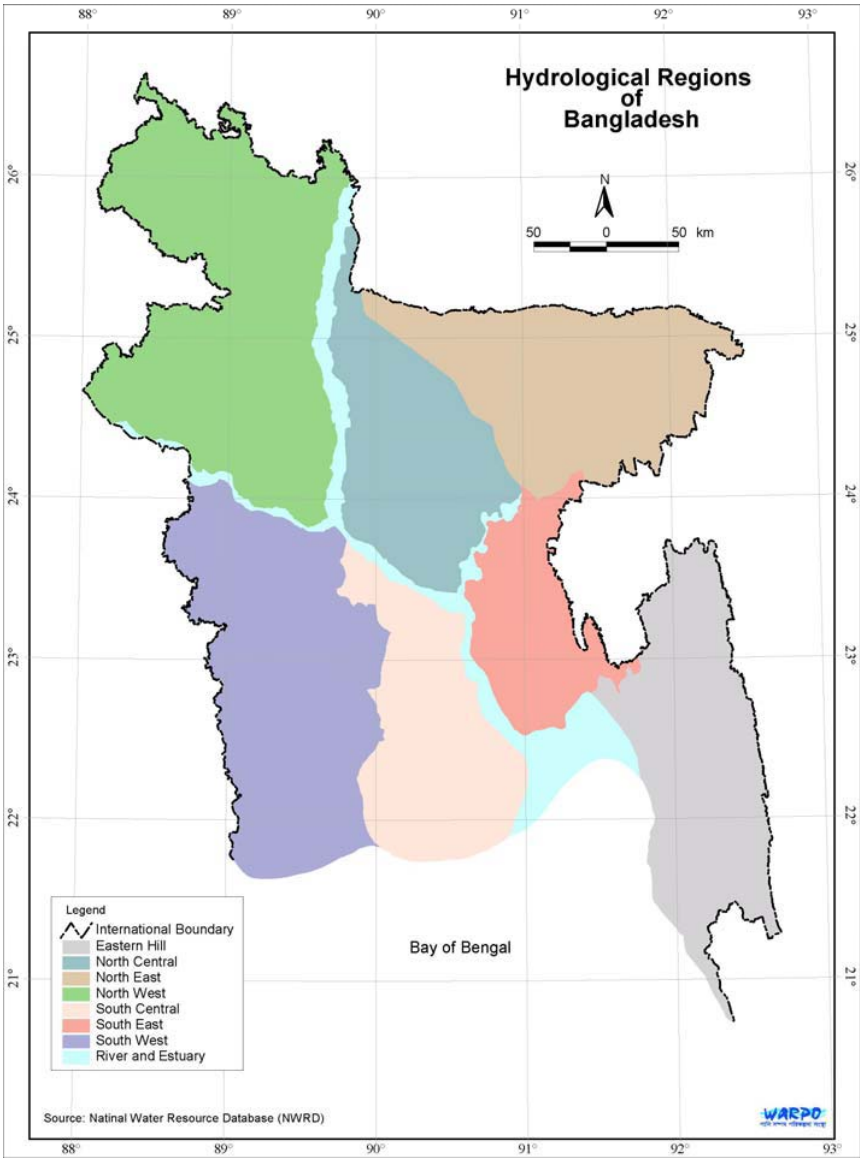
Agencies involved

Altogether some 35 national Government organisation, affiliated with 13 different Ministries, have been identified with functions relevant to the water sector

Analytical Framework

Development of the analytical framework for the planning process began with the assessment of the needs arising from the National Goals and Policy Directives related to the human and physical environments. The framework is developed so that all concerned with the development, management and use of water resources and water services in Bangladesh may plan and implement their activities in a co-ordinated and integrated manner, towards the achievement of the national goals.

The analytical framework linked with the physical system followed a systematic evaluation and assessment of water resources management options with rationales and sustainable development objectives. Resources allocation followed the broader multi-sectoral resources allocation context. The analyses undertaken were based on eight distinct ***hydrological regions*** *namely North East, North Central, North West, South East, South Central, South West, Eastern Hills and River & Estuaries* and eight sub-sectoral clusters. However, within each region there are significant sub-regions, defined by parameters such as agro-climatic zone, landform, river salinity and degree of urbanization.



To facilitate the analysis a comprehensive database called National Water Sector Database (NWRD) has been developed in the process on the natural resources relevant to the water sector of Bangladesh. A number of tools and models namely MIKE-II, MIKE-SHE, Groundwater Recharge model were used for process modeling,

Activity Programs

All the interventions/measures/programs are clustered into eight major groups based on the countries eight hydrological regions. Each cluster comprises a number of individual programmers, with a total of 84 sub-sectoral programmers. In all two clusters, which address the institutional, HRD, and legal aspects for the sustainable development and management of the water sector, as such, these are cross cutting issues, and concerns are as follows:

- Institutional Development
- Facilitation of an enabling environment

Other six clusters that will need capital investments cover the following:

- Major Rivers
- Towns and Rural Areas
- Major Cities
- Disaster Management
- Agriculture and Water Management
- Environment and Aquatic Resource

Details of the programs

i) Institutional Development

Programs under the Institutional Development clusters are recommended to serve the specific objectives of *ensuring rational management* and *wise use of the nation's water resources. First* group of proposals has been made to bringing about changes in the institutional set-up in the water sector to ensure effective regulation, decentralisation and devolution. The second group of programmes is targeted at developing institutional capacities with particular attention given to Local Government, Water Resources Planning Organization (WARPO), Department of Environment (DoE), Bangladesh Water Development Board (BWDB), Disaster Management Bureau (DMB) and the Department of Meteorology. There are 6 programs in the cluster.

ii) Enabling Environment

Four main areas of activity will address the immediate objectives associated with (i) establishing a coherent framework of rights, obligations and rules of business (ii) increasing the knowledge base through targeted research and improved data management (iii) promoting user-commitment to sustainable and wise use of water and (iv) developing an appropriate mix of public and private sector funding and operations. There are twelve programs in the cluster.

iii) Main River Development

The programs under the cluster have six focuses under four main themes. The first theme is to investigate the scope and viability of developing the Ganges, Brahmaputra and Meghna river water. Within the international context of regional developments, the ways by which Bangladesh can maintain *secured and sufficient supply of fresh water* to meet all its needs in the long-term including *the in-stream* needs are listed in the theme. In the second theme *options of Barrages* in the major rivers and distribution for water supply are the main thrust in the program. Thirdly to review and determine a viable and affordable plan to deal with the problems of *river erosion.* Finally investigation is proposed about the prospects of *hydropower* generation in the context of national energy development plans and competing uses for water. There are twelve programs in the cluster.

iv) Towns and Rural Areas

Under the cluster focus is on arsenic mitigation, water supply and sanitation, flood protection and storm drainage in the urban areas. The main thrust is on arsenic mitigation programs in rural and urban areas. Secondly sustainable improvements is targeted to improve operational efficiency, service delivery, provide affordable and financially sustainable services in the water supply and sanitation. Towns and urban centers will be provided as a priority and phased implementation with reasonable flood protection and drainage facilities. There are eight programs in the cluster.

v) Major Cities

One of the major challenges in water sector is to address the development requirements in four major cities namely Dhaka, Chittagong, Khulna and Rajshahi. The main aim of the cluster is to satisfy increasing demands for safe drinking water and sanitation and provide adequate flood protection and storm water drainage, to the extent feasible and affordable in these cities. Inventories for the facilities in water supply and sanitation are prerequisite for future development in the cities with particular emphasis on the poor and disadvantaged. There are five programs in the Cluster.

vi) Disaster Management

Major water related disasters are flood, cyclone and drought. Disaster management involves prevention and mitigation measures, preparedness plans and related warning systems, emergency response measures and post-disaster reconstruction and rehabilitation. Whilst some people will always remain at risk, the main aims are to provide the means by which, through a combination of structural and non-structural measures, adequate warnings are given, people can survive with most of their assets intact, and the affected can rebuild their lives thereafter. There are six programs in this cluster. The programs include flood proofing, cyclone shelters and killas, supplementary irrigation and drought protection and rural water supplies.

vii) Agriculture and Water Management

The overall agricultural policy objective is to expand and diversify agricultural production and to maintain food security, especially with regard to sustaining self-sufficiency in rice. The water sector has an important role to play by removing constraints that may be caused by either shortage or excess of water. The programs under the cluster proposes continued expansion of minor irrigation, water conservation for multi-purpose use, rationalization of the many existing public flood control, drainage and irrigation schemes, a limited number of new irrigation schemes where needed and feasible and improved coastal protection works, including mangrove afforestation on the foreshore as well as in the country's upland catchments. There are eight programs in the cluster.

viii) Environment and Aquatic Resources

Urgent action has been proposed to clean-up pollution hot spots and to prevent pollution in the ecologically sensitive areas. Prime concern with capture fisheries is to provide suitable habitats for maintaining bio-diversity as well as fish production. For this purpose Fisheries Master Plan for the revival of capture fisheries has been recommended. Apart from that sufficient water area and appropriate linkage between river and floodplain flows are proposed as mitigation measures for capture fisheries. *The ecologically sensitive* areas are under great pressure, both from encroachment and as sources for subsistence and production. The key issue is to reverse this trend. The Sundarban mangrove area and parts of the Haor Basin wetlands, the former as a *World Heritage Site* and both as *Ramsar Sites*. The other water bodies in the country are also ecologically sensitive, but are individually smaller and subject to much more intensive pressures of encroachment and exploitation. *Water management for the Haor Basin and Water management for the* Sundarbans are proposed to improve eco-system and fisheries in the Haor areas and Sundarbans' productivity and bio-diversity respectively. There are ten programs in this cluster.

Implementation of the Plan

Implementation Period

The Plan is proposed to be implemented in three phases: in the short-term (2000-05) it is considered a firm plan of ongoing and new activities; in the medium-term (2006-10) it is an indicative plan, and in the long-term (2011-2025) a perspective plan. Implementation of the plan is to be monitored regularly and it will be updated every five years.

Investment Requirements and Funding

The table below illustrates the Base Case funding requirements for the plan by sub-sectoral cluster for each phase of the Plan. It may be noted that overall investment requirements are dominated by

Programme Capital Costs *Taka billion (mid-2000 prices)*	No. of Progs	Short 2000-05	Medium 2006-10	Long 2011-25	Residual From 2026	Total
Institutional Development	10	3.8	6.7	8.0	1.5	19.9
Enabling Environment	13	0.8	0.9	1.8	-	3.6
Main Rivers	12	8.4	14.3	155.2	45.3	223.2
Towns and Rural Areas	8	29.5	88.3	133.7	13.4	264.9
Major Cities	17	22.1	93.9	185.6	10.3	311.9
Disaster Management	6	5.0	7.8	13.7	0.7	27.2
Agriculture & Water Management	8	1.7	7.2	29.5	7.2	45.6
Environment & Aquatic Resources	10	3.1	5.5	9.7	-	18.2
Totals	84	74.4	224.7	537.1	78.3	914.6
Equivalent US$ billion		*1.5*	*4.4*	*10.5*	*1.5*	*17.9*

Residual costs are those relating to programmes started, but not completed, by 2025

three of the clusters (Main Rivers at 24%, Towns and Rural Areas at 29% and Major Cities at 34%, the latter two making up nearly two-thirds of the total investment requirements).

Implementation Modalities

The programs are to be implemented by line agencies and others, those would be responsible for planning and implementing of its own activities and projects within the NWMP framework. All projects proposed by different line ministries will adhere to normal Government administrative procedures and will conform to all relevant rules and guidelines issued by Government. Responsibility for overall coordination of Plan's implementation lies with the National Water Resources Council, who will issue directives as required through its Executive Committee. Water Resources Planning Organization (WARPO) will provide necessary assistance in this regard.

2.2 ONGOING ACTIVITIES

2.2.1 Integrated Coastal Zone Management Plan Project (ICZMP)

Background

Introduction

147 Upazilas of 19 districts of the southern part of the country and Exclusive Economic Zone (EEZ) in the Bay of Bengal constituted the coastal zone of Bangladesh. These areas of the country, like other areas of the world are resourceful but it also face vulnerabilities resulting from hazards like cyclone, storm surge, floods etc.

Development activities in this area are implemented by different agencies of the Government of Bangladesh (GoB). As usual, each agency has its own mandate which, often is narrowly focused towards a particular sector (for example water development, road, building etc.) without giving proper attention to the effect of such development activities on other sectors. Such mono-sectoral development activities may cause adverse impacts on the environment of the areas.

To reduce the vulnerabilities of the coastal lives (of all living organisms), for improving the living standard of coastal people by enhancing their livelihood capacities (poverty reduction), to coordinate and harmonize the development activities of all implementing agencies working in coastal area and for maintaining a healthy eco-system, the concept of Integrated Coastal Zone Management (ICZM) has been conceived and pressed into action.

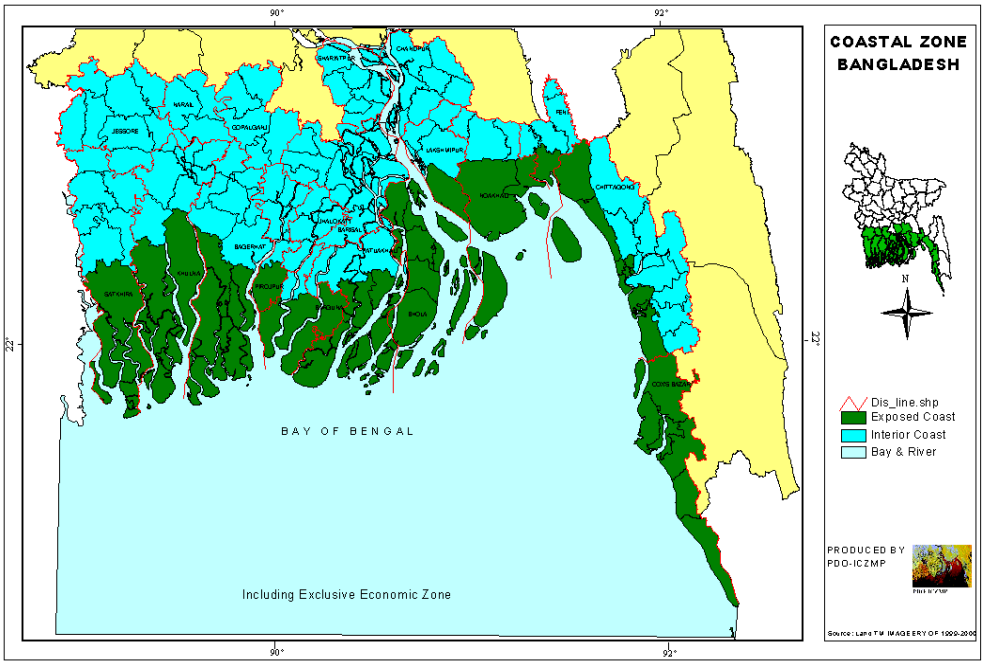


Figure: Coastal Zone of Bangladesh

Nineteen Districts: Chittagong, Cox's Bazar, Feni, Noakhali, Lakshmipur, Chandpur, Bhola, Barisal, Patuakhali, Barguna, Jhalokathi, Pirojpur, Khulna, Satkhira, Bagerhat, Jessore, Narail, Gopalganj and Shariatpur.

It was agreed that a Program Development Office for Integrated Coastal Zone Management Plan (PDO-ICZM) be established. A number of facilitating inter-agency institutional structures including an Inter-ministerial Steering Committee and a Technical Committee were conceptualized and made operational with the Ministry of Water Resources as the lead ministry and the Water Resources Planning Organization (WARPO) as the lead agency.

General approach:

The purpose of the ICZMP Project is to help transform the practice of marine and coastal resources management in Bangladesh. This represents a change from the current situation, characterized by "open access" to all, the unsustainable exploitation of resources, low level of transparency and little stakeholder participation in resource management, to a desired future situation, characterized by sustainable, structured, rational and transparent marine and coastal resource management with low levels of resource conflict, high levels of stakeholder participation and a skilled, supportive bureaucracy. This process of change aims to enhance community development and improve livelihood conditions paying due attention to different social variables, including gender. The concept of vulnerability of different social groups is important in this context to create conditions in which the reduction of poverty, the development of sustainable livelihoods and the integration of the coastal zone into national processes can take place.

Objectives:

The specific objectives, to realize this goal, are outlined below.

1. economic growth;
2. meeting basic needs & creating livelihood opportunities for coastal communities;
3. reduction of vulnerabilities and enhancement of coping capacities;
4. sustainable management of coastal resources;
5. equitable distribution of resources and economic benefits across social strata;
6. empowerment of coastal communities;
7. women's advancement and promotion of gender equality; and
8. preservation and enhancement of critical ecosystems.

Output:

To realize these objectives, the priority focus will be on livelihoods of people and 'area based development' encompassing management of natural resources. The challenge is to develop an innovative approach to make the above meaningful and operational. This requires a holistic approach integrating such management issues as: coastal development and disaster management; planning and implementation at national and community levels; policies, strategies and plans of different sectors; and management of land and water resources. Activities are structured through six outputs as presented below:

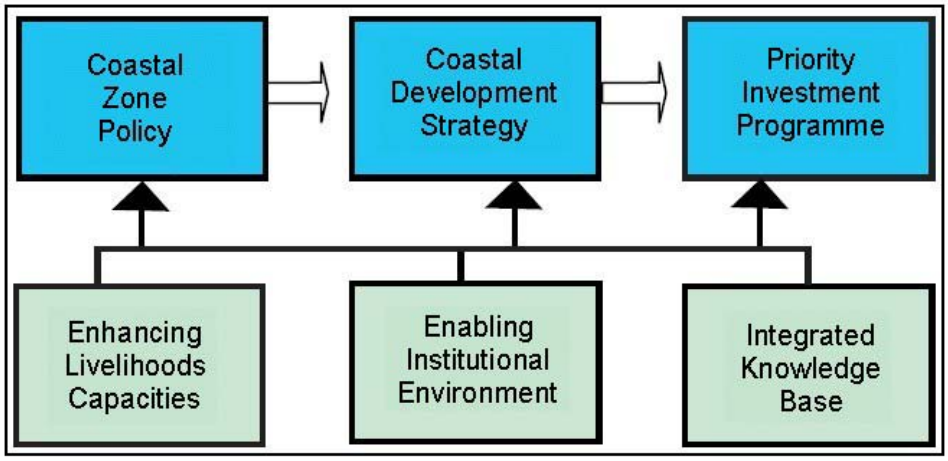


Figure: Relationship between PDO-ICZMP outputs

The diagram reflect the approach taken to coastal development, with the core process based on a flow from policy to strategy to a program of investments Three of the outputs on the top line are categorized as key outputs and the three others on the bottom line are cross cutting themes to support the key outputs.

Management Structure

i. In house set-up

The PDO-ICZM in house set-up is composed of a team of consultants: GoB experts and WARPO professionals.

Consultant Team:

A group of experts from the ARCADIS- Euro-consult is working in the Program Development Office (PDO) as in-house consultant team. The team is composed of: team leader; three long-term senior national experts, a group of short-term national & international experts, three research officers and supporting staff.

GoB experts:

The TAPP provides for services of five GoB departmental experts, on deputation from the Ministry of Establishment; Ministry of Fisheries and Livestock; Ministry of Water Resources; Ministry of Environment of Forest and Ministry of Agriculture to work as the in house team in the Program Development Office (PDO) During the reporting period, selection of departmental experts and procedures of their deputation were completed and four of the five deputed experts joined the project.

WARPO Professionals:

A team of WARPO experts is involved in the PDO-ICZMP in house team as counterparts to the consultant. This team consists of Engineers, Agriculturists, Environmentalists, Socio-economists & IT specialists.

ii. Out house set-up

Task Forces (TF)

The establishment of Task Forces is foreseen in pursuit of the major out puts of the study. Task forces is the vehicle for activity involving GoB organizations in project execution and create ownership for the ICZM process under design.

During the reporting period, the MoWR constituted the Task Force on Policy and Strategy and reconstituted the Task Forces on Livelihoods and Knowledge base. A number of meetings were held for this purpose.

Focal Points (FP)

Focal Points are operational contact points of partner organizations in relation to PDO-ICZM activities. At present, there are 35 Focal Points in different Agencies. During the reporting period orientation session and intensive interactions have taken place involving Focal Points when in house team visited them at their offices to discuss various issues.

Activities

Progress

The Project is going on as per schedule. Progress of work up to June 2004 is 42% Administrative Arrangement (AA) was signed between Government of Bangladesh and Government of the Netherlands on 22 April, 2004. Contribution Arrangement (CA) has been submitted by RNE to ERD on 24 May, 2004, and is waiting for approval by ERD and Royal Netherlands Embassy. According to the decision of the meeting on Final Report submitted by the Joint Mid Term Review Mission (MTR) WARPO has prepared a 2nd revised TAPP which includes extension of project (budget neutral) up to December 2005 and other anticipated changes. WARPO submitted the TAPP to MoWR on 20 June, 2004. A summery overview of activities on the outputs in the reporting period is presented in the following table:

Overview of the Activities during the Reporting Period

Sl. No.	Outputs	Purpose	Activities during the period
1.	Coastal Development Strategy (CDS):	Under this output, the integrating and coordinating activities will take place, leading to the formulation, analysis and evaluation of a strategy for coastal development.	Steps for the formulation of the CDS have been agreed. Background papers for the dialogue have been prepared.
2.	Coastal Zone Policy (CZPo):	This policy lists down GoB vision and principals of ICZMP. Such as policy would identify the intended beneficiaries of coastal development, aims to create a commitment for harmonization of different sectoral policies and would clear the ground for an enhanced interaction between different levels of government.	A preliminary draft of the CZPo was presented at a national seminar on May 12, 2003. Based on discussions and comments, the 1st draft was prepared in August 2003. The draft Coastal Zone Policy was presented and discussed at all 19 coastal district towns, facilitated by the district administration. In these meetings local government officials, public representatives, NGOs, Teachers, Farmers, Fishermen, Media, Civil Society and other members participated. The draft was presented and discussed at the Task Force on Policy & Strategy.
3.	Priority Investment Program (PIP):	Priority investments include investments both in physical and social infrastructures that would constitute investments for building sustainable local - level capabilities for including livelihood conditions.	An updated and inventory, of on-going GoB and NGO projects, on the basis of the ADP 2003-2004, has been completed. A total of 223 and 74 projects were identified being under implementation by 26 government agencies and 18 NGOs, respectively. Concept note formulation involving relevant government agencies has been initiated.
4.	Community Capacities to enhance livelihood:	This output focuses on the development models of good practice to enhance the capacity of communities to improve the livelihood. Such models include structures of an enabling local environment or partnership amongst GoB agencies, NGOs and Private Organizations.	A synthesis document on coastal livelihoods has been produced in March 2004 under a series publication "Living in the Coast". A gender status paper was circulated widely. A workshop to disseminate findings was organized jointly with the Department of Women Affairs and participated by leading gender experts.

Sl. No.	Outputs	Purpose	Activities during the period
5.	Enabling Institutional Environment:	This output aims to create the conditions that would support local communities in improving their livelihood conditions. This considers processes of: (i) harmonization between national sector policies and activities; (ii) coordination between national and regional offices of government; and (iii) integration of all development partners in implementing development activities.	A 'compendium on Selected Laws Relating to and / or having bearing on coastal areas' and a study on 'role of private sector' have been completed.
6.	Integrated Knowledge base:	The purpose of the knowledge base activities is to have better information and a better understanding of coastal conditions and process in support of ICZMP. Key activities will be collecting and disseminating information and filling knowledge gaps.	The indicator framework has been completed. Based on the framework, a set of aggregated indices is being elaborated - a draft of the 'Profile of the Coastal Zone of Bangladesh' has been finalized. First draft for information booklet for Cox's Bazar, Projpur, Jhalokathi, Bagerhat and Barguna completed and draft for Gopalganj, Shariatpur and Patuakhali initiated. Identified knowledge gaps from earlier report and studies has been compiled in a document and are being finalized.

Consultation meeting on Coastal Zone Policy (CZPo) in Pirojpur

Publication

During the reporting period, 13 working papers as listed below were prepared and distributed. Separately, the project conceptualized publication of a booklet type series for wider dissemination of synthesized results. The title of the series is 'Living in the Coast'. During the reporting period, two publications, in this series, came into light.

Name of the publications:

1. Delineation of the Coastal Zone (WP005)	December 2003
2. Framework of Indicators for ICZM (WP016)	October 2003
3. Local Level Institutional Arrangements in CDSP; a case study (WP019)	August 2003
4. The Process of Policy & Strategy Formulation (WP020)	August 2003
5. Urban Poor in the Coastal Zone (WP021)	August 2003
6. NGOs in Coastal Development (WP022)	August 2003
7. Local Level institutional arrangements in ECFC project (WP023)	September 2003
8. Proceedings of the Orientation Session for Focal Points on ICZM (WP024)	October 2003
9. Inventory of Projects & Initiatives in the Coastal Zone (update 2003) (WP025)	December 2003
10. Proceedings of District Level Consultations on Coastal Zone Policy (WP026)	December 2003
11. Women of the Coast: A Gender Status Paper on the Coastal Zone (WP027)	January 2004
12. Role of the Private Sector: An assessment of the status in the coastal zone of Bangladesh (WP028)	February 2004
13. Compendium on Selected Laws relating to and/or having bearing on coastal areas (WP029)	March 2004

Living in the Coast-A Series	
1. Living in the Coast: People & Livelihoods	March 2004
2. Living in the Coast: Problems, Opportunities & Challenges	June 2004

All these publications are usually sent to selected members of the TC. projects, NGOs, media group, specialized research organizations.

Two issues of Bangla news bulletin (Tatarekha) was published and distributed (7000 copies). Issues were distributed widely to all Union Parishads, all Pourashavas, all relevant government offices of the Upazila and District, NGOs and all Press Clubs covering all 19 districts of the coastal zone. Copies are also mailed to all Members of Parliaments representing coastal constituencies. An English version was also prepared and circulated electronically, mostly to international community and overseas recipients.

The website is continuously being updated and maintained. Efforts have been made to facilitate access of this website through other international websites. This is now linked at "One Coast", 'Coastal Management' and 'Bay of Bengal' websites.

Compilation of 'Press Clippings is on going and maintained at the in-house library.

Salient Feature

Name of the project	**Integrated Coastal Zone Management Plan (ICZMP) Project**
Commencement	February 2002
Completion	January 2005
Source of finance	Grant
Development Partners	Govt. of the Netherlands (GoN) Department for International Development (DFID), UK.
Approval status	Original TAPP approved;
Project Cost (Lakh Tk)	Tk. 1365.61 lakh (approved TAPP) Tk. 2128.88 lakh (revised TAPP) PA = 1930.25, TA = 1469.49, FA = 460.36, GoB = 198.63
Coverage	19 coastal districts + EEZ
Population covered	35.1 million (2001)
Project Area	47,212 sqkm

2.2.2 South West Area Integrated Water Resources Management Project

Background

The problems relating to integrated water resources management of the southwest area of Bangladesh are diverse and complex. During the dry season there is severe shortage of water of desired quality for various purposes. On the other hand, during the monsoon, flood causes havoc to life and property in the region. Besides these, drainage congestion in the low-lying areas, river bank erosion, salinity intrusion, arsenic contamination of the ground water etc. aggravates the water management issue in the region. As a result of this complex hydrological behavior/pattern, poverty remains the central issue of overall economic development of the area. In the past various projects have been implemented in the south-west region. Most of them were targeted mainly to agricultural development that was the need of the time. Other issues such as fisheries, navigation, drinking water supply, environment etc. were not adequately addressed in the past.

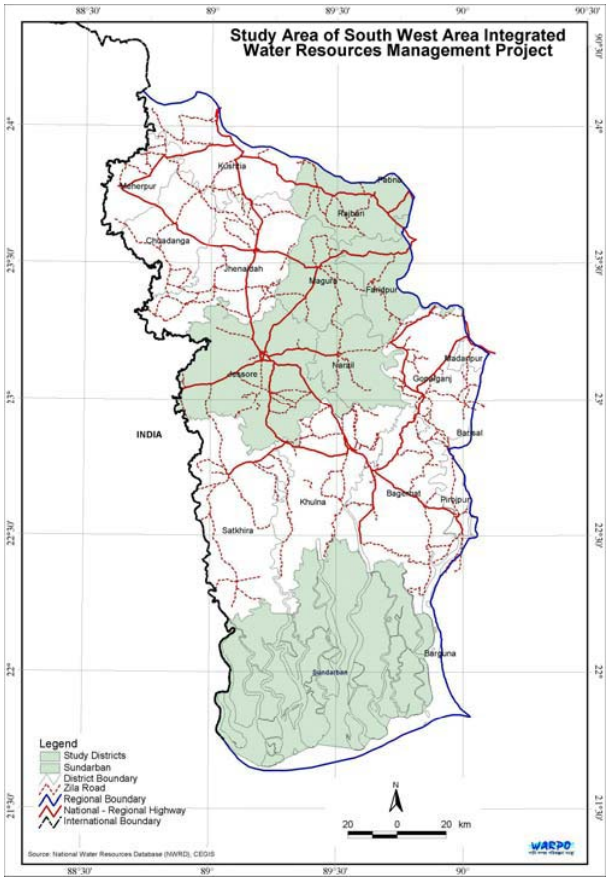
Following the adoption of the National Water Policy and the National Water Management Plan, the issue of integrated water resources management came into surface where all sectoral issues of diverse interests are to be addressed in an integrated manner and participatory approach of management were emphasized. In this context Asian Development Bank (ADB) provided the Technical Assistance to the GoB for South West Area Integrated Water Resources Management Project.

Study Area

The study area, measuring about 780 sqkm, covers five districts of the south-west area, namely, Faridpur, Rajbari, Jessore, Magura and Narail. The study would adopt Integrated Water Resources Management (IWRM) concept in a bottom up approach.

Objective

The overall objective of the project is to reduce poverty and enhance socio-economic status of people in the south-west area through improved water resources management while addressing diverse social and environmental concerns from an IWRM perspective. The study is being implemented in two phases.



Output

Phase-I

The outputs of the phase-I are:

- Regional IWRM strategy;
- Sub-regional (district-level) participatory IWRM plans and priority investment opportunities and possible scope of the ensuring loan;
- Institutional action agendas to operate IWRM and facilitate sustainable service delivery.

Phase-II

The output of the phase-II will be:

- Detailed IWRM Plans;
- Policy and Institutional Dialogues and Actions;
- Design of Production and other Support Systems;
- Social and Environmental Dimensions;
- Project Costing and Economic Analysis and;
- Preparation of the Draft Project Document.

Project Management

The project is being implemented in two phases. Phase-I implemented under the guidance of WARPO whereas phase-II is being implemented under the guidance of Bangladesh Water Development Board headed by one TA Manager from each organization. LGED is working as Co TA Manager for both the phases.

Up to date achievement

(i) The consultants submitted the draft phase-I (Interim) report of the project on 31 April 2004. Comments on the report was invited from different organizations. The report was discussed in a regional level workshop at Jessore on 12 May 2004 and a national level meeting on 15th May 2004 at Dhaka.

(ii) An ADB Review Mission visited the proposed project area during 10 to 12 May 2004 and were also present in the regional workshop and national level meeting to get the feedback from the stakeholders. A tripartite meeting among executing agencies (WARPO, BWDB, LGED), the consultants and the ADB mission was held on 15th May 2004.

(iii) The consultants are now finalizing the report incorporating the comments received from different organizations and the recommendations of the regional workshop, national level meeting, tripartite meeting as well as the suggestions provided by the ADB Mission and will submit the report by 31 July 2004.

Financial Arrangement

The total approved cost of the study is Tk. 652.50 lakh of which Tk. 522.00 lakh has been provided by the Asian Development Bank as grant.

Implementation Period

The consultants started work on September 2003 and the final report is expected to be submitted by November 2004.

2.2.3 Environmental Monitoring Information Network for Water Resources (EMIN)

Background

Bangladesh, one of the most hydrologically dynamic regions in the world, experiences various water related natural disasters every year such as recurrent flooding, drought, cyclone, large scale river bank erosion and continuous river dying/river siltation etc.

Information is a key for water resources planning, resource mobilization, and implementation of interventions and mitigation of risks due to above disasters. Information exchange and dissemination is another key for appropriate use and timeliness of information. In this regards the Ministry of Water Resources directed Center for Environmental and Geographical Information System (CEGIS) (erstwhile EGIS) to participate on the "Feasibility study for an Environmental Monitoring Information Network (EMIN) for water resources information" with ICT group of RADARSAT International, Canada.

The objective of the feasibility study was to test the applicability of establishing the water related information network among the national and local stakeholders for better management of water resources. The approaches consisting of participatory approach utilized in stakeholder analysis, need assessment, multi-stakeholder engagement sessions, and information sharing demonstrations.

Project Description

EMIN is proposed to enhance capacity development by providing water and natural resources management information in Bangladesh through an enhanced and accessible information network based upon existing GIS/RS database, satellite images, different monitoring information lying with relevant agencies and advanced information technologies. It aims to bring about improved data sources and information that helps decision making by the stakeholders and dissemination of appropriate erosion, siltation and morphological changes of rivers and flood monitoring information among main stakeholders dealing with these application.

Objective

The broad objective of EMIN is to implement an information network to facilitate the planning and management of water and land resources as it relates to flood, erosion, river morphology monitoring and regional basin resources among national stakeholders and the potential local stakeholders of the Brahmaputra-Jamuna Flood Plain region.

Output

The following are the output of the project

i) Flood Monitoring and Prediction:
   - Flood inundation
   - Lead time prediction
   - Flash Flood

ii) River Morphology Monitoring and Prediction:
   - Generate Erosion/accretion monitoring/preparedness information
   - Conduct Erosion Prediction
   - Generate River siltation/dying information

iii) Regional/Basin development planning and resource assessment:
   - Assess regional basin resources

Project Management

The project is being implemented jointly by WARPO and BWDB with WARPO as the lead agency.

Financing Arrangement

The total approved cost of the project is Tk. 1723.03 lakh of which Tk. 1439.86 lakh has been provided by Canadian CIDA as grant.

Project Duration

According to the approved TAPP the project will be completed within the three financial years starting from July 1, 2003 to Jun 30, 2006.

For dissemination of flood-related information, Daulatpur upazila of Manikgonj district and Nagorpur upazila of Tangail have been selected. Necessary mathematical tools have been developed to generate information, and necessary hardwares (Fax machine etc.) have also been installed in the office of the Thana Nirbahi Officers of these upazilas. For proper interpretation of the flood related information, extensive consultation up to village level, including the related persons at the upazila level have been conducted. Moreover, a National level Workshop was arranged to get feedback from National level stakeholders. It is expected that dissemination of flood related information to these upazilas would start from monsoon season of this year (2004).

Mr. Hafizuddin Ahmad, Bir Bikram, Honorable Minister, Ministry of Water Resources, in a Workshop on EMIN Project

Some of the flood related products and proposed erosion related products of the EMIN project are listed below:

FLOOD PRODUCTS

Scope	Information Product	Description
National	National Inundation Extent Map	An open water extent map of Bangladesh, with district names and boundaries, produced every 24 days.
	National Inundation District Area Table	A district-wise table showing current extent of inundation and percentage area inundated, produced every 24 days.
	National River Flood Situation and Forecast Map	A national map produced daily, showing 48 hr. WL prediction at FFWC gauge station.
	National Monthly Flood Bulletin	Monthly summary of hydro-meteorological observations.
	National Aman Land use Map	A national map showing areas under Aman cultivation following the monsoon produced annually.
District	District Gauge Station WL Table	A table produced daily, showing danger levels, water levels on the previous day, current day and expected levels in 24 hours and 48 hours' time at the main river FFWC gauging stations that may impact the concerned district.
Upazilla	Upazilla Gauge Station WL Map	A map for each study upazilla produced daily, showing predicted water levels in 48 hours' time at the local gauging stations.
	Upazilla Gauge Station WL Table	A table for each study uapzilla produced daily, showing water levels at the local gauging stations on the current day and the predicted change in 48 hours' time.
	Upazilla Union-wise Inundation Table	A daily table for each study uazilla showing percentage area of the unions inundated and changes expected in 24, 48, 72, and 96 hours'.
Union	Union mouza WL Forecast Table	Tables produced daily, showing mauza-wise predictions of changes in water level in 48 hours' in the unions under each of thew upazillas.
Community	Community WL Change Forecast Flag Signal	Water level in a mouza on current day and the predicted change in 48 hours' time, displayed daily with flags.

EROSION RELATED PRODUCTS (PROPOSED)

Scope	Information Product	Description
National	Base information along the right bank of the Jamuna River	A base map covering 1.5 km wide floodplain along the right bank of the Jamuna River.
	Monitoring of erosion along the right bank of the Jamuna River and associated damages	A map and also a report will be prepared to disseminate erosion monitoring information.
	Erosion prediction along the right bank of the Jamuna River and vulnerability assessment	A map and also a report will be prepared to show the erosion vulnerable areas, settlements, embankments, educational institutions, hat-bazars, growth centers, roads and other infrastructures.
Local	Preparation of local erosion product	Erosion prediction will be prepared on a detailed base map so that erosion vulnerability of each of the house could be assessed.

Salient Feature:

Name of the project	**Environmental Monitoring Information Network For Water Resources (EMIN)**
Commencement	July 2003
Completion	June 2006
Source of finance	CIDA and GoB
Development Partners	CIDA
Approval status	TAPP approved on 05/12/2003
Project Cost (Lakh Tk)	Total 1723.03 PA = 1439.86 GoB = 283.17
Area Coverage	A: Flood i. Daulatpur Upazila of Manikganj ii. Nagorpur Upazila of Tangail B: Erosion i. Dhunat Upazila of Bogra ii. Kazipur Upazila of Sirajganj

2.2.4 National Water Resources Database

Introduction

One of the mandated key functions of WARPO is to establish and maintain the National Water Resources Database (NWRD) and make the data available for all concerned towards proper water resources planning and management. There is no gainsaying that water resource managers require uninterrupted access to wide range of info/data for undertaking four vital program objective achieving exercises: planning, implementation, monitoring and evaluation.

Collection and collation of multi-sectoral data set started from MPO Phase I (1983-86) period and continued during MPO Phase II (1989-1991) and Flood Action Plan studies. During the preparation of National Water management Plan, 2001, the NWRD was established in 1998 after compiling the huge amount of multidisciplinary multi-sectoral data and information collated from different agencies. The datasets of NWRD are kept in a secured database system with relational integrity and archiving system. After completion of NWMP project in 2001, CEGIS continues its support to maintain and update the database. Several application and user-friendly tools were developed for the planners and users. The accessibility to the database is made widely open in nature so that in future data and information can be accessed through the Web based Internet services. A wide variety of agencies, users, projects and researchers are getting benefits from efficient use of NWRD.

Objectives

The overall objectives of the NWRD operation during the period under review were:

- ◊ Update the existing data on different parameters and make a quality control procedures; for data maintenance and updates to meet the NWMP's requirements;
- ◊ Make the data available to users and define the data ownership;
- ◊ Update the data inventory covering the major data collecting and providing agencies;
- ◊ Make a standard format for data preparation, analysis and map composition; and
- ◊ Future provision of hardware and software updates and recommendations.

Database design and implementation using Oracle

The design and implementation of the NWRD is always given high priority so that the database can be handled with ease and data integrity maintained. NWRD is a geo-spatial database covering information of different features like geo-graphical data, time dependent observations and other tabular data. The ever-increasing growth of NWRD as information base put the database to revisit the build up conditions and functionality for wider users accessibility. During this phase some of the database functionalities have been investigated and updated.

Metadata

Metadata was designed and implemented for all of the data layers of NWRD describing the background information of data. The meta database was redesigned into Access database format for ease in web hosting and flexibility in maintenance. Since the NWRD is a growing database it needs to be flexible to handle and maintain so that the Internet Service Providers (ISP) also can provide facilities with full access (if required).

Data Capturing and Processing

One of the major tasks of NWRD is to maintain a good quality database and update each component out of available information. NWRD also generates and updates the base information of the country using up to date satellite images. To update the data layers in NWRD, a detailed questionnaire survey was conducted covering 33 government and non-government agencies regarding their data holdings and future provision for updates and maintenance.

Updated Data Inventory Report

Data is being constantly collected and processed by the Government agencies, NGOs and projects. The earlier inventory was updated covering a larger number of data collecting agencies (DCA) and the draft report was compiled describing the data holdings of the agencies and mode of dissemination. It is helpful for NWRD as well as to other projects to look into the data availability in the country and the mode of accessibility.

NTWL: Phulbari, 232

Meteorological: Khulna, 42

Sample Photographs of hydro-meteorological stations

Data Collection & Capturing

Data have been collected from different agencies after finalizing the inventory list. Some new data layers have been added to the database and other data have been updated. Data have been collected from Bangladesh Water Development Board (BWDB), Bangladesh Meteorological Department (BMD), Bangladesh Inland Water Transport Authority (BIWTA), Department of Public Health Engineering (DPHE), Geological Survey of Bangladesh (GSB), Soil Resources Development Institute (SRDI), Coastal Embankment Rehabilitation Project (CERP), Department of Fisheries (DoF), Bangladesh Arsenic Mitigation Water Supply Project (BAMWSP), United Nations Children Education Fund (UNICEF) and Bangladesh Bureau of Statistics (BBS). Hydro-meteorological data have been updated up to 2002. Development Contract Agreement (DCAs) should give high priority in the data collection process as all the planning and design are based on the authentic data collection, processing and presentation.

NWRD is updating the base data layers of the country using high-resolution satellite images. Indian Remote Sensing (IRS) with 6-meter resolution panchromatic images was considered as the base of data capturing. The images were geo-referenced with the DGPS system.

NWRD has taken initiative to collect the geo-graphical locations of hydro-meteorological stations of the country. During the field survey relevant field offices were contacted for accessing to a particular stations. A number of stations were not found as illustrated in the old hardcopy maps and/or related attribute information. A total of 200 hydro-meteorological stations were geo-referenced using DGPS/GPS system. The positional accuracy of the location of the stations varied a maximum of 10 meters.

Data Processing

NWRD collates data from DCAs, process it into a suitable database format and make corrections when errors are detected. The reported errors are documented for queries to the concerned agencies for further quality checking. Initial quality checks are done by visual plots, comparison plots, difference plots and/or overlay of features and both data sets are kept in the database. Data processing is a continuous process as NWRD is being updated as and when the data is readily available.

Tools Development and Updates

The existing tools are updated and process information is documented. These existing tools are simple to use and to make them more user-friendly, NWRD enhanced some of the tools in a web-based platform:

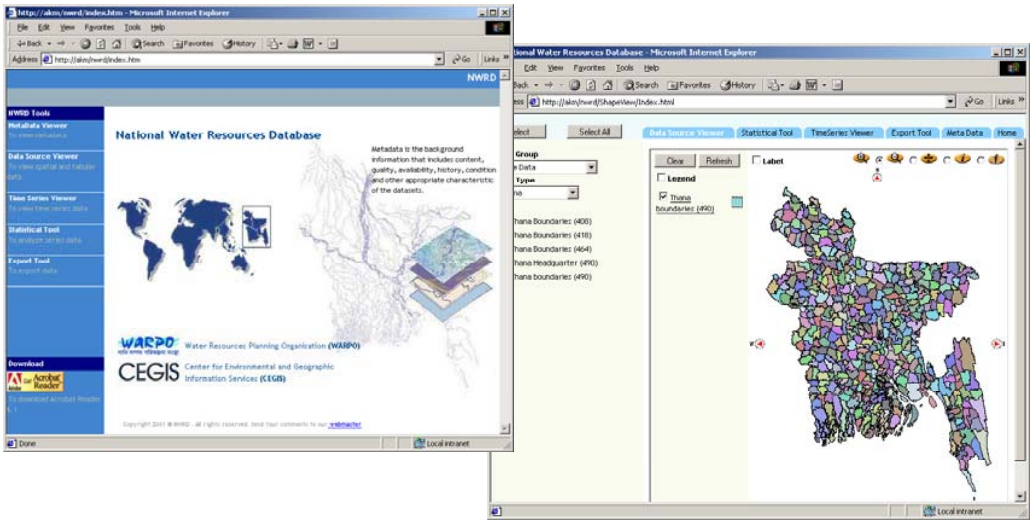
- ◊ Data source viewer, time series viewer, statistical analysis, export tools and metadata in a single portal in web based design
- ◊ Graphical presentation and editing of time dependent data
- ◊ Data dissemination tools

Web based document information system, computer inventory system and update of library information system.

Designs and Description of Tools

The tools are implemented on Web based platform and therefore, users can access the central database from any where on the network. The overall design is made flexible so that in future these tools can be accessed through Internet when the database will be upload into a web server. Users can only access the data, analyze and export to a predefined user format without making any changes of the source data.

All the tools were linked to ORACLE database as it gives more flexibility in handling spatial database as well as other data.



Main portal of NWRD Tools

Data source viewer

This tool is designed to display spatial, temporal, tabular and other types of data. Spatial data are displayed as an image of the shape files. The multiple layers of spatial data can be superimposed.

Time Series Viewer Tool

Time series viewer is a user-friendly tool that can be used to display any time dependant data. Different types of superimposition are the additional facilities for displaying data.

Statistical Tool

Time series Statistical Tool is interactive tool to analyze any time dependent data. Several analysis options are developed to interact with the users and analyzed the raw information to produce the results in table and chart forms.

Export Tool

A user-friendly generic export tool has been designed for easy exporting of data from NWRD server. This tool has been developed to allow users to take copies of the data formatted to their own requirements, which are available in NWRD.

Dissemination Tool

Data Dissemination Tool is a very interactive tool to disseminate data and information from the data server. The major function of this tool is to display and prepare the data availability, data estimation cost, invoice, data receiving form for client, and finally data export.

Document Information System (DIS)

Information has been generated by different projects and activities, which are documented in reports and many other forms. NWRD has designed a web based DIS system by which user can have access to different type of reports generated by WARPO as well as other agencies.

Map Templates for NWRD

NWRD possesses a huge number of data layers, which are designed in an integrated environment. The best way to represent the data is how nicely and neatly the information is presented. Different layouts are necessary to present different types of features. As NWRD produces information on geo-graphical locations, the layout of the maps plays a major role for describing the theme.

A draft map templates document has been developed to represent different information in different page sizes and scale. Also the textural and symbolic features are scaled to present the features in a map for different orientation.

Data Quality

Good quality data is the backbone of any database. The misinterpretation of data generally delays the overall process of planning and implementation of projects or programs. Data collection should always be driven by the planning requirements rather than simple regular monitoring. A standard for data collection process is indeed a primary task, which is urgently needed for getting free and flawless data. Along with the standards, the collection process needs to be improved in keeping with modern technology.

Data Quality: An Overview

The exiting data quality has been investigated for different types of data. As NWRD possesses more than 400 data layers comprising a number of data layers in shape files forms, time series, simple table and pdf formats.

Spatial data: NWRD collates data on spatial data layers as well as generates base information. Different agencies use different projection system for representing the spatial data. In NWRD all spatial data are kept in the BTM (Bangladesh Transverse Mercator) co-ordinate system and in shape file formats. All the data layers are corrected on the basis of Landsat mosaic of 1997 image. The accuracy of the mosaic is considered to be within 25-100 meter. So the spatial data layers, which have been updated shows similar error in the feature extraction.

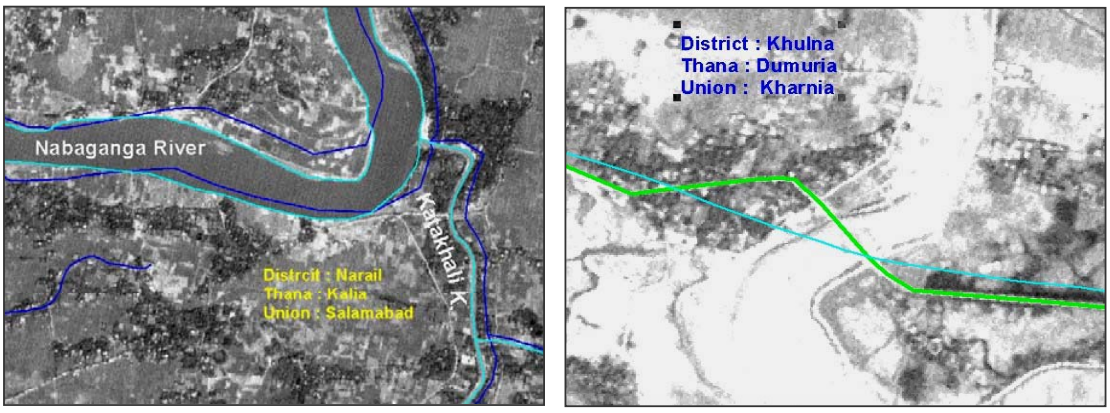
Time series data: Major hydro-meteorological data is being collected by BWDB, BIWTA and BMD on a regular basis. The times series data has been collected from the above agencies from 1995 onwards on different hydrological parameters. The quality of the data has been checked for obvious errors and compared with the neighboring stations for validating the observations.

Simple tabular data: Tabular data are mainly collected from BBS, SRDI, BADC, DoF, DPHE, NMIC and DAE. It covers different information on agriculture, fisheries, environment and other sectors. The hardcopy data are digitized and quality has been checked after digitization by generating plots. Quality of these types of data is very critical to determine as the error (if any) originates from the source of collection.

Improvement of existing data quality

Spatial data: The quality of existing data is in the process of improvement in many different ways. The spatial data is broadly classified as vector and raster. NWRD holds both vector information as well as raster data.

River, road, rail and embankment are line features need to be corrected with proper alignment and distance. To update the linear and polygon features recent satellite images were used to improve the quality of the data. The IRS images with 6 meter resolution were considered as the source of base feature extraction with DGPS corrected geo-referenced images.



Quality improvement of spatial data using geo-referenced IRS images

Temporal data: The time series data has been collated from different agencies with different quality status. The errors in the data are inherent from the field observations due to manual process of collection and processing. It is very difficult to minimize the error easily and clearly as it propagates

from the field. Feedback from the field is very important to effect correction in the observations. The datum of the gauges has to be revisited so that the changes in Reduced Level (RL) can be adjusted in several cases. The times series data in NWRD has been edited in two steps: the long-term hydrograph comparison with the station itself and other adjacent stations; using data driven modeling techniques to eliminate the errors in data.

The first step gives an indication of the error in the data set showing the peak of the observation, which can be easily rectified after visualization of the plots. But changes in trend of the data or interpretation of the missing values need a long-term analysis by observing the characteristics and behavior of event over the years. In this respect data-driven modeling techniques give better result than other statistical analysis. Application of data driven modeling using the Artificial Neural Network (ANN), which is being widely used now for data modeling. The ANN techniques for infilling the partial missing data and full series data generation is shown in the Figure below. The time series data in NWRD are often analyzed using different tools. Some advance statistical analysis methods have been documented for analyzing the temporal data.

Data Dissemination

NWRD is continuously disseminating the updated data to different agencies, projects and researchers. During the year 2003-2004, more than 50 users including around 30 external users like government and non-government agencies have collected spatial, temporal and other data for the planning and design purpose. Other than the data, NWRD disseminate processed information, maps and poster for different agency.

Network Design and Implementation

To hold the huge amount of data and information it needs to keep in a secured database system with full protection and backup facilities. Necessary hardware and software was purchased to optimize the use of the database. The Information Technology (IT) is growing rapidly with new data handling capabilities and technological stride, and so, database needs to be updated on a regular basis in order to keep pace with technology advancement. NWRD has reviewed the existing IT facilities at WARPO and the following recommendations and updates were being sorted out for the smooth management of the information system.

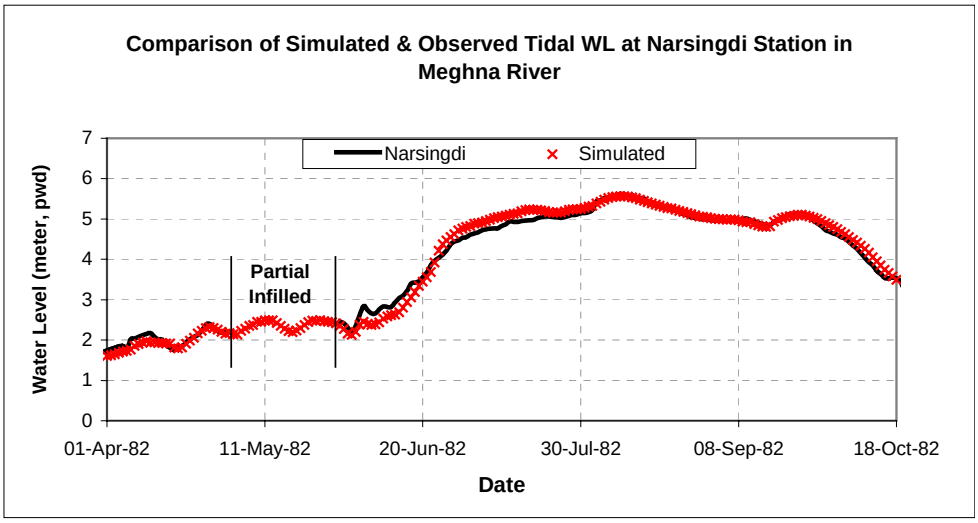


Figure: Data modeling techniques using ANN methods

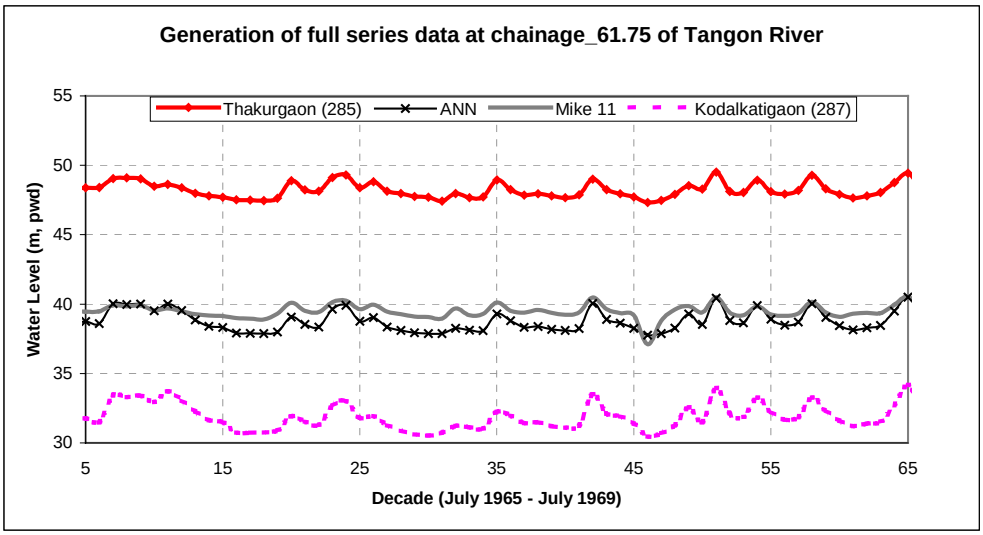


Figure: Data modeling techniques using ANN methods

Present Network System

The present network system is working with Windows 2000 server environment having 50 clients with expansion option up to 125 clients. The new network consists of three servers. Two out of three servers are DELL and the other one is COMPAQ. The whole network has been redesigned and restructured to overcome the problems identified last year. The DELL PowerEdge 4600 serving as master domain controller PowerEdge 2300 serving as backup domain controller for better system redundancy and the COMPAQ serving as member server.

WARPO network is protected by Antivirus software for virus threats. The new data backup system has been introduced for data backup. The intranet mail system has been introduced.

During July-December 2003 WARPO moved to its new premises. Subsequently the LAN infrastructure is redesigned. New and updated network cable (CAT-6) has been installed following standard procedure for cable configuration. The advantage of CAT-6 cable is that it can transfer data at the rate up to 1Gbps. The new infrastructure can handle up to 125 connections.

All the small 10 Mbps hubs have been replaced with 10/100Mbps switches and these switches have 24 ports each and introduced 5 of them to cater to the whole network.

The new server was installed along with the old one. Operating system of these servers has been upgraded to WINDOWS 2000 server with service pack 4.

2.2.5 Twinning Mission for Supporting Institutional Development of WARPO

Twinning Arrangement

Institutional Development of WARPO is pre-requisite to honour its mandate and carry out its functions effectively. This is likely to involve changes to management structure and appointment of more qualified and skilled professionals. An institutional arrangement is necessary to carry out the activities. Twinning arrangement between the Ministry of Water Resources of Bangladesh and the Ministry of Transport, Public Health and Water Management of the Netherlands has been signed on November 22, 2000 to support WARPO in the field of institutional strengthening and capacity building.

Objective

Major objectives of the twinning arrangement are-

- Ensure a long-term basis for inter-agency / institutional collaboration in country's water management sector, based on the policy frame-work of the bi-lateral development cooperation relation worked out between Bangladesh and The Netherlands.

- Support the ongoing transformation process in the water sector of Bangladesh, with an emphasis on multidisciplinary co-operation, management structures, policy development and implementation, and division of tasks and responsibilities between public and private sectors.

- Strengthen capacities in the field of integrated approaches for planning, implementation and maintenance of water and coastal resources and water-related infrastructure.

Duration of the Twinning mission

The Twinning arrangement has been signed for a period of 5 years commencing from November 2000. During these 5 years it is expected to undertake 3 to 4 mission a year.

Task Force

A Task Force (TF) consisting of 12 senior and mid-level professionals of WARPO was constituted as local counter part. The members of the Task Force are:

Mr. Abdul Halim Mia, PSO, Agriculture and Coordinator of Task Force
Dr. Nilufa Islam, PSO, Environment
Mr. Md. Shahjahan, PSO, Economics
Mr. Md. Arzel Hossain Khan, PSO, Water Resources
Mr. Md. Abdul Baten, PSO, Computer and Information
Mr. G J N Murshed, SSO, Economics
Mr. S. M. Shahab Uddin Mahmood, Deputy Secretary
Mr. Md. Siddiqur Rahman, SSO, Water Resources
Mr. Saiful Alam, SSO, Water Resourcess
Mr. Md. Ekram Ullah, SSO, Environment
Mr. Kazi Rezaul Karim, SSO, Engineering
Ms. Nazmun Nahar Chowdhury, Library and Publication Officer

Visit of the Twinning Mission (TM) in Successive Year:

Under the Twining Arrangement the Mission Members completed 6 (six) Visit in successive years, as mentioned below. During their Visit, series of meeting were held with Task Force members. Discussion mainly focused on

- Re arrangement of existing set up of WARPO
- Stakeholder and PEST analysis in relation to Capacity Building of WARPO
- Vision, Mission, Role of WARPO etc.

1st Twinning Mission: November 2001

2nd Twinning Mission: January 2002

3rd Twinning Mission: June 2002

4th Twinning Mission: October - November 2002

5th Twinning Mission: March 2003

6th Twinning Mission: June 2003

Mission during the reporting year

7th Twinning Mission: January 2004

The Seventh Twinning Mission meetings were held with the WARPO Task Force members from January 24 to 28, 2004.

Activities

- PEST[1] Analysis and Stakeholders Analysis.
- Preparation of Organization Development Plan (ODP).

The TM members divided the WARPO Task Force members into two sub-groups to prepare and present their papers on the above mentioned two activities separately. The members of the two groups prepared their brief reports based on the outline given by the TM. Each group presented individual report and shared views with the TM. The TM members opined that each point of the two reports needs to be elaborated further before the next mission comes.

Members of the Twinning Mission

The members of the Twinning Mission are:

Dr. Jaap de Heer
Mr. Rien Van Zetten
Jos Van Alphen

Meeting of WARPO task force with Twining Mission Members

Mission Report

A mission report was prepared by Twinning Mission and Task Force as a joint effort. This report was presented in the wrap up meeting with Secretary, Ministry of Water Resources in the chair, by the Director General, WARPO together with Task Force Coordinator and Twining Mission members at the end of mission. The report contained:

- An overview of the activities carried out by TF and TM;
- Monitor of progress in the capacity building process in relation to the Action Plan and the ToR;
- A brief discussion on the successes achieved and the problems encountered so far;
- Next steps and results expected out of the upcoming mission according to the road map.

The mission reports was then distributed to: Minister, Secretary, DG BWDB, DG WARPO, Task Force, Twinning Mission, Twinning Committee, RNE, World Bank and ADB.

PEST[1] analysis is to examine the political commitment, economic viability, social and environmental acceptability and soundness and technical feasibility of the priority programs/ projects and overall role to be played by the concerned agencies and organization (BWDB, WARPO etc. in water sector).

2.3 FUTURE ACTIVITIES

2.3.1 Impact Assessment of the Proposed Indian River Linking Project for Inter Basin Water Transfer

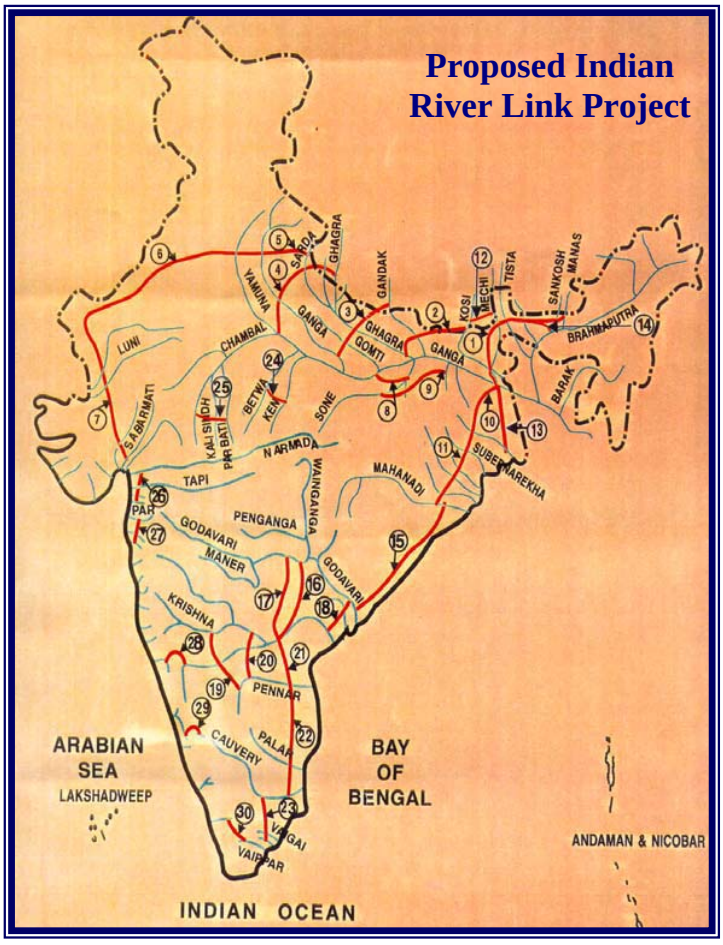
Introduction

The Government of India has been implementing the feasibility study of a mega program namely "Inter-linking the Major Rivers of India" following the National Perspective Plan, 1980 (NPP) for water resources development of India by inter-linking major rivers in the region. About 173 billion cubic meter (BCM) of water from the so-called north-eastern *'water surplus'* region will be transferred to the western and the southern arid and semiarid region of India by constructing 30 river links, some 3,000 storages and 12,500 Km of canal through inter-linking 37 major rivers as presented in the Figure below. Preliminary assessment shows that the project if implemented will cause widespread irreversible and disastrous impact on economy, environment and livelihood of the people of Bangladesh.

HIMALAYAN COMPONENT

NAME OF THE LINKS

1. Brahmaputra-Ganga (MSTG)
2. Kosi-Ghagra
3. Gandak-Ganga
4. Ghagra-Yamuna
5. Sarda-Yamuna
6. Yamuna-Rajasthan
7. Rajasthan-Sabarmati
8. Chunar-Sone Barrage
9. Sone Dam-Southern Tributaries of Ganga
10. Ganga-Damodar-Subernarekha
11. Subernarekha-Mahanadi
12. Kosi-Mechi
13. Farakka-Sunderbans
14. Brahmaputra-**Ganga (JTF) (ALT)**



PENINSULAR COMPONENT

NAME OF THE LINKS

15. Mahanadi (Mani Bhadra) - Godavari (Dowlaiswram)
16. Godavari (Inchampalli Low Dam) - Krishna (Nagarjunasagar Tail Pond)
17. Godavari (Inchampalli) - Krishna (Nagarjunasagar)
18. Godavari (Polavaram) - Krishna (Vijayawada)
19. Krishna (Almatti) - Pennar
20. Krishna (Srisailam)- Pennar
21. Krishna (Nagarjunasagar) - Pennar (Somasila)
22. Pennar (Somasila) - Cauvery (Grand Anicut)
23. Cauvery (Kattalai) - Vaigai-Gundar
24. Ken-Betwa
25. Prabati-Kalisindh-Chambal
26. Par-Tapi-Narmada
27. **Damanganga-Pinjal**
28. **Bedti-Varda**
29. **Netravati-Hemavati**
30. Pamba-Achankovil-Vaippar

Objectives

Overall objective of the study is to investigate on possible changes of the state of water resources system and its impact on the socio-economic and environmental situation in Bangladesh due to proposed IRLP.

Scope of Work

- *Data collection and acquisition*
- Assessment of the year round surface water availability in rivers during the next 50 years
- *Assessment of water demand scenarios in Bangladesh and India in the next 50 years*
- Investigation on probable scenarios of inter-basin transfer/water withdrawal by India
- Environmental study to quantify the adverse impacts on ecosystem, both on land and water
- *Socio-Economic Study of the country in the wake of water withdrawal*
- *A database would be developed for future reference and updating the study on the regional water resources development.*
- *Recommend in-country preparation for combating the new situation*
- *Others*

Duration of the Project:

The project duration will be one and half years from July 2004 up till December 2005.

2.3.2 Strategies for Reducing Vulnerability to Floods

Introduction

Bangladesh has witnessed several unprecedented flood. Severe flood ruins the economy of the country and causes immense hardship on livelihoods of the people. The Bangladesh Water and Flood Management Strategy (BWFMS), 1995 summarized the lessons learnt through implementation of the FAP and recommended a combination of structural and non-structural measures for future flood management in the country. It is important now to review the current approach of the country on flood management and develop revised strategies to reduce future vulnerabilities originated from flood disaster.

Objectives

The overall goal of the study is to develop a comprehensive understanding of recent floods and propose actions/guidelines to facilitate future preparedness in facing major floods through policy and practices and thereby reduce vulnerability due to flood. The specific objectives are as follows:

- To learn lessons from the past for preparing for the future
- To facilitate changing the conventional mind set and influence present practices to become more proactive for combating flood
- To develop a protocol for damage assessment by different sector
- To develop a sector-wise user manual that can be used as standard guideline for flood preparedness
- To conduct an Environmental Assessment with focus on urban flooding in Dhaka City and propose actions to be embodied in the Master Plan.
- To facilitate preparation of a transitional strategy linked with the long term policy and strategy for major floods
- Proposal for a medium-term and long-term plan of action

Scope of Work

The study will encompass the following major component tasks:

- Analysis of recent major flood events (with special focus on flood 2004)
- Assessment of damages due to flood
- Flood vulnerability assessment
- Managing urban flood- Dhaka city
- Comprehensive and integrated flood management policy and strategy for Bangladesh

Management

A Project Steering Committee and a Project Implementation Committee has been proposed for implementation of the study. WARPO would lead the implementation of the study. WARPO would have the overall responsibility to coordinate and supervise the study through Technical Committee.

2.3.3 Surface Water Development for Safe Drinking Water Supply in the Arsenic Affected Area in Bangladesh

Introduction

Arsenic contamination of shallow aquifer in Bangladesh is an unprecedented water quality catastrophe in the recent history. Groundwater based drinking water sources in 61 out of 64 districts of Bangladesh are contaminated by arsenic. It is estimated that 27% of the shallow tubewells in the country, spread over **268 Upazilas** are contaminated with arsenic above Bangladesh standard of 0.05mg/L as drinking water quality. Around 35 million people are affected in the areas. Field surveys have identified 13,872 patient with arsenic related illness. Several options are being suggested and tested in the area for arsenic mitigation including those based on surface water sources. However an integrated approach to determine alternative options is still lacking. The proposed study will develop a methodology for decision making on alternative options for drinking water supply and prepare a integrated plan emphasizing surface water source for drinking water supply. The proposed project is in compliance with the draft National Arsenic Policy.

Objective

- Assess surface water resources availability;
- Develop a methodology for systematic appraisal of different alternative options for drinking water supply;
- Develop a strategy and implementation plan for surface water use as sources for drinking water supply in the arsenic affected areas.

Outputs

- In-depth surface water resources availability and quality analysis in the arsenic affected area;
- Development of a GIS database on contamination and resources available of all the sources;
- Develop a computational framework and tools to evaluate alternative options for drinking water supply;
- Prepare a Report on strategy and implementation plan for using Surface Water as an alternative sources in the arsenic affected area.

Inputs

A baseline information database on status of arsenic contamination, surface water availability and quality status and the implementation status of the alternative options in the arsenic affected area will be created.

Implementation Ministry: Ministry of Water Resources

Lead Agency : Water Resources Planning Organization (WARPO)

Partner Organization : DPHE, BWDB,CEGIS and IWM

2.3.4 Monitoring of Implementation of National Water Management Plan (NWMP)

Introduction

National Water Management Plan (NWMP) has been approved on 31st March 2004 and NWRC directed WARPO to oversee its implementation as per guideline available in NWPo. According to the NWPo, the NWMP will be implemented by different agencies. WARPO will take apex role in national planning and monitoring the implementation of the plan.

Objective

Overall objective of the project would be to assist the local level planning of integrated Water Resources Management (IWRM) and also to assist planning commission in the process of clearing of projects and monitor and coordinate the implementation of NWMP.

Specific objectives

- Assisting local level Planning by developing and improving different procedures, guidelines including delineating hydrological units, water stress areas, flood vulnerable areas and other regulatory zone etc;
- Establishment of WARPO as "Clearing House";
- Establishment of Monitoring and Evaluation for NWMP at WARPO.

Scope of Work

Assisting local planing of Integrated Water Resources Management

As per NWPo, important activities of WARPO as an Apex Planing Organization may be as follows:

- Update of Water Resources Assessment;
- Delineate Hydrological units on regional and sub-regional context;
- Flood vulnerable area;
- Water Stress area;
- Zoning of brackish water for aquaculture etc.

Uncertainty exists on the availability of surface water as well as on groundwater. This requires developing suitable methods, tools and models to work out credible estimates in the next update of NWMP. The in-stream requirements of water resources shares the majority of the total water demand in the country therefore require prudent assessment for future planning. Two PC-II has been prepared costing TK 20 million awaiting Technical assistance.

An approach to delineate water resources management unit is prerequisite for proper management of water to deal with variety of conflicting issues and interest. WARPO has delineated 8-hydrological units for National and Regional Planing and is also mandated to guide delineating units in the sub-regional planning for local water resources management. A comprehensive approach to develop flood zoning and risk maps, delineation of water stress area and zoning brackish water for aquaculture are also important along with hydrological units and would be pursued in this component.

Implementing "Clearing House" role

Coordinating the implementation of projects and programs outlined in the NWMP requires some form of "Clearance" on its consistency with the guideline of NWMP. The National Water Policy (NWPo) requires that WARPO does this role ***for all "water sector projects"*** *and report to the ECNWRC.* According to NWMP the mandated role of "Clearing house" may be seen as a means to assist Planning commission through screening projects as per guidelines of the NWPo before the projects are included in the Annual Development Plan, Three year rolling plan or Five-year plan etc. Initial project concepts would require simple procedure while feasibility reports would need detail screening process.

Some of the guidelines (EIA, IEE, GPP, GWMP, SI etc) are well developed and few needs update for project preparations. Review procedure for EIA Clearance already exist. WARPO may need to prepare a comprehensive guideline integrating all the available guidelines and develop its own procedure for "NWMP" and "Non-NWMP" projects in consultation with different agencies and Planning Commission. The implementation however would require legal cover and executive order.

Implementing Monitoring and Evaluation of NWMP

Monitoring & evaluation of NWMP is another mandated role of WARPO. The function may be conceptualized firstly as to keep track of actions being taken to implement the NWMP and secondly, to determine the extent to which policy objectives are being achieved. This information would be also important in updating the NWMP at five-year intervals, as well as to examine periodically whether the policies set by Government are achieving the desired results. For this purposes it would be required to implement MIS with linkage of NWRD, database of IMED. Based on the evaluation of projects and programs WARPO would have to develop a capacity to develop strategy and framework to the Planing Commission for Annual Development Program.

3 STRENGTHENING WARPO

Introduction

The Water Resources Planning Organization (WARPO) has been entrusted with the mandate for national water resources planning. The overall tasks for WARPO flow from the mandate given to the organization in 1992, the directives of the National Water Policy published in 1999, and the subsequent directives of the National Water Resources Council and its Executive Committee. WARPO has Board of Directors (Parichalna Parishad), and Executive Committee (Nirbahi Committee) for decision-making and Technical Committee for networking and interaction with other agencies. The enacting Ordinance no. 12 of 1992 and the National Water Policy of 1999 (NWPo) explicitly refer to the following "principal responsibilities" of WARPO.

- Planning and strategy formulation, focusing on the preparation and periodically updating of a NWMP;
- Collect and analyze information regarding the utilization of water resources and disseminate the same;
- Support and advise other agencies in water use : assist in studies, assist in an impact;
- Assessment of their water sector interventions;
- Setting up the NWRD and Information Management Systems;
- Acting as a "clearing house" for water sector projects;
- Support to the ECNWRC;
- Improving the level of education coordinating studies; organizing workshops, etc. and
- All other tasks assigned by GoB.

NWMP has been prepared by WARPO. This plan will be updated every five years. The updating of NWMP is a major task of WARPO. The NWMP outlines the necessity of Institutional Development through Capacity Building of WARPO to perform the mandated task effectively.

The Five-year Work Plan for WARPO has already been prepared, which covers the period 2002-2006. This period reflects the initial short-term phase of the National Water Management Plan, and represents a time when WARPO must fully respond to the many challenges ahead in planning, coordinating and monitoring the sectoral development. Thus, in preparing the Work Plan recognition is given to both external and internal needs, the later associated with strengthening the capacity of WARPO.

Strengthening needs

The mandate and five year work plan of WARPO have entrusted the organization with some specific job. The available capacity of WARPO is sufficient to complete their normal job efficiently. But, not sufficient enough to complete its redefined role in an effective, efficient and sustainable manner.

So, the existing multidisciplinary structured WARPO needs to be sufficiently equipped with man, machine etc. to build its capacity, so that it becomes a centre of excellence, characterized by

committed high caliber professionals. A review may be required about organizational structure, staff requirement, logistics support and training needs to fulfil the functional obligation. The strengthening may be focused on the following issues:

- Strengthening of internal organization structure
- Capacity building of WARPO professionals
- An office building

Strengthening of Organisation

The existing manpower of WARPO is not sufficient enough to complete their mandated job. So, step is needed to be taken to revise organization structure with additional high caliber professionals commensurate with its functions in active and efficient manner. The Task Force (TF) of WARPO, with assistance from the Twinning Mission members is already preparing the Organizational Development Plan (ODP) of WARPO, which is expected to be finalised shortly.

Capacity building of WARPO professionals

WARPO is the national apex body in macro-level planning of water resources of the country. It has gained sufficient experience through the implementation of FAP studies and then National Water Management Plan (NWMP). For continuation and upgrading of the internal capabilities, the professionals of WARPO need continuous on-the-job training and exposure to experiences abroad. The training programme needs to be compatible with the functional needs of the organization. The continued education and training will improve the skills of the existing manpower, institutional capacity as well as providing planning and management support to other water related agencies. This skill development involves:

- Skill development in Integrated Water Resources Management (IWRM) towards/ upgrading of NWMP.
- Skill development in macro level planning and management.
- Acquaintance with modern tools and techniques.
- Skill development in monitoring and evaluation of NWMP programmes implementation.
- Skill development in presentation capability and organising seminars (national and international), preparing training guidelines and manuals.
- Skill development in Participatory Planning Capacity with special emphasis on Social-Gender issues as well as environmental concern.
- Skill development in coordinating water sector activities with stakeholders involving GoB, line agencies, LGIs and Development partners.
- Skill development in research works in collaboration with National and International Universities/Research Institutes.

Office Building

The location of WARPO office changed six times since its establishment in 1992. In the process of shifting, WARPO lost much of its valuable documents and equipment. Moreover, this frequent movement involved a lot of hassles and considerable suffering as well as drained out huge amount of government money during shiftings and relocation.

At present Integrated Coastal Zone Management Plan (ICZMP), South West Area Integrated Water Resources Management Plan, Environmental Monitoring Information Network for Water Resources Project (EMIN) are under implementation by WARPO. Some other projects are also in the pipeline for implementation.

So long as WARPO is stationed in a rented house, there would be naturally a trend of deterioration and replication of previous cycles. In order to sustain this organisation and to perform its mandate in the future, a way of breaking this cycle of shifting must be found. For continuing and upgrading the internal institutional capacity of WARPO, National Water Resources Database as well as to make WARPO as a centre of excellence in water resources sector, a permanent office building for WARPO is a must.

A permanent office complex of WARPO is needed to be constructed with a provision to accommodate other institutions like CEGIS and IWM who have connection with macro level planning. In this context, provision has been made in the proposed PCP of Water Management Improvement Project (WMIP) to construct office building of WARPO.

4 LIBRARY & PUBLICATION

Library Activities

WARPO possesses a well- organized and rich Library stuffed with various category of water-sector Study Reports as well as those relevant to other allied sectors like agriculture, land, fisheries, environment, climate change, flood, river-bank erosion, coastal zone, public health, water and sanitation, etc. Being web-enable and serving as an easy–searching computerized cataloguing system, the library is regularly updated; WARPO authority and its Staff are always relentless in enriching the library as a valuable resource center to serve multi-sector planners, professionals, academicians and practitioners.

As to WARPO Library's utilization during the period under review, the following may be referred to:

Nearly 70 (seventy) potential external Users responding donor agencies, NGOs and other non-government office, semi-government and autonomous bodies, University Departments, etc., had visited this resource center to browse documents of their interest and need and capture info/data relevant to their academic and/or professional purpose;

165 (one hundred and sixty-five) new documents, reports, journals, newsletters etc., have been added to the Library inventory during the period, and sufficient number of books, documents, etc., have been lent out on borrowing system.

Some of the important books are:

1. Draft code of conduct for the sustainable management of mangrove ecosystems, Donald J. Macintosh and Elizabeth C. Ashton.

2. Probabilistic model for dry season hydrographs in the Ganges-Jamuna-Padma and available water after meeting in-stream requirement, final report, Institute of Water and Flood Management (IWFM), July 2003.

3. Feasibility study of Kairdhala Ratna FCDI project, final report, BWDB, March 2003.

4. Coastal Embankment Rehabilitation Project, implementation completion report, World Bank, June 2003.

5. Water balance model (WBM) South West Region, version – 1.0, CEGIS, June 2003.

6. Feasibility study of Jadukata-Rakti river improvement project, final report, BWDB, May 2003.

7. Feasibility study for a comprehensive study for drainage and flood management in the Manu-Dhalai-Kushiyara-Khowai systems, accompanying report on sub-project segregation, BWDB, July 2003.

8. Feasibility study for a comprehensive study for drainage and flood management in the Manu-Dhalai-Kushiyara-Khowai systems, final report, main report, annex, BWDB, June 2003.

9. Bangladesh Arsenic Mitigation Water Supply Project (BAMWSP), national screening program-phase I & II (42 Upazila) data book (vol. 01), National Arsenic Mitigation Information Center, August 2003.

10. Draft guidelines on strategic planning and management of water resources, Dr. Douglas Webster and Ti Le-Huu, UNESCAP, 30 June 2003.

11. Linkages and flood impacts: some evidence at macro level – The case of Bangladesh, geography and environmental management paper no. 30, K. M. Nabiul Islam, BIDS.

12. Flood loss potentials and construction of standard loss data sets – A case study of residential sector of Bangladesh, research report 169, K. M. Nabiul Islam, BIDS, August 2001.

13. The impacts of flooding and methods of assessment in Urban areas of Bangladesh, thesis, K. M. Nabiul Islam, 1997.

14. The public procurement regulations, 2003.

15. Report of the committee on surface water development and management for drinking water supply in the arsenic affected areas of Bangladesh, Ministry of Local Government, Rural Development & Co-Operatives, July 2003.

16. Second small scale water resources development sector project, Patuakhali district water management assessment, final draft, June 2003.

17. Second small scale water resources development sector project, Lakshamipur district water management assessment, final draft, June 2003.

18. Command Area Development Project, project completion report, & final report, BWDB, September 2003.

19. Water for all: The water policy of the Asian Development Bank, October 2000.

20. Bangladesh towards developing effective water security strategy: The empowerment challenges for the poorest by Hafiz Uddin Ahmed B. B, Ministry of Water Resources, 4-5 November, 2003.

21. Analytical framework for the planning of integrated water resources management, WARPO & CEGIS, December 2003.

22. Integrated Coastal Zone Management Plan Project, proceedings of district level consultations on the draft coastal zone policy (September – October 2003), WARPO, December 2003.

23. Role of engineers in poverty reduction, IEB, 2004.

24. ICZMP Project, inventory of projects & initiatives in the coastal zone (update 2003), PDO-ICZMP, December 2003.

25. Border/Common rivers of Bangladesh, BWDB.

26. Second Small Scale Water Resources Development Sector Project: Lakshmipur district water resources assessment, LGED, December 2003.

27. Second Small Scale Water Resources Development Sector Project: Patuakhali district water resources assessment, LGED, December 2003.

28. Integrated water resources management, Global Water Partnership, June 2003.

29. Feasibility Study for Improvement of Flood Forecasting and Warning Services in the People's Republic of Bangladesh, Final report, Volume I, II, III, & IV, JICA, December 2003.

30. Final report on Barind Environmental Action Plan (BEAP), BMDA, April 2003.

31. Report of the Water Resources management: thematic sub-committee (group 10) contribution towards preparation of the Poverty Reduction Strategy Paper (PRSP) for Bangladesh, first draft, April 2004.

32. Living in the coast peoples and livelihoods, PDO-ICZMP, March 2004.

33. Compendium on selected laws relating to and/or having bearing on coastal areas, working paper 029, PDO-ICZMP, March 2004.

34. The procedures for implementation of The Public Procurement Regulations 2003, Ministry of Planning, March 2004.

News clippings on water and water related issues (environment, public health, fisheries, agriculture, sanitation, sewerage, water logging, flood, river, pollution etc.) are preserved from different important daily newspapers.

Many important reports and pictures are scanned and preserved under digital section of library.

Publication

The 6th issue of WARPO Newsletter has been published in October 2003, with the information of WARPO new office building and it's activities. This issue also has a fresher look of updated National Water Resources Database (NWRD). Information about all ongoing projects and projects in the pipeline are also available in this issue.

5 VISITORS

Minister's Visit

The Honourable Minister, Ministry of Water Resources, Mr. Hafizuddin Ahmad, M.P (Bir Bikram) along with Mr Saifuddin Ahmed, Secretary of the Ministry visited Water Resources Planning Organization (WARPO) on 4th August 2003. The Minister was cordially received by the Director General, WARPO, and was briefed about the activities of the organization. During his visit he met the officers of WARPO and had an open and congenial discussion on various issues of WARPO and water resources of the country. At the onset of discussion, the Minister thanked DG and officers of WARPO for inviting him in this organization.

The Minister mentioned with due importance that water is a scarce and single most important resource for our well being. That is why its proper uses have to be ensured in all respects of our life. As Bangladesh is an agrarian country and its agricultural practices largely depend on water so we must take appropriate measures for its management, conservation and discreet and balanced use.

The Minister also said that, it is unfortunate, as a lower riparian country we do not have any control on this valuable resource. As a result our waters have faced aggression of others due to unilateral upstream diversion. The Minister expressed his expectation that the technologists of our country will come forward with confidence to solve the problems like flood, water scarcity during the wet and dry season, river erosion and sedimentation by their own knowledge and expertise own technologies.

Mr. Hafizuddin Ahmad, Bir Bikram, Honorable Minister, MoWR & Mr. Saifuddin Ahmad, Secretary, MoWR during their visit to WARPO (4.08.03)

The Minister apprehended that the "Link canal Project" proposed by India will be very much detrimental and disastrous to our national interest. He hoped that WARPO should have clear directives for others on this issue. It is an important task of WARPO to make proper plan for saving country's water resources. He requested WARPO to take preliminary work on this proposal.

The Minister expressed his positive opinion on WARPO's own permanent building when he was informed that since the creation of WARPO it is shifting from one place to another for which WARPO is losing its institutional memories.

He again thanked all the officers of WARPO and expressed his willingness to visit WARPO again within a short time.

Professionals and Researchers

A good number of professionals from different government and non- government Organization, Teachers, Students, and Researchers visited the WARPO office for study of reports, collection of information and data on water as well as all relevant sector.

6 TRAINING AND WORKSHOP

Since its establishment, emphasis has been given to develop the skill and knowledge of the WARPO professionals through on job training, higher studies, workshop, seminar etc. in home and abroad. During 2003-2004 some of the WARPO personnel attended workshop, seminar and training program in home and abroad. The details of which are furnished below:

Local Training

Sl. No.	Name of Course	Duration	Organizing Agency	No. of Participants
1.	Training of "Basic Computer Operation of Windows XP"	5 days	Modernization of MoWR Financial Management Capability Project Funded by CIDA	6
2.	Regional Meeting of National Water Sector Apex Bodies	5 days	ADB	2
3.	National Training Course on Public Procurement	3 weeks	IMED	1
4.	Computer Application & English Language	21 days	Regional Public Administration Centre, Dhaka	1
5.	Computer Application of English Language	25 days	Regional Public Administration Centre, Dhaka	1
6.	Introduction to Computer & Application Package under Women in Development (WID) Programme	1 month 5 days	Bangladesh Computer Council	1
7.	Project Management Course	6 days	IMED	4
8.	Colombo Plan Training Workshop on Application of Latest Decision Making Support System and Techniques in Water Resources Planning Management	3 days	UNDP	1
9.	Project Management Course	6 days	IMED	7
10.	Sustainable Coastal Development Cost-2003	1 month 3 days	SSPA, Sweden	1
11.	Project Management Course	6 days	IMED	6

Foreign Training/Workshop/Seminar

Sl. No.	Name and Designation	Country Visits	Duration	Field of Study
1.	H. S. Mozaddad Faruque Director General	Netherlands	19-23 April, 2004	Twinning Committee Meeting.
2.	H. S. Mozaddad Faruque Director General	Vietnam	18-22 May, 2004	Regional Meeting of National Water Sector Apex Body.
3.	Md. Abdul Baten, PSO	Vietnam	18-22 May, 2004	Regional Meeting of National Water Sector Apex Body.
4.	Abdul Halim Mia, PSO	Mumbai, India	7-9 April, 2004	**IAEA/RCA MEETING FOR SENIOR MANAGERS OF END-USERS DEVELOPMENTS ON APPLICATION OF ISOTOPE TECHNIQUES IN GROUND WATER CONTAMINATION**
5.	Hasan Parvez, SSO	Malaysia	12-16 June, 2004	Aquatic Resources Are More Than Fish: The Eco-System Approach in Inland Fisheries And Role of Intra Country Linkage.

7 FINANCIAL MANAGEMENT

Water Resources Planning Organization (WARPO) is a national organization with the mandate of a statutory Public Authority under the Ministry of Water Resources, Government of the Peoples Republic of Bangladesh. The Annual Expenses are being borne by development and revenue budget of the government.

The development budget was made available through the Annual Development Programme (ADP) for the on-going development project under the WARPO. Moreover, an amount of Tk. 2.85 lakh was received from different organization as cost for supplying Water Resources data and information.

The total budget and expenditure during the year 2003 - 2004 is presented below:

SL No	Fund Released		Expenditure		Balance
	Source	Tk (in lakh)	Description	Taka (in lakh)	
1.	**Project** a) Integrated coastal zone Management Project b) EMIN Project.	1019.00 407.00	**Project** a. Integrated coastal Zone Management Projects EMIN Project	873.00 400.00	146.00 7.00
	Sub-total:	1426.00		1273.00	
2.	**Revenue Budget**	141.85	a. Pay and allowances b. others	78.22 47.25	16.38 --
3.	**Other income (own)**	2.85			
	Total	1570.70		1398.47	169.38

Director Generals of WARPO

Mr. Md. Tutiar Rahman
(01-01-1992 to 15-02-1992
& 28-12-1994 to 31-12-1995)

Mr. Md. Taslim Uddin
(15-02-1992 to 17-07-1994)

Mr. Liaquat Hossain
(17-07-1994 to 27-12-1994)

Mr.Masroor-ul Haq Siddiqi BU
(31-12-1995 to 30-12-1997)

Mr.Md. Abdul Wahab (In-charge)
(30-06-1997 to 12-10-1997)

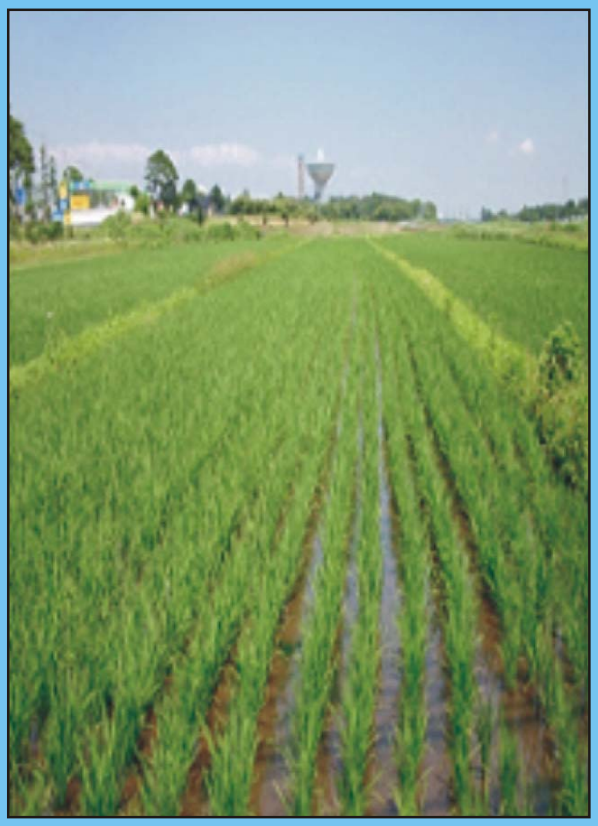
Mr. A. K. M. Halimur Rahman
(12-10-1997 to 10-03-1999)

Mr.Tauhidul Anwar Khan
(10-03-1999 to 16-09-2000)

Dr. M.A. Quassem
(17-09-2000 to 30-12-2001)

Mr Giasuddin Ahmed Choudhury
(30-12-2001 to 05-10-2002)

Mr. Hossain Shahid Mozaddad Faruque
(05-10-2002 to 19-11-2002 (ADl.C), 19-11-2002 to 19-05-2003,
21-05-2003 to 01-06-2004, 03-06-2004 to 08-02-2005,
14-02-2005 continuing)



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