



Government of the People's Republic of Bangladesh  
Ministry of Water Resources

# **National Water Management Plan**

Volume 3

Investment Portfolio

December 2001

**WARPO**  
পানি সম্পদ পরিকল্পনা সংস্থা

Water Resources Planning Organization



Government of the People's Republic of Bangladesh

Ministry of Water Resources

## **National Water Management Plan**

Volume 3

Investment Portfolio

December 2001

Approved by

National Water Resources Council on March 31, 2004

**Water Resources Planning Organization**

# National Water Management Plan Volumes

**1      Summary**

**2      Main Report**

Part A: The Context

Part B: The National Water Management Plan

Part C: Implementation Arrangements

**3      Investment Portfolio**

**4      Regional Plans**

**5      Supporting Information**

Annex A: The National Water Policy

Annex B: Development Strategy for the NWMP

Annex C: Environmental Assessment

Annex D: Supporting Information

## Programme List

Cluster: Institutional Development	
MIS Ref	Programme Name
ID 001	Local Government Needs Assessment for Water Management
ID 002	Independent Regulatory Bodies for Water Supply and Sanitation Service Sector
ID 003	FCD and FCD/I Management Rationalisation
ID 004	BWDB Regional and Sub-regional Management Strengthening
ID 005	Local Government Capacity Building for Water Management
ID 006	WARPO Capacity Building
ID 007	Department of Environment Capacity Building
ID 008	Disaster Management Bureau Capacity Building
ID 009	Department of Meteorology Capacity Building
ID 010	BWDB Capacity Building
Cluster: Enabling Environment	
MIS Ref	Programme Name
EE 001	Support to the Preparation of New Legislation
EE 002	Field Testing of Participatory Management Models
EE 003	Water Resources Legislation – Preparation of Supporting Ordinances
EE 004	Project Preparation Procedures – Guidelines and Manuals
EE 005	Regulatory and Economic Instruments
EE 006	Field Testing and Finalisation of the Guidelines for Participatory Water Management
EE 007	NWRD Improved Data Collection and Processing Facilities
EE 008	Water Resources Management Research and Development Studies
EE 009	Water Resources Management Long Term Research and Development
EE 010	Raising Public Awareness in the Wise Use and Management of Water
EE 011	Private Sector Participation in Water Management
EE 012	Water and Environment Funds
EE 013	Alternative Financing Methods for Water Management
Cluster: Main Rivers	
MIS Ref	Programme Name
MR 001	Main Rivers Studies and Research Programmes
MR 002	Main Rivers Abstraction Projects
MR 003	Ganges Barrage and Ancillary Works
MR 004	Meghna Barrage and Ancillary Works
MR 005	Brahmaputra Barrage and Ancillary Works
MR 006	Regional River Management and Improvement
MR 007	Ganges Dependent Area Regional Surface Water Distribution Networks
MR 008	North East and South East Regional Surface Water Distribution Networks
MR 009	North Central and North West Regional Surface Water Distribution Networks
MR 010	Main Rivers Erosion Control at Selected Locations
MR 011	River Dredging for Navigation
MR 012	Hydropower Development and Upgrading
Cluster: Towns and Rural Areas	
MIS Ref	Programme Name
TR 001	Urban Arsenic Mitigation
TR 002	Rural Arsenic Mitigation
TR 003	Large and Small Town Water Supply and Distribution Systems
TR 004	Rural Water Supply and Distribution Systems
TR 005	Large and Small Town Sanitation and Sewerage Systems
TR 006	Rural Sanitation
TR 007	Large and Small Town Flood Protection
TR 008	Large and Small Town Stormwater Drainage



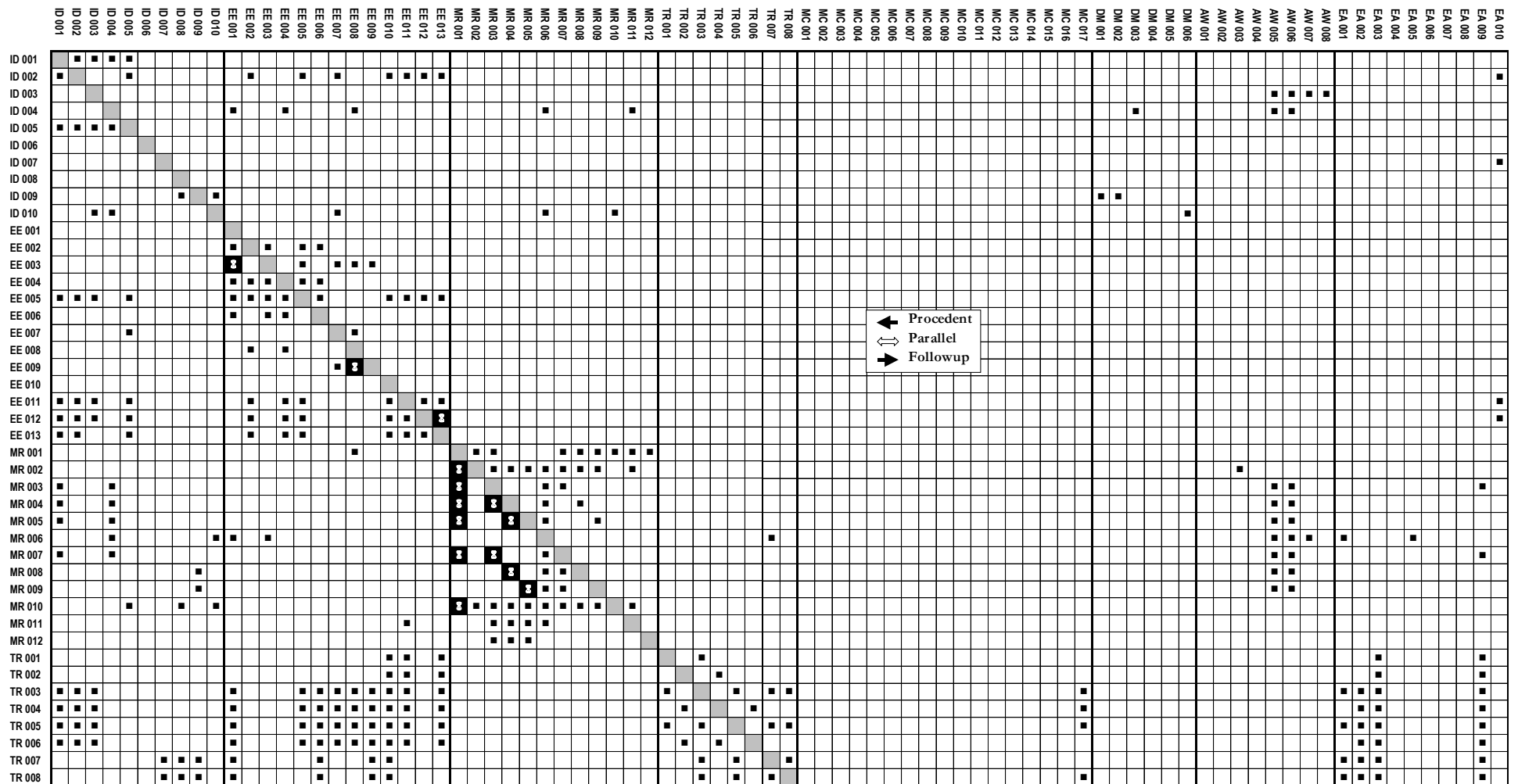
<b>Cluster: Major Cities</b>	
<b>MIS Ref</b>	<b>Programme Name</b>
MC 001	Inventory and Asset Management Plan of the Water Supply and Sanitation Sector
MC 002	Dhaka Bulk Water Supply and Distribution Systems
MC 003	Chittagong Bulk Water Supply and Distribution Systems
MC 004	Khulna Bulk Water Supply and Distribution Systems
MC 005	Rajshahi Bulk Water Supply and Distribution Systems
MC 006	Dhaka Sanitation and Sewerage Systems
MC 007	Chittagong Sanitation and Sewerage Systems
MC 008	Khulna Sanitation and Sewerage Systems
MC 009	Rajshahi Sanitation and Sewerage Systems
MC 010	Dhaka Flood Protection
MC 011	Dhaka Stormwater Drainage
MC 012	Chittagong Flood Protection
MC 013	Chittagong Stormwater Drainage
MC 014	Khulna Flood Protection
MC 015	Khulna Stormwater Drainage
MC 016	Rajshahi Flood Protection
MC 017	Rajshahi Stormwater Drainage
<b>Cluster: Disaster Management</b>	
<b>MIS Ref</b>	<b>Programme Name</b>
DM 001	Cyclone Shelters and Killas
DM 002	Bari-level Cyclone Shelters
DM 003	Flood Proofing in the Charlands and Haor Basin
DM 004	National, Regional and Key Feeder Roads - Flood Proofing
DM 005	Railway Flood Proofing
DM 006	Supplementary Irrigation and Drought Proofing of Rural Water Supplies
<b>Cluster: Agriculture and Water Management</b>	
<b>MIS Ref</b>	<b>Programme Name</b>
AW 001	Promotion of Expanded Minor Irrigation and Improved On-farm Water Management
AW 002	Improved Performance of Existing Public Surface Water Irrigation Schemes
AW 003	New Public Surface Water Irrigation Schemes
AW 004	New Public Deep Tubewell Irrigation Schemes
AW 005	Improved Water Management at Local Government Level
AW 006	Improved Water Management at Community Level
AW 007	Rationalisation of Existing FCD Infrastructure
AW 008	Land Reclamation, Coastal Protection and Aforestation
<b>Cluster: Environment and Aquatic Resources</b>	
<b>MIS Ref</b>	<b>Programme Name</b>
EA 001	National Pollution Control Plan
EA 002	National Clean-up of Existing Industrial Pollution
EA 003	National Water Quality Monitoring
EA 004	National Fisheries Master Plan
EA 005	National Fish Pass Programme
EA 006	Unspecified Regional Programmes
EA 007	Improved Water Management in the Haor Basins of the North East Region
EA 008	Environmentally Critical Areas and Integrated Wetland Management
EA 009	Improved Water Management and Salinity Control in the Sundarbans
EA 010	Public Awareness Raising and Empowerment in respect of Environmental Issues

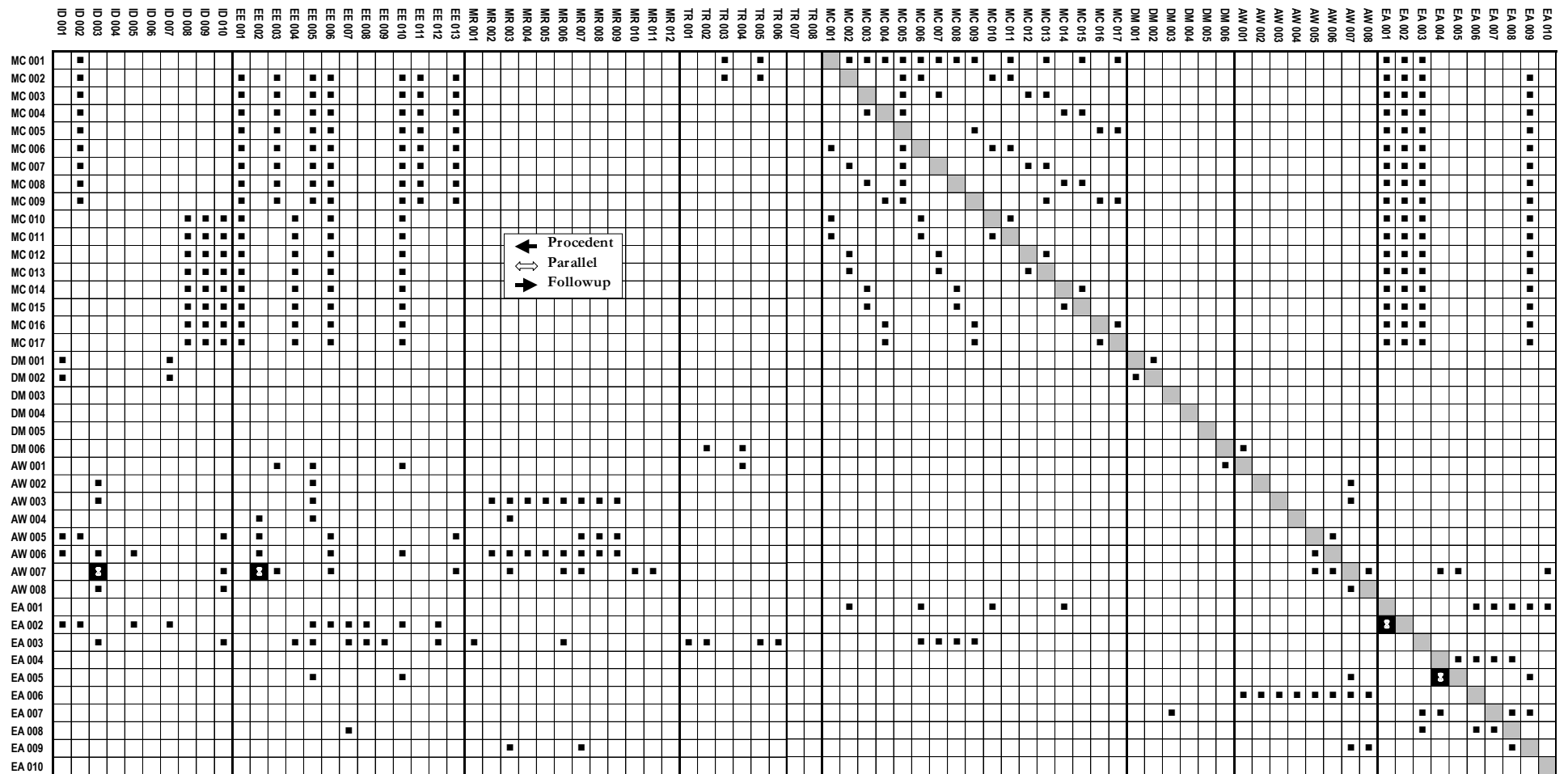
## Agency Responsibilities

[illegible]



## Linkage between Programmes





■ Technical linkage

↔ Phasing linkage



# **Institutional Development**



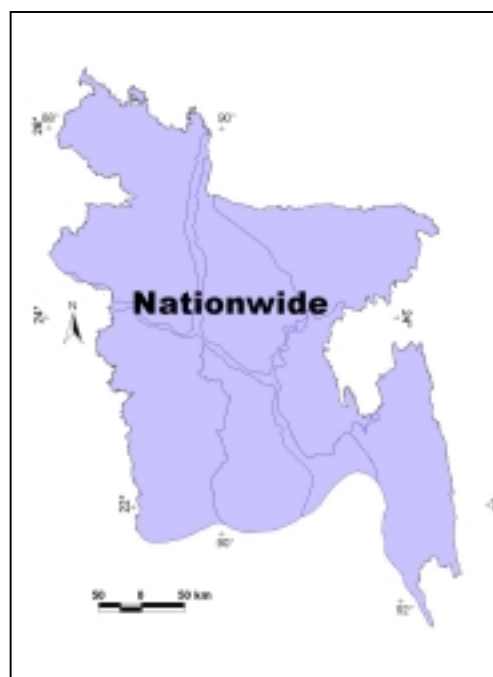


**Local Government Needs Assessment for Water Management**

Ref: ID 001

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide Significance****Relevance to NWPo**

The NWPo introduces significant new roles and responsibilities for Local Government Institutions. In particular §4.2 Article e requires LGI's to implement FCD/I projects having a command area less than or equal to 1000ha, while Article f calls upon LGI's to be the principle agencies for coordinating stakeholder participation at all stages of water sector project cycles. Equally §4.3 Article e allows the central Government to decentralize water allocation rights to the LGI's. The preamble to §4.4 establishes the principle that LGI's have a role to play in the community level resource management. §4.4b Article e provides for the possibility of LGI involvement in the joint management of non-municipal water schemes over 5000ha, while Article f requires the ownership of FCD and FCD/I projects with command areas less than or equal to 1000 ha to be transferred to LGI's.

**Purpose of Programme**

As a result of the NWPo, LGI's will become progressively responsible (with community groups) for the management of all FCD schemes up to 5000ha, and for the raising of operation and maintenance tariffs through local resources. They may also play an important role in supporting the management of larger schemes by autonomous bodies. In addition, LGI's will be responsible for development of community cyclone protection and will work with NGO's in support of bari-level cyclone and flood proofing programmes. They will also have essential roles to play as regards the development of improved water supply and sanitation facilities in the rural areas. Equally, in the urban sector, paurashava and city corporations will become increasingly autonomous and responsible (directly or through WASA's) for the provision of all water-related services. Such new responsibilities clearly represent a challenge for the LGI's which have little or no historic experience of water sector development and are in any case generally weak or non-existent (the DSR reports that three out of four levels of Parishad have yet to be established). The DSR also concludes that considerable efforts will be needed to strengthen local planning and management capacity if it is to evolve in a manner that adequately reflects local issues while remaining, or indeed becoming compatible with national plans as well as with those of the line agencies. To this end the programme has two objectives and they are linked. The first objective is to identify management structures, procedures and human resources needed by the LGI's if they are to take on the management of local water resources and channel systems; water supply and sanitation development; urban and peri-urban services as well as cyclone protection facilities. An expected feature of the resulting management structure is likely to be a central training support unit based within the Ministry of Local Government and Rural Development. The

second objective is to identify the steps necessary to achieve these ends and the human resource training needs.

## Programme Outline

In acknowledgement of the need to make solid progress in the water sector decentralization process, the programme will take place in the short term while the outstanding LGI's are still being established. In fact, by identifying suitable institutional arrangements and their associated capacity building implications and during or before LGI establishment will increase the chances of the institutions becoming effective as early as possible. Management and training needs assessments will therefore be carried out as follows. A study of potential LGI water sector operations will identify appropriate measures to allow LGIs control over development funding in their areas of responsibility in the water sector and will cover Paurashavas and each level of Parishad. Inter-alia, the study will cover accountability; loan modalities; alternative means of generating funds; tariffs; oversight and audit; institutional, legal and management requirements and human resource development. At the same time, a parallel study at Zila level will identify and develop appropriate planning mechanisms at Zila level and below. Each will take around 18 months and cover a few contiguous Districts and should explore the modalities of implementing the new policy. Together the studies will inform the preparation of realistic development, capacity building and training plans reflecting the results of broad consultation with all parties and including details of costs, benefits, financing plans, cost recovery, and long term management. Such plans should seek to integrate private sector activities wherever possible, including the employment of Bangladeshi consulting firms while including plans for disposition of FCD projects within the jurisdictional area

Once the two studies are concluded, they will be used to design a responsive training and capacity building programme.

## Financing Arrangements

On the assumption that the studies take place in say, eight locations across the country (each representing one or more Districts with differing development constraints), the costs are expected to total some Tk40M and Tk130M for the LGI and Zila level studies respectively and will be appropriate for Government funding.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"> <li>Outline management structure, procedures and human resource requirements for local water sector development and management by LGI's agreed by all stakeholders</li> </ul>	K	<ul style="list-style-type: none"> <li>Formal agreement of stakeholder agencies</li> </ul>	2004
<ul style="list-style-type: none"> <li>Bangladesh's institutional framework for the water sector regulated, decentralised and devolved according to subsidiarity principles</li> </ul>	D	<ul style="list-style-type: none"> <li>Ratified legal framework</li> </ul>	2019

## Institutional Arrangements

By their very nature, the studies will have to cross ministry boundaries, but should preferably be led by the LGD in collaboration with WARPO and with the support of consultants. The study team themselves should be lead by a senior official in Local Government Division and include

representatives of existing LGIs and CBOs with units from DPHE, LGED and BWDB. WARPO should also participate in an advisory role, both to ensure consistency with NWMP and to help develop linkages between the National Water Resources Database and the local level plans. Community organisations should take a prominent role in setting forth plans for their immediate areas.

### **Existing Documentation**

Background analyses leading to the identification of this programme can be found in Section 4 of the DSR, where specific details are provided in sub-sections 4-4 and 4-5. Other than that, no additional documentation has been identified.

### **Linkages**

There is a clear and direct link with Programme ID 005 (Local Government Capacity Building for Water Management) for which this programme essentially represents the preparatory phase. Less direct, but equally important links also exist with programmes ID 002 (Independent Regulatory Bodies for Water Supply and Sanitation Service Sector); ID 003 (FCD and FCD/I Management Rationalisation); and ID 004 (BWDB Regional and Sub-regional Management Strengthening).

### **Risks and Assumptions**

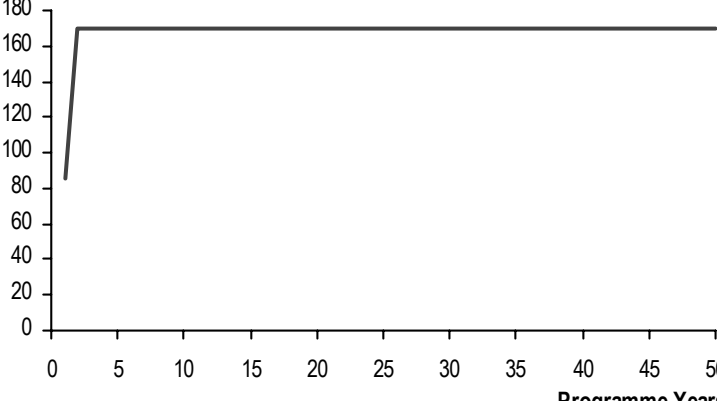
The main risk will be that continuing delays in LGI establishment will compromise the validity of the programme or delay its execution. It is assumed however, that the Government's clearly enunciated and repeated commitment to decentralization along with the advice and support of the donor community will be sufficient to overcome the remaining inertia.



**Local Government Needs Assessment for Water Management**Ref : **ID 001**

Cluster :	Institutional Development		Region(s) :	All	
Focus/Foci :	Local Government Institutions		Location :	Nationwide	
Start Year <sup>1</sup> :	2002	Duration <sup>2</sup> :	2 year(s)	Agency(s) Responsible :	LGD (Lead) None (Supporting)
Short Description :	The NWPo creates new roles for and places new responsibilities on Local Government Institutions. In particular §4.2.e requires LGI's to implement FCD/I projects having a command area less than or equal to 1000ha, while §4.2.f calls upon LGI's to coordinate stakeholder participation at all stages of water sector project cycles. Furthermore, as a result of §4.4.d LGI's will become progressively responsible for the management of all FCD schemes up to 5000ha, as well as for the raising of operation and maintenance tariffs through local resources. This programme assesses the implications of these challenges in terms of the institutional framework and human resource requirements and presents them in the form of a institutional capacity building and human resource development programme document.				

<b>MIS Links</b>	Cost Calculation :	ID Programme costing.xls	Map :	ID 001 Map.jpg
	Disb't Schedule :	ID Programme costing.xls	Description :	ID 001 PgP.doc

Finance								
	Costs			Private	Funding (%)		Expected by	
					GoB	Beneficiaries	Programme	Year
Total Capital <sup>3</sup>	170.00	MTk		0%	100%	0%		2
Ultimate Recurring	0.00	MTk/yr		n/a	n/a	n/a		n/a
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart				
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment ○ Recurring — Total			
Status :	Identified							
Financial Base Year:	mid-2000							
Planned Expenditure (to date) :			0	MTk				
Actual Expenditure <sup>4</sup> (to date) :			0	MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Outline management structure, procedures and human resource requirements for local water sector development and management by LGI's agreed by all stakeholders	• Formal agreement of stakeholder agencies	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 001
Title	Local Government Needs Assessment for Water Management

### Assumptions:

Taka/US\$	51.000	TA duration	2.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	84.0	20,000		85.7	0.0%	-
Senior National consultants (all-in rate)	p-m	124.0		150	18.6	0.0%	-
Mid-level National consultants (all-in rate)	p-m	312.0		90	28.1	0.0%	-
Sub-totals					132.4		-
Other general TA programme costs		25%			33.1		-
Specific other TA programme costs	Study tour	2	45000		4.6	0.0%	-
<b>Total TA Costs</b>					<b>170.0</b>		-
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-
<b>Overall Programme Costs</b>							
					170.0		-

### Notes

	Expat	National-1	National-2	Total	
Potential LGI water sector operations	24.0	24.0	40.0	88.0	p-m
Planning mechanisms at Zila level	60.0	100.0	272.0	432.0	p-m
Totals	84.0	124.0	312.0	520.0	p-m

## Independent Regulatory Body for Water Supply and Sanitation Service Sector

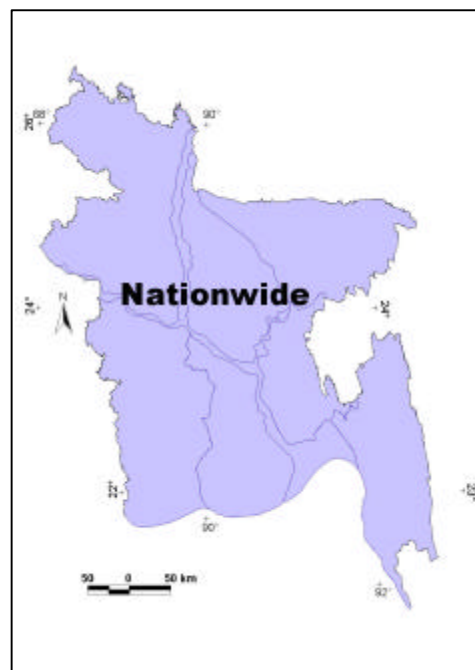
Ref: ID 002

### Basic Data

NWMP Sub-sector      **Institutional Development**Region(s)              **National Significance**

### Relevance to NWPo

NWPo and the National Policy for Safe Water Supply and Sanitation (NPSWSS) both clearly state that private sector participation (PSP) in the water supply and sanitation sector will be promoted in order to access the capital resources, management expertise and performance efficiency of private enterprise. However, for such a partnership to operate satisfactorily in the long term interests of both the consumer and the private investor, there is a clear need for an independent regulatory framework to supervise and monitor the contractual relationship, performance and pricing in a fair and even-handed manner. The NWPo supports this initiative in several key phrases. For example, policy highlights the need “To develop a legal and regulatory environment that will help the process of decentralisation, sound environmental management, and improve the investment climate for the private sector in water development and management”, and that “...there should be a separation of policy, planning and regulatory functions from implementation and operational functions at each level of government”, and “...each institution must be held accountable for financial and operational performance.” The NWMP suggests that independent regulation of the private sector can or will control monopolistic tendencies, improve economic efficiency by encouraging natural monopolies to perform at a socially optimal level, and maintain balance between the potentially competing interests of government, regulated utilities and consumers.



### Purpose of Programme

The main purpose of the programme is to establish an independent regulatory body which will provide a fair and pragmatic framework for the supervision, control and monitoring of private (and possibly public) sector contracts, investment, management and operations in the water supply and sanitation sector. The major challenge will be to establish a regulatory framework which is independent and fair to all parties in setting standards, guidelines and pricing parameters which encourage private investment and give confidence to the consumer that services will improve at an affordable price.

The international trend has been to promote a framework of national principles and guidelines, coupled with regional or local instruments to resolve specific issues and potential conflicts. Lessons for Bangladesh from these experiences are:

- (a) A realistic assessment is needed of actual institutions and government effectiveness. In establishing an effective regulatory framework, institutional restructuring, strengthening and technical training will be key factors;



- (b) The quality and structure of incentives and instruments to be used in the regulatory process are important factors in the creation of a fair balance between the consumer and private sector companies;
- (c) Creation of a regulatory framework does not guarantee effective regulation. Implementation of the regulatory controls needs to be monitored carefully;
- (d) Administrative and financial independence is a central requirement if a regulatory agency is to function effectively. Regulatory and operational functions must be clearly separated;
- (e) GoB needs to develop an innovative regulatory framework with incentives to attract private investment to small cities and towns. Local private companies, with relevant expertise, should be encouraged to participate in order to increase competition; and
- (f) Fully “independent” regulation is difficult to achieve without strong safeguards and a willingness to limit political interference. In this context, the Government needs to guarantee, formalise and institutionalise its commitments to consumers and investors.

In theory, the scope of an independent regulatory framework could also be broadened to cover public sector operators (e.g. DWASA, CWASA and municipal operations) and community-based schemes in the water supply and sanitation sector. This may present considerable difficulties in the short to medium term given the poor performance of most public sector operators in the sector. However, the proposed study will examine the implications of this alternative.

The Government will also complement this initiative with parallel and supporting programmes under the NWMP (see “Linkages”). It should be stated also that the proposed regulatory body will not have any direct responsibility for environmental regulation (e.g. polluting wastewater discharges to surface water and groundwater). This is the responsibility of the Department of Environment, and is currently being strengthened with external assistance from UNDP and Canada.

## **Programme Outline**

The study and manual for an Independent Regulatory Body for the Water Supply and Sanitation Sector will be commissioned within the next two years. It is expected that the project programme will cover the following major topics, among others:

- (a) Review of international experience with regulatory bodies in the water supply and sanitation sector;
- (b) Review of relevant institutional, financial and legal issues in Bangladesh;
- (c) Analysis of alternative independent regulatory structure appropriate for Bangladesh;
- (d) Results of wide-ranging stakeholder consultation process;
- (e) Institutional and legal requirements for an Independent Regulatory Body;
- (f) Financing and training requirements for an Independent Regulatory Body;
- (g) Detailed regulatory framework and manual; and
- (h) Recommendations for a time-bound Action Plan to establish the Independent Regulatory Body.

Within the analysis of alternative independent regulatory structures (see: item (c) above), it is expected that the presentation will include, among other options: (i) private sector involvement only; (ii) public and private sector operations (i.e. including DWASA, CWASA, municipal operations, and community-based schemes); (iii) central or regional IRBs; (iv) water supply and sewerage only, excluding sanitation; (v) urban and/or rural water services; and (vi) other combinations.

The first few years of the implementation programme will demonstrate GoB's serious intent to push forward with the process of private sector participation (PSP) and the establishment of an Independent Regulatory Body for the Water Supply and Sanitation Sector.

## Financing Arrangements

The proposed programme (study, manual and action plan) for establishing an Independent Regulatory Body (IRB) for the Water Supply and Sanitation Sector is suitable for GoB funding with the support of the international donor community. The initial funding requirement for Technical Assistance is estimated at Tk75M at mid-2000 prices.

One of the principal outputs of the study will be the Action Plan for the establishment of the IRB. The implementation plan will be costed in detail to cover the first 5 years of operation. The NWMP provides a provisional estimate of Tk1,200M.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Regulatory Framework agreed by Government Stakeholders	I1	• The framework	2006
• Regulatory manual completed and agreed	I2	• The manual • The agreement	2007
• Independent regulatory bodies for water supply and sanitation services established and fully functional	K	• Operational charters of the regulatory bodies • Legal status of the regulatory bodies	2011
• Bangladesh's institutional framework for the water sector regulated, decentralised and devolved according to subsidiarity principles	D	• Ratified legal framework	2019

## Institutional Arrangements

The Local Government Division, in co-ordination with the Ministry of Finance, will be responsible for commissioning the study for Regulatory and Economic Instruments. LGD will be the executing agency, and be responsible for preparing the Terms of Reference and other background documentation.

Institutional arrangements for the implementation of the action plan on an Independent Regulatory Body for the Water and Sanitation Sector will depend on the detailed recommendations of the proposed study.

## References and Documentation

- (a) Strategy Study to Mobilise Finance and Increase Efficiency in the Dhaka Water Supply and Sewerage Sector, Halcrow Management Services Limited, August 1998
- (b) The Water Supply and Sewerage Authority Act (1996) and other legislation

## Linkages

The programme for an Independent Regulatory Body for the Water Supply and Sanitation Sector should be closely linked and co-ordinated with other NWMP programmes, namely: (a) Local Government Needs Assessment for Water Management (ID 001); (b) Local Government Capacity Building for Water Management (ID 005); (c) Field Testing of Participatory Management Models (EE 002); (d) Project Preparation Procedures - Guidelines and Manuals (EE 007); (e) Regulatory and Economic Instruments (EE 005); (f) Raising Public Awareness in the Wise Use and Management of Water (EE 010); (g) Private Sector Participation in Water

Management (EE 011); (h) Water and Environment Funds (EE 012); (i) Alternative Financing Methods for Water Management (EE 013); and (j) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

Preparation and development of the Independent Regulatory Body for Water Supply and Sanitation should also be co-ordinated with Ministry of Water Resources (MoWR), WARPO, Ministry of Industry (MoI), Ministry of Agriculture (MoA), Ministry of Environment and Forests (MoEF), Bangladesh Water Development Board (BWDB), Department of Public Health Engineering (DPHE), Local Government Engineering Department (LGED), Department of Environment (DoE), DWASA, CWASA, Local Government authorities, NGOs, the private sector and other stakeholders.

### **Risks and Assumptions**

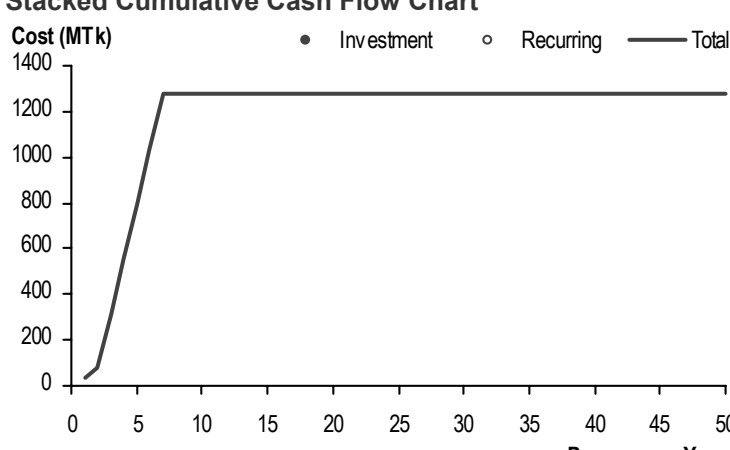
The risks associated with the commissioning and execution of the proposed IRB Study and Manual are minimal, providing well qualified international consultants are engaged to carry out the work. The main risks will arise after the study and manual have been completed. They will fall into two categories: institutional and financial. The institutional risks are twofold: firstly, whether there is sufficient political will and commitment to carry out the IRB programme; and secondly, whether government line agencies and enterprises will provide effective support and co-operation to implement the proposals. The NWPo and NPSWSS give clear statements that private sector participation is an integral part of water sector policy; therefore, GoB must give sustained support if the additional financial resources and management expertise are to be forthcoming from the private sector. In this context, parallel co-ordination and implementation of the EE Programmes will be crucial. The main financial risk is that if the IRB programme is not effectively implemented then the private sector may not have the necessary confidence that the Government will regulate the sector in a fair and acceptable manner. This will result in less domestic private sector investment and will delay indefinitely the possibility of foreign private investment. It may also discourage some international donor support for the water sector.

## Independent Regulatory Bodies for Water Supply and Sanitation Service Sector

Ref : **ID 002**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>New Regulatory Bodies</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>7 year(s)</b>
		Agency(s) Responsible :	<b>LGD</b> (Lead) <b>MoFinance,</b> (Supporting) <b>New agencies</b>
Short Description :	Initially, this programme will begin by studying options for the establishment of a regulatory framework for water supply and sanitation as well as the institutional demands thereof. This preliminary stage will be followed by the establishment and mandating of the institutions themselves. It is anticipated that existing institutions will be able to accept some of the responsibility; even so a clear need for new, specialist agencies is foreseen.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 002 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 002 PgP.doc

Finance							
	Costs		Private	Funding (%)	Expected by		
				GoB	Beneficiaries		
					ProgrammeYear		
Total Capital <sup>3</sup>	1,275.00 MTk		0%	100%	0%	7	
Ultimate Recurring	0.00 MTk/yr		n/a	n/a	n/a	n/a	
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart			
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring	— Total
Status :	Identified						
Financial Base Year:	mid-2000						
Planned Expenditure (to date) :	0 MTk						
Actual Expenditure <sup>4</sup> (to date) :	0 MTk						
							

## Monitoring

Objective	Indicator	Present Status <sup>5</sup>
• Regulatory Framework agreed by Government Stakeholders	• The framework	NYD
• Regulatory manual completed and agreed	• The manual • The agreement	NYD
• Independent regulatory bodies for water supply and sanitation services established and fully functional	• Operational charters of the regulatory bodies • Legal status of the regulatory bodies	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	ID 002
Title	Independent Regulatory Bodies for Water Supply and Sanitation Service Sector

*Assumptions:*

Taka/US\$	51.000	TA duration	2.0	years	All prices in mid-2000 values
		Investment duration	5.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	48.0	20,000		49.0		
Senior National consultants (all-in rate)	p-m	36.0		150	5.4		
Mid-level National consultants (all-in rate)	p-m	63.0		90	5.7		
Sub-totals					60.0		
Other general TA programme costs		25%			15.0		
Specific other TA programme costs					-		
<b>Total TA Costs</b>					<b>75.0</b>		
<b>Other Programme Costs</b>							
1. Provision for setting up body(ies)	LS	1			1,200.0	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>1,200.0</b>		-
<b>Overall Programme Costs</b>							
					<b>1,275.0</b>		-

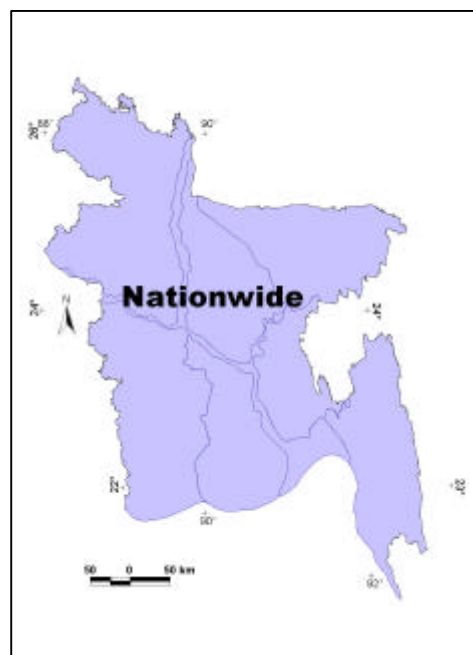


**FCD and FCD/I Management Rationalisation**

Ref: ID 003

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **National Significance****Relevance to NWPo**

Realising that the ultimate success of public water resources management projects depends on the peoples acceptance and ownership of each project, it is the policy of the Government that: *'The management of public water schemes, barring municipal schemes, with a command area up to 5000ha will be gradually made over to local and community organisations and their O&M will be financed through local resources.'* (Clause 4.04d) and; *'Ownership of FCD and FCDI projects with command area of 1000ha or less will gradually be transferred to the local governments, beginning with the ones that are being satisfactorily managed and operated by the beneficiary/ community organisations.'* (Clause 4.04f)

**Purpose of Programme**

In adhering to the principles outlined by policy, a future institutional framework is expected to include measures to enable: a) Existing FCD infrastructure (up to 5000ha), currently operated by BWDB/LGED, will be handed over to local government and/or community groups as soon as sustainable mechanisms to effect the transfer are established. And; b) Existing and new FCD(I) projects over 5000ha will be progressively transferred to autonomous operating authorities, constituted in a manner determined through trial and testing. The purpose of this programme therefore, is to carry out pilot studies of alternative institutional models to effect the management transfer of FCD(I) schemes to local Government, community organisations, or new autonomous bodies in accordance with policy.

**Programme Outline**

Year 1 of the programme would be spent preparing detailed plans for the pilot phase testing. Some six to eight schemes would be carefully selected for the testing. Four possible modes have been suggested:

- i) Hand-over to Local Government
- ii) Hand-over to beneficiaries
- iii) Joint management by BWDB and beneficiaries
- iv) Establishment of a joint non-profit making management company owned by BWDB and Local Government Institutions.

Other models may be considered providing they comply with Government Policy and efforts would be made at an early stage to identify these through intensive local consultation.

These models would be tested during years 2 to 6, concurrently with environmental audit (in accordance with NEMAP requirements) and requisite civil works arising from the outcome of participatory planning involving all stakeholders.

In parallel to the above a full inventory would be made of BWDB schemes including an assessment of the physical condition of the works. A programme of environmental audit would also be launched.

The results of the pilot testing, the asset survey and the audits conducted would be compiled in years 4 to 6 and a plan of action would be drawn up for the remaining BWDB schemes. Up to a further ten years may be required to implement this proposed management plan for the existing BWDB schemes (which would be implemented under Programmes AW 002 and AW 007).

## Financing Arrangements

This programme is suitable for GoB funding (possibly with donor assistance) and is expected to cost approximately 1,300 TkM.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Reduction in the number of schemes directly managed by BWDB	I1	• Nationwide FCD(/I) statistics	2019
• Increase in funds for O&M after turnover of scheme	I2	• Scheme accounts	N/A
• 75% of decentralised FCD/I schemes considered sustainable within 10 years of transfer	K	• National FCD/I scheme statistics	2019
• Bangladesh's institutional framework for the water sector regulated, decentralised and devolved according to subsidiarity principles	D	• Ratified legal framework	2019

## Institutional Arrangements

Preparation of the management plan would be the responsibility of BWDB. In view of the wide range of skills required, Technical Assistance (TA) would be required. Implementation arrangements will be determined on the basis of the management plan but are expected to involve LGIs, CBOs, and WUGs as well as further TA.

## Existing Documentation

A start was made on a scheme-by-scheme assessment during the Water Sector Improvement Project preparatory studies, but handover was not considered in detail. Documentation on the CARE flood proofing project and the LGED Small Scale Water Resources Development Project may also provide useful information regarding previous management transfer attempts in the Bangladesh water sector.

## Linkages

There will be an obvious linkage with AW 007 'Rationalisation of Existing FCD Infrastructure' as well as possible links with AW 008 'Coastal Protection and Aforestation' and MR 006 'Regional River Management and Improvement'.

## **Risks and Assumptions**

Transfer of management responsibilities may meet with considerable resistance, particularly when financial responsibilities are included as well. However a suitably tactful and consultative process at all stages of the programme should minimise these problems. Other risks include inadequate or subjective evaluation of pilot schemes that would result in further unsustainability at scheme level.

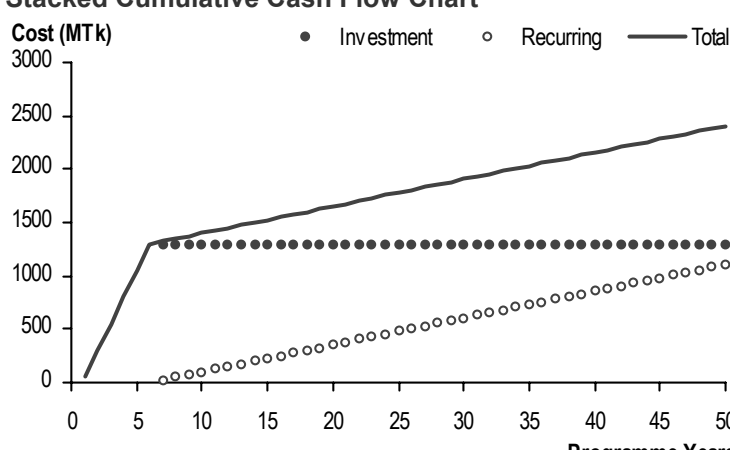
**FCD and FCD/I Management Rationalisation**

Ref :

**ID 003**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Bangladesh Water Development Board</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>6 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>None</b> (Supporting)
Short Description :	This programme is intended to facilitate the transfer of FCD/I scheme management as per policy. Three steps will be involved. In the short term BWDB will receive capacity building with respect to environmental and social issues, while in consultation with the stakeholders a range of transfer options will be identified and prepared. Finally these options will be pilot tested at selected locations during the short and medium term.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 003 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 003 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme		Year	
	Total Capital <sup>3</sup>		1,300.00 MTk	0%	85%	15%	6		
	Ultimate Recurring		25.20 MTk/yr	n/a	50%	50%	7		
	Date of Data :		31 07 01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment ○ Recurring — Total				
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	MTk								
Actual Expenditure <sup>4</sup> (to date) :	MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Reduction in the number of schemes directly managed by BWDB	• Nationwide FCD(I) statistics	NYD
• Increase in funds for O&M after turnover of scheme	• Scheme accounts	NYD
• 75% of decentralised FCD/I schemes considered sustainable within 10 years of transfer	• National FCD/I scheme statistics	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 003
Title	FCD and FCD/I Management Rationalisation

### Assumptions:

Taka/US\$	51.000	TA duration	1.0	years	All prices in mid-2000 values
		Investment duration	5.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	28.0	20,000		28.6		
Senior National consultants (all-in rate)	p-m	28.0		150	4.2	0.0%	-
Mid-level National consultants (all-in rate)	p-m	80.0		90	7.2	0.0%	-
Sub-totals					40.0		-
Other general TA programme costs		25%			10.0		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					<b>50.0</b>		<b>-</b>
<b>Other Programme Costs</b>							
1. Pilot scheme investment (rehabilitation)	ha	45,000		20	900.0	2.8%	25.2
2. TA support for environmental audit	year	5		50,000	250.0	0.0%	-
3. TA support for evaluation of pilot schemes	year	1		50,000	50.0	0.0%	-
4. TA support for long-term management plan	year	1		50,000	50.0	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>1,250.0</b>		<b>25.2</b>
<b>Overall Programme Costs</b>					<b>1,300.0</b>		<b>25.2</b>

### Notes:

Rehabilitation rate is based on NWMPP estimates derived from actual BWDB costs



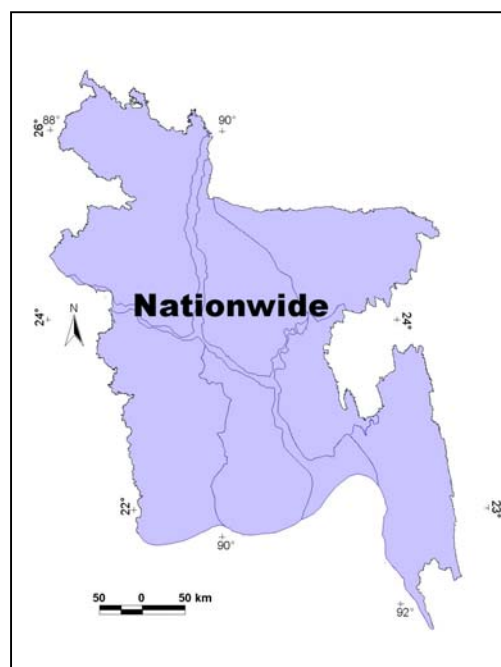
**BWDB Regional and Sub-regional Management Strengthening**

Ref: ID 004

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide Significance****Relevance to NWPo**

The Introduction to the NWPo acknowledges that the most critical issues for water resources management include alternating flood and water scarcity, meeting ever-expanding water needs and massive river sedimentation and bank erosion. Provision of total water quality management and maintenance of the eco-system are also major concerns of Policy. In §3, Policy objectives include harnessing and development of all forms of surface water and ground water in an efficient and equitable manner and bringing about institutional changes to help decentralise the management of water resources.

In §4.2, NWPo directs that, within the macro framework of the NWMP, and (d) sector agencies and local bodies will prepare and implement sub-regional and local water-management plans, (f) ensuring the participation of all project affected persons. Furthermore, agencies will (j) undertake comprehensive development and management of the main rivers (k) for multipurpose use, (l) de-silt watercourses to maintain navigation channels and proper drainage, (n) protect water quality, (p) designate and provide desired levels of flood protection, and (q) develop and implement master plans for river training and erosion control works and for (q) reclamation of land from rivers.

**Purpose of Programme**

Under its Act (2000), BWDB is responsible for controlling the flow of water in all rivers and channels and aquifers. Local Government institutions are already vested with authority to manage local water resources. Recognising this, the Government's strategy is that river improvement programmes will be prepared in an integrated manner giving due importance to all users and environmental and fish migration requirements. The plans will identify dredging and erosion control measures, taking account of new flood protection requirements for areas of high economic importance as defined by Policy. Potential and actual sources of pollution will be identified along with areas of encroachment. In formulating programmes, actions will be prioritised taking account of social, environmental and economic criteria. Activities on regional river systems will be coordinated with improvements to local channel systems in a manner that leads to cost-effective and sustainable improvement of the surface water resource system by all concerned. The purpose of this programme is to provide the necessary support to BWDB to enable the agency to prepare river improvement plans at regional and sub-regional level consistent with the above strategy.

## Programme Outline

The programme will address four main issues to fulfil the objectives above. Firstly support will be provided to establish an inventory of river systems, cataloguing inter alia the condition and general requirements on each river and, whilst doing so, demarcating in principle a mutually acceptable division of responsibilities between BWDB and Local Government. Secondly, support will be provided to BWDB to allocate responsibilities within the organisation for each river and to determine the management structures most suited to ensure effective implementation. Thirdly, within this framework, at least one river will be selected in each of eight hydrological regions, and support provided for BWDB to prepare improvement programmes for each. Lastly, on the basis of the above, support will be provided to BWDB to determine an overall procedure for river improvement programmes, identify and overcome skill and resource gaps and introduce a system for monitoring performance and impacts of the programmes.

## Financing Arrangements

The programme is expected to take 3 years to reach the stage of an agreed approach to river improvement, with a further 3 years to provide training and capacity building necessary for the approach to be made sustainable. The first phase is expected to cost Tk179M and the second Tk71M. Both are suitable for Government funding with the potential for donor support.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Establishment of river inventory with demarcation of BWDB responsibility	I1	• Reports issues and approved by GoB	2004
• BWDB internal organisation structured to plan, develop and manage river improvement programmes with established capacity	K	• Reports issues and approved by GoB and implemented by BWDB • River improvement plans produced at an acceptable quality	2006
• Bangladesh's institutional framework for the water sector regulated, decentralized and devolved according to subsidiarity principles	D	• Ratified legal framework	2019

## Institutional Arrangements

The programme will be implemented by BWDB. Close co-operation will be needed with many water sector agencies with direct and indirect stake in river management. These include WARPO, DoE, BIWTA, Municipalities, Zila parishads, WASAs, LGED, community organisations, irrigation project authorities, private sector (power companies, industry, boat-owners, irrigators, land owners and developers) etc. A critical factor will be achieving consensus between these different groups on planning procedures, dispute resolution and legal enforcement where required. Thus from the outset, BWDB will need to establish a consultative approach with an appropriate forum for debate.

## Existing Documentation

There are many previous studies of existing rivers and river systems available in both WARPO and BWDB archives. The BWDB Act 2000 defines the responsibilities and mandate of the organisation. The various Parishad Acts set out Local Government responsibilities. EGIS has been working on river erosion forecasting, and BWDB and BIWTA have records of sedimentation and dredging. DoE has identified pollution hot-spots and WARPO is working on

fish migration and habitat preservation requirements. SWMC have provided WARPO with hydrodynamic 1-D models of the main rivers of each hydrological region.

## **Linkages**

As stated, this programme will be complemented by other institutional capacity building programmes. It will also have some bearing on several of the Enabling Environment programmes, notably EE 001: Support to Preparation of New legislation, EE 004: Project Preparation Procedures – Guidelines and Manuals, and EE 008: Water Resources Management Research and Development Studies. It will have to fully integrate with all the Main River programmes, and specifically will provide the basis for investment under MR 006: Regional River Management and Improvement, and MR 011: River Dredging for Navigation. Plans for Flood Protection and Stormwater drainage under the MC and TR programmes will need to be taken account of, along with DM 003: Flood Proofing in the Charlands and Haor Basin. Similarly, inter-action with Agriculture and Water Management Programmes will be required, particularly AW 005 and AW 006 dealing with improvements to water management and at Local Government and Community levels. Finally, there is strong linkage with virtually all the Environment and Aquatic Resource programmes.

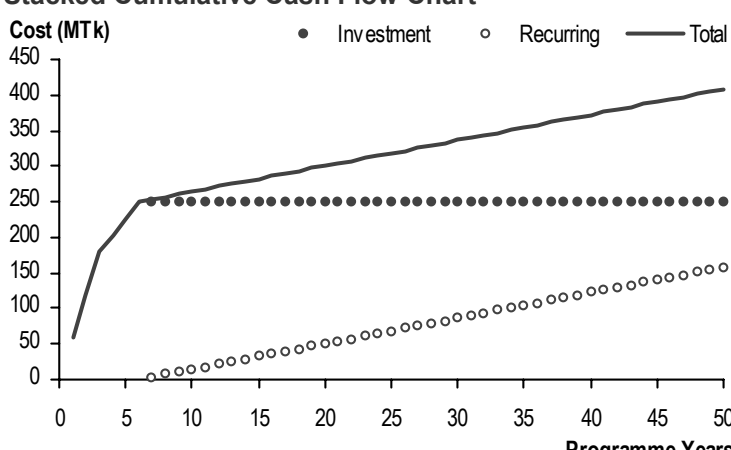
## **Risks and Assumptions**

The main concern relates to the culture change needed within BWDB to move from a centrally driven project-orientated approach to that of long-term integrated management of the river systems in a manner responsive to different needs. The programme seeks to address this through supporting BWDB in finding suitable organisation arrangements and in providing capacity building to help build up the ability of the organisation to field the broad spectrum of skills needed. A second concern is to overcome the ad hoc approach to river management that has characterised many past projects, often driven by political expediency. The sooner BWDB has integrated plans, and the legal backing to enforce them, the quicker this can be overcome.

**BWDB Regional and Sub-regional Management Strengthening**Ref : **ID 004**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Bangladesh Water Development Board</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>6 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>None</b> (Supporting)
Short Description :	According to its Act, BWDB is responsible for controlling the flow of water in all rivers and aquifers. To this end it is the strategy of GoB to prepare integrated river improvement initiatives which give due importance to all stakeholders. This programme is intended to provide the necessary support to BWDB to enable it to prepare such initiatives at regional and sub-regional levels consistent with the GoB strategy.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 004 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 004 PgP.doc

<b>Finance</b>	Costs	Private	Funding (%)	Expected by	
			GoB	Beneficiaries	ProgrammeYear
Total Capital <sup>3</sup>	<b>250.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>6</b>
Ultimate Recurring	<b>3.60</b> MTk/yr	<b>n/a</b>	<b>100%</b>	<b>0%</b>	<b>7</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b> 			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Establishment of river inventory with demarcation of BWDB responsibility	• Reports issued and approved by GoB	NYD
• BWDB internal organisation structured to plan, develop and manage river improvement programmes with established capacity	• Reports issued and approved by GoB and implemented by BWDB • River improvement plans produced at an acceptable quality	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 004
Title	BWDB Regional and Sub-regional Management Strengthening

### Assumptions:

Taka/US\$	51.000	TA duration	3.0	years	All prices in mid-2000 values
		Investment duration	3.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	84.0	20,000		85.7		
Senior National consultants (all-in rate)	p-m	130.0		150	19.5	0.0%	-
Mid-level National consultants (all-in rate)	p-m	136.0		90	12.2	0.0%	-
Sub-totals					117.4		-
Other general TA programme costs		25%			29.4		-
Specific other TA programme costs	River models	8		4,000	32.0	0.0%	-
<b>Total TA Costs</b>					<b>178.8</b>		-
<b>Other Programme Costs</b>					TkM		
1. Training/HRD for BWDB staff in integrated river planning		8		7.1	56.8	0.0%	-
2. Equipment for BWDB Offices		8		1.8	14.4	25.0%	3.6
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>71.2</b>		<b>3.6</b>
<b>Overall Programme Costs</b>					<b>250.0</b>		<b>3.6</b>

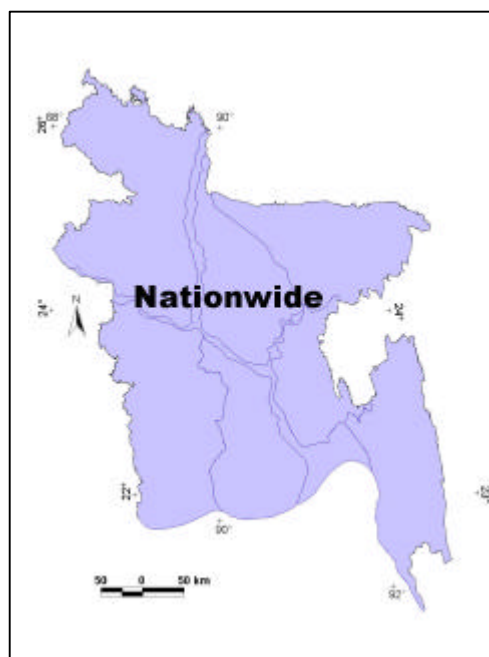
<b>Training Programmes</b>		<b>Regional Design Units</b>		<b>8 No.</b>
Trainees	25 per Regional Unit	Computer equipment	1,125,000	Tk/unit
80% Local	100,000 Tk/trainee	Communication support	200,000	Tk/unit
20% O/seas	20,000 \$/trainee	Miscellaneous other	500,000	Tk/unit
Total	<b>7.1</b> TkM/unit	Total	<b>1.8</b>	TkM/unit

**Local Government Capacity Building for Water Management**

Ref: ID 005

**Basic Data**NWMP Sub-sector **Institutional Development**Region(s) **Nationwide Significance****Relevance to NWPo**

The NWPo introduces significant new roles and responsibilities for Local Government Institutions. In particular §4.2 Article e requires LG's to implement FCD/I projects having a command area less than or equal to 1000ha, while Article f calls upon LG's to be the principle agencies for coordinating stakeholder participation at all stages of water sector project cycles. Equally §4.3 Article e allows the central Government to decentralize water allocation rights to the LG's. The preamble to §4.4 establishes the principle that LG's have a role to play in the community level resource management. §4.4b Article e provides for the possibility of LG involvement in the joint management of non-municipal water schemes over 5000ha, while Article f requires the ownership of FCD and FCD/I projects with command areas less than or equal to 1000ha to be transferred to LG's.

**Purpose of Programme**

As a result of the NWPo, LGI's will become progressively responsible (with community groups) for the management of all FCD schemes up to 5000ha, and for the raising of operation and maintenance tariffs through local resources. They may also play an important role in supporting the management of larger schemes by autonomous bodies. In addition, LGI's will be responsible for development of community cyclone protection and will work with NGO's in support of barrier-level cyclone and flood proofing programmes. They will also have essential roles to play as regards the development of improved water supply and sanitation facilities in the rural areas. Equally, in the urban sector, paurashava and city corporations will become increasingly autonomous and responsible (directly or through WASA's) for the provision of all water-related services. Such new responsibilities clearly represent a challenge for the LGI's which have little or no historic experience of water sector development and are in any case generally weak or non-existent (the DSR reports that three out of four levels of Parishad have yet to be established). The DSR also concludes that considerable efforts will be needed to strengthen local planning and management capacity if it is to evolve in a manner that adequately reflects local issues while remaining, or indeed becoming compatible with national plans as well as with those of the line agencies. This programme is intended to deliver the necessary capacity building and human resource development in response to the needs assessments carried out under Programme ID 001 (Local Government Needs Assessment for Water Management). However, despite this programme's local focus, it will be necessary to include within its components to address the training needs of the LGED, especially in terms of the participatory implementation of small water projects/schemes and of the DPHE in terms of mobilising and working with the private sector.



## Programme Outline

The details of this programme will be defined by ID 001. It is anticipated nevertheless that this programme will begin with the establishment of the Central Training Unit and thereafter comprise a long and sustained effort beginning in the short term of the NWMP and continuing throughout the remainder of its 25 years. During that time it is intended to train a total of 737,900 LGI employees made up as follows:

Civil Administrative level	No of Institutional Entities	Estimated No of Trainees per Entities	Total No of Trainees
Paurashava	206	25	5,150
Zila Parishad	64	20	1,280
Upazila Parishad	464	15	6,960
Union Parishad	4,451	10	44,510
Gram Parishad	68,000	10	680,000
<b>Totals</b>	<b>73,815</b>		<b>737,900</b>

## Financing Arrangements

The programme is expected to cost some Tk12,100M inclusive of 2.5% monitoring and evaluation costs. It is suitable for Government funding.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Programme document for LGI capacity building for local water sector management and development by LGI's	I1	• Signed project document	2005
• Central Training Unit established at the Ministry of Local Government and Rural Development	I2	• Operational charter of the Central Training Unit	2006
• LGI water management operational capacity consistent with the needs of decentralised water management in Bangladesh	K	• Legal status of the Central Training Unit	2027
• Capacities of Bangladesh's restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) management reviews	2027
		• Regular (5 yearly) Independent training review	2027

## Institutional Arrangements

The proposed Central Training Unit (CTU) will be responsible for overall coordination of the programme and will begin by nominating and training District Level Human Resource Development Units (DLHRDUs), one for each District. With CTU assistance these will be responsible for developing their own long term capacity building strategies targeted at decentralised water management and reflecting closely the recommendations of ID 001. Such strategies will then be grant funded from the programme budget which will remain under the control of the CTU which will also provide training materials (as identified by ID 001) while monitoring and evaluating progress. Ideally, District training strategies will have measurable interim objectives which once reached would qualify the District in question for capital funding commensurate with the level of institutional reform and capacity reached as a direct or indirect result of the training and capacity building activities.

## Existing Documentation

Background analyses leading to the identification of this programme can be found in §4 of the DSR, where specific details are provided in sub-sections 4-4 and 4-5. Other than that, no additional documentation has been identified.

## **Linkages**

There is a clear and direct link with Programme ID 001 which represents the preparatory phase for this programme. Less direct, but equally important links also exist with programmes ID 002 (Independent Regulatory Bodies for Water Supply and Sanitation Service Sector); ID 003 (FCD and FCD/I Management Rationalisation); and ID 004 (BWDB Regional and Sub-regional Management Strengthening).

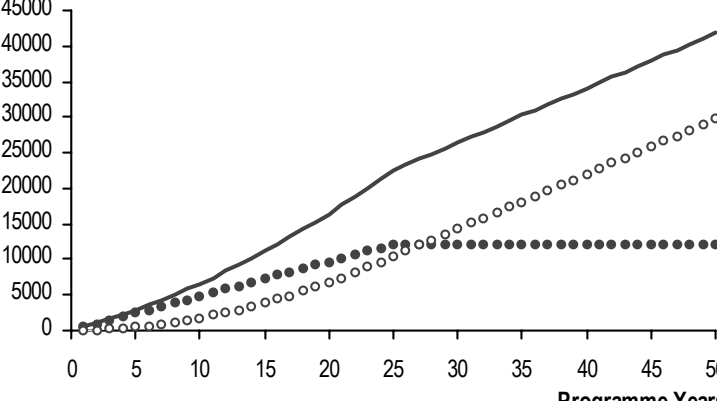
## **Risks and Assumptions**

The main risk will be that continuing delays in LGI establishment will compromise the validity of the programme or delay its execution. It is assumed however, that the Government's clearly enunciated and repeated commitment to decentralisation along with the advice and support of the donor community will be sufficient to overcome the remaining inertia.

**Local Government Capacity Building for Water Management**Ref : **ID 005**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Local Government Institutions</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>25 year(s)</b>
		Agency(s) Responsible :	<b>LGIs</b> (Lead) <b>None</b> (Supporting)
Short Description :	The NWPo creates new roles for and places new responsibilities on Local Government Institutions. In particular §4.2.e requires LGI's to implement FCD/I projects having a command area less than or equal to 1000ha, while §4.2.f calls upon LGI's to coordinate stakeholder participation at all stages of water sector project cycles. Furthermore, as a result of §4.4.d LGI's will become progressively responsible for the management of all FCD schemes up to 5000ha, as well as for the raising of operation and maintenance tariffs through local resources. This programme is intended to deliver the necessary capacity building and human resource development in response to the needs assessments carried out under Programme ID 001 (Local Government Needs Assessment for Water Management). The programme will begin with the establishment of a Central Training Unit and thereafter comprise a long and sustained effort beginning in the short term of the NWMP and continuing throughout the remainder of its 25 years. The programme will include training for both LGED and DPHE to strengthen their		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 005 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 005 PgP.doc

Finance						
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear	
Total Capital <sup>3</sup>	12,100.00 MTk	0%	100%	0%	25	
Ultimate Recurring	771.90 MTk/yr	n/a	100%	0%	26	
Date of Data :	31 07 01	Stacked Cumulative Cash Flow Chart				
	(dd) (mm) (yy)	Cost (MTk)				
Status :	Identified	● Investment ○ Recurring — Total				
Financial Base Year:	mid-2000					
Planned Expenditure (to date) :	0 MTk					
Actual Expenditure <sup>4</sup> (to date) :	0 MTk					

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Programme document for LGI capacity building for local water sector management and development by LGI's	• Signed project document	NYD
• Central Training Unit established at the Ministry of Local Government and Rural Development	• Operational charter of the Central Training Unit • Legal status of the Central Training Unit	NYD
• LGI water management operational capacity consistent with the needs of decentralised water management in Bangladesh	• Regular (5 yearly) management reviews	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design ,supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

## National Water Management Plan

### Programme Costing Sheet

Programme Ref	ID 005
Title	Local Government Capacity Building for Water Management

#### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Local Government staff training					6,768.7	0.0%	-
2. Office equipment					3,859.3	20.0%	771.9
3. Monitoring and evaluation		2.5%			272.0	0.0%	-
4. Strengthening LGED support capacity					600.0	0.0%	-
5. Strengthening DPHE support capacity					600.0	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					12,100.0		771.9
<b>Overall Programme Costs</b>					<b>12,100.0</b>		<b>771.9</b>

#### Local Government Training Costs

Urban centres, consisting of four city corporations (Dhaka, Chittagong, Rajshahi and, added in 1990, Khulna) and 206 Paurashavas, are independent of the Bangladesh territorial administrative structure of six Divisions 64 Zilas, 464 Upazilas, 4451 Unions and 68,000 villages.

	No.	Trainees per entity	Cost per trainee	Total training cost (TkM)	Equipment per entity	Total equip. cost (TkM)	Total cost (TkM)
Paurashava	206	25	42,500	219	250,000	52	270
Zila parishads	64	20	42,500	54	250,000	16	70
Upazila Parishads	464	15	21,250	148	125,000	58	206
Union Parishads	4,451	10	12,750	568	75,000	334	901
Gram Parishads	68,000	10	8,500	5,780	50,000	3,400	9,180
<b>Totals</b>	<b>73,185</b>			<b>6,769</b>		<b>3,859</b>	<b>10,628</b>

**WARPO Capacity Building**

Ref: ID 006

**Basic Data**

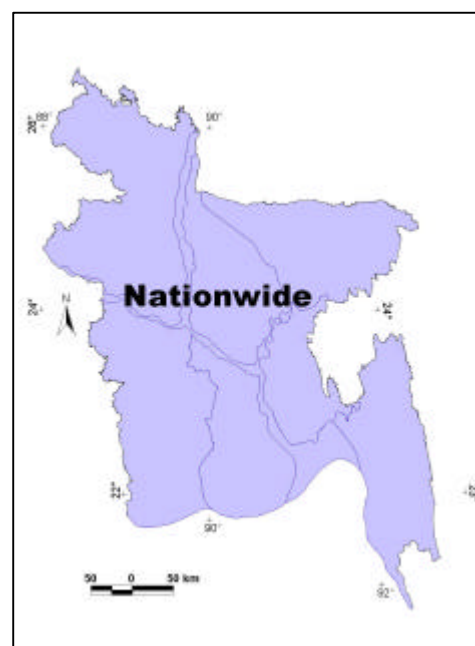
NWMP Sub-sector **Institutional Development**

Region(s) **Nationwide Significance**
**Relevance to NWPo**

§5.d of the NWPo establishes WARPO i) as the exclusive government institution for macro-level water resources planning and ii) as the Executive Secretariat of the ECNWRC.

**Purpose of Programme**

The various responsibilities assigned to WARPO by §5.d of the NWPo can be said to fall into two categories, namely: routine core services and periodic services. They are defined as follows:


**Routine Core Services**

- Maintenance, updating and dissemination of the NWRD
- Upkeep of water resource assessment
- Monitoring implementation of the NWMP and its impacts
- Functioning as a “clearing house” for all water sector projects
- Secretariat to the NWRC/ECNWRC
- Responding to NWRC/ECNWRC requests for information and advice

**Periodic Services**

- Updates of the National Water Management Plan
- Contributions to Five Year Plans
- Provision of ad hoc advice on policy, strategy, institutional and legal issues
- Execution of special studies, research, etc as required from time to time

Clearly if these tasks are to be fulfilled adequately, it will be necessary for WARPO to attract and retain a cadre of focused, permanent staff supported as and when required by reliable, high calibre contracted experts. Equally, in the interests of continuity, WARPO will have to become an attractive career option in terms of long term employment, while housing itself in a permanent functional and purpose built office. Unfortunately however WARPO and indeed its predecessors have suffered considerably from a lack of permanence, with adequate funding support provided only during national plan preparations and little in-between. These cycles of disinterest in WARPO have lead to loss of information and institutional memory. Career opportunities have been very limited, even for WARPO’s few permanent staff, and it is difficult for WARPO to attract and retain the calibre of staff suggested by its new responsibilities under Policy. This programme comprises a pragmatic approach to solving these pernicious problems.

**Programme Outline**

Four parallel strategies will be involved, all deliverable during the short term of the NWMP. The first involves revision of WARPO’s legal establishment, including necessary adjustments to its mandate to bring it fully into line both with NWPo requirements and the functional needs identified in the NWMP. Specific attention will be given in this to WARPO’s role as Secretariat

to the ECNWRC, precise definition of its “clearing house” role and relationships with other planning and monitoring agencies, reinforcing its position of neutrality amongst the many agencies involved in the water sector and reviewing the composition of the WARPO Board of Governors to provide strong and appropriate stewardship. Secondly, steps will be taken to revise WARPO’s staffing structure commensurate with its redefined functions, acknowledging the potential benefits of short term employment of specialists to support periodic activities. Thirdly, a permanent, purpose built high-tech office will be constructed for WARPO, potentially sharing this facility to mutual benefit with other organisations such as SWMC, EGIS and the JRC. Finally, value will be added to these investments by means of a series of capacity building initiatives delivered over a three to five year period with a focus on further strengthening of planning and monitoring capabilities as well the establishment of stronger links with the LGI’s and with line agencies.

## Financing Arrangements

The total cost, all of which will be incurred in the NWMP short-term, is estimated to be Tk660M. All of this is suitable for GoB financing, perhaps with donor assistance.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• WARPO mandate and establishment in line with NWPO and NWMP requirements	I1	• Gazetted Act and approved establishment	2003
• WARPO housed in a purpose built fully equipped high tech facility	I2	• Registered address of WARPO	2004
• WARPO capacity building training programme	I3	• Signed Project Document	2003
• WARPO established as a centre of excellence	K	• Donor confidence • Investor confidence • Correlation between plans and actualities in the water sector	2008
• Capacities of Bangladesh’s restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) independent training reviews	2025

## Institutional Arrangements

WARPO will be the main executor of this programme. Interim steps will be agreed with WARPO’s Board of Governors with further endorsement from the Ministry of Water Resources to whom WARPO at present is administratively attached.

## Existing Documentation

A five year work plan for WARPO is available. It provides a preliminary outline of WARPO capacity building requirements.

## Linkages

Operational linkages will be encouraged with the SWMC for resource modelling; EGIS for NWRD maintenance and broader environmental impact monitoring of water sector development activities, and BIDS for economic and regulatory issues. Administrative linkages will have to be strengthened with the Planning Commission and ideally, philosophical linkages should be established with other related bodies around the world for the purpose of information sharing and exposure to other sectoral solutions/paradigms.

## **Risks and Assumptions**

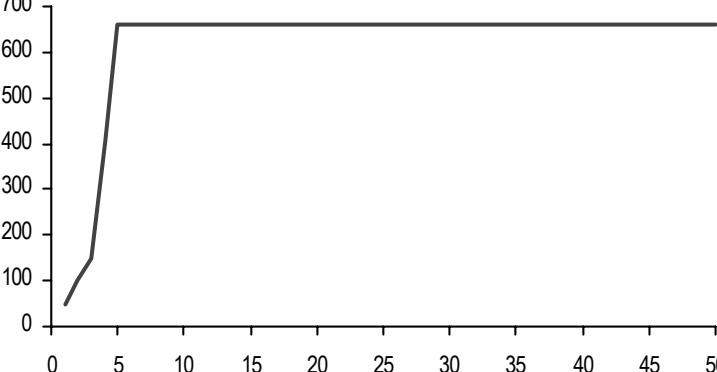
The first main risk concerns the ability of WARPO to attract and retain staff of appropriate calibre. This will be mitigated by placing the organisation in an influential position with an attractive and efficient operating environment, including good career and training prospects. Wider civil service reforms, including the prospects for enhanced performance related employment conditions would also be of direct relevance to WARPO. The second risk is simply that of inaction, leading to a further cyclical collapse of WARPO at a time when it is clearly needed to champion the NWPO as well as guiding and monitoring its implementation under the NWMP. It is reasonable to assume however, that current, strongly enunciated central commitment to institutional reform will be sufficient to overcome this.



**WARPO Capacity Building**Ref : **ID 006**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>WARPO</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2001</b>	Duration <sup>2</sup> :	<b>5 year(s)</b>
		Agency(s) Responsible :	<b>WARPO</b> (Lead) <b>None</b> (Supporting)
Short Description :	WARPO has suffered considerably in the past from a lack of permanence, with adequate funding support being provided only during national plan preparations and little in-between. Furthermore, prevailing employment conditions then, make the appointment and retention of suitable staff difficult. This programme intends to render WARPO sustainable while building its capacity such that it becomes a centre of excellence characterized by committed high calibre staff. This will be achieved by revision of WARPO's legal establishment, restructuring of WARPO staffing, relocation to a permanent suitable office and various capacity building programmes.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 006 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 006 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme	Year		
	Total Capital <sup>3</sup>		660.00 MTk	0%	100%	0%		5	
	Ultimate Recurring		0.00 MTk/yr	n/a	n/a	n/a		n/a	
	Date of Data :		31 07 01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment ○ Recurring — Total				
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• WARPO mandate and establishment in line with NWPo and NWMP requirements	• Gazetted Act and approved establishment	NYD
• WARPO housed in a purpose built fully equipped high tech facility	• Registered address of WARPO	NYD
• WARPO capacity building training programme	• Signed Project Document	NYD
• WARPO established as a centre of excellence	• Donor confidence • Investor confidence • Correlation between plans and actualities in the water sector	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	ID 006
Title	WARPO Capacity Building

*Assumptions:*

Taka/US\$	51.000	TA duration	5.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	115.0	20,000		117.3		
Senior National consultants (all-in rate)	p-m	115.0		150	17.3	0.0%	-
Mid-level National consultants (all-in rate)	p-m	283.0		90	25.5	0.0%	-
Sub-totals					160.0		-
Other general TA programme costs		25%			40.0		-
Specific other TA programme costs	Training and Study tours				50.0	0.0%	-
<b>Total TA Costs</b>					<b>250.0</b>		-
<b>Other Programme Costs</b>							
1. Provision for R&D support	PS				310.0	0.0%	-
2. Permanent building	PS	Upkeep covered by R&D Support			100.0	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>410.0</b>		-
<b>Overall Programme Costs</b>							
<b>Overall Programme Costs</b>					<b>660.0</b>		-

**Department of Environment Capacity Building**

Ref: ID 007

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide****Relevance to NWPo**

Article 4.08 has three clauses with explicit operational implications for the Department of Environment (DoE): (b) requires that effluent disposal is monitored by relevant Government agencies; (c) instructs the DoE and (d) requires that industrial polluters pay for the clean-up of water bodies polluted by them. Equally, the Policy is characterised by numerous implicit references to environmental standards and objectives, most of which have implications for further DoE operations and capacity.

**Purpose of Programme**

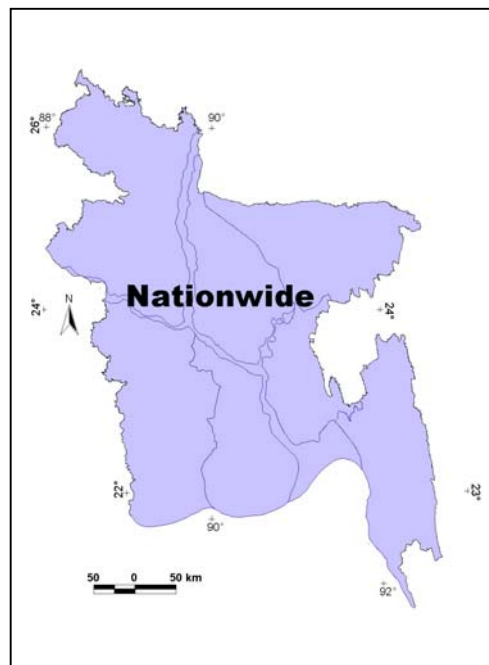
The purpose of the Programme is to strengthen DoE's ability to carry out its duties effectively.

**Programme Outline**

The DoE is the primary institution for environmental management and the setting and enforcement of the environmental regulations. Its key duties related to the water sector include:

- pollution control, including the monitoring of effluent sources and ensuring mitigation of environmental pollution;
- setting the Water Quality Standard (WQS) for particular uses of water and for discharges to water bodies;
- defining EIA procedures and issuing environmental clearance permits, the latter being legal requirements before proposed projects can proceed to implementation;
- providing advice or taking direct action to prevent degradation of the environment;
- declaring Environmentally Critical Areas (ECAs) where the ecosystem has been degraded to a critical state. ECA status confers protection on land and water resources through a series of environmental regulations.

However, the DoE has been consistently under-resourced and needs institutional strengthening. In 1999 the Sustainable Environmental Management Programme (SEMP) began this process, with UNDP and other donor support. SEMP includes a Policy and Institutions sub-programme within SEMP, which has a component on "Capacity Building for Environmental Legislation and Policy Analysis". Linked with this is the Bangladesh Environmental Management Project (BEMP), supported by the Canadian Government, which over a five-year period is strengthening the DoE.



BEMP forms the core of the DoE strengthening effort. Started in 1999, with a total budget of Tk391M, its emphasis is on human resource development, institutional planning, legal and policy matters, strategic planning, awareness raising and resource information systems, linked by practical demonstration projects. The “brown” rather than “green” environment is being given priority. Air pollution is the subject of the first demonstration project and the Buriganga River Pollution Prevention and Control Project is the second. BEMP’s approach is to work closely with industries. A serious constraint on BEMP impact so far has been DoE’s understaffing, which has resulted in low absorptive capacity to technical assistance. Increased staffing has been promised by GoB.

Despite this and other difficulties, BEMP has a vital contribution to make to the improvement of the water-related environment. An effective DoE, as the primary official body responsible, is essential. Due to its relative youth and lack of resources, the DoE will be unable to fulfil its role without a continuing strengthening programme, coupled with increased staffing and budget provisions from GoB. This is likely to be a long-term process.

It is therefore envisaged that the DoE strengthening programme will continue for a further five years after the end of the current phase in June 2004. Based on the cost data in the 2000/01 ADP, the budget remaining at the end of that fiscal year will be Tk218M. If this is fully utilised in the remaining three years, the average annual spend will be around Tk73M. The same level of spend has been assumed for the 5 year period after June 2004, the total cost of the new phase of the programme thus being Tk365M. Part of this continued strengthening programme will need to be put into establishment of DoE representation at Zila level to facilitate environmental oversight and regulation of local level activities as per law.

## Financing Arrangements

Financing will be by GoB, with a major donor contribution expected as at present.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"> <li>Department of Environment capacity building programme agreed by DoE and WARPO</li> </ul>	I1	<ul style="list-style-type: none"> <li>Signed Project Document</li> </ul>	2005
<ul style="list-style-type: none"> <li>Department of Environment capacity building programme completed</li> </ul>	K	<ul style="list-style-type: none"> <li>Ex-post evaluation</li> <li>Programme completion report</li> </ul>	2010
<ul style="list-style-type: none"> <li>Capacities of Bangladesh’s restructured water sector institutions strengthened in line with future demands on them</li> </ul>	D	<ul style="list-style-type: none"> <li>Regular (5 yearly) independent training reviews</li> </ul>	2026

## Institutional Arrangements

As at present, the host agency for the strengthening programme will be the DoE, as the institution being strengthened, and close liaison will be maintained with those SEMP components which are relevant to the Programme.

## Existing Documentation

Mainly BEMP, SEMP and donor agency reports.

**Linkages**

Links will be strong with Programme EA 010 Environmental Responsibility, Public Awareness Raising and Empowerment; and with other EA programmes. There will also be some linkage with other Institutional Development programmes.

**Risks and Assumptions**

The greatest risk is that GoB will fail to provide sufficient staff and funding to enable DoE to benefit fully from the technical assistance provided and thereafter to function effectively.

**Department of Environment Capacity Building**

Ref :

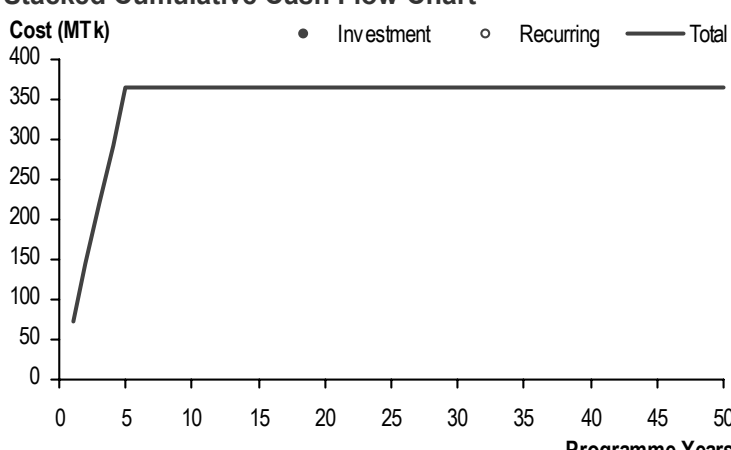
**ID 007**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>		
Focus/Foci :	<b>Department of Environment</b>	Location :	<b>Nationwide</b>		
Start Year <sup>1</sup> :	<b>2001</b>	Duration <sup>2</sup> :	<b>5 year(s)</b>	Agency(s) Responsible :	<b>DoE</b> (Lead) <b>None</b> (Supporting)
Short Description :	As far as aquatic resources are concerned, DoE is mandated to protect water quality and ensure efficiency of use and in particular to monitor (and establish standards of) effluent disposal to prevent water pollution. This programme allows for institutional capacity building of DoE including the establishment of representational offices down to District level.				

**MIS Links**

Cost Calculation :	ID Programme costing.xls	Map :	ID 007 Map.jpg
Disb't Schedule :	ID Programme costing.xls	Description :	ID 007 PgP.doc

**Finance**

	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>365.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>5</b>
Ultimate Recurring	<b>0.00</b> MTk/yr	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b> 			
Status :	<b>Preparation</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Department of Environment capacity building programme agreed by DoE and WARPO	• Signed Project Document	NYD
• Department of Environment capacity building programme completed	• Ex-post evaluation • Programme complete report	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 007
Title	Department of Environment Capacity Building

### Assumptions:

Taka/US\$	51.000	TA duration	5.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	168.0	20,000		171.4		
Senior National consultants (all-in rate)	p-m	300.0		150	45.0	0.0%	-
Mid-level National consultants (all-in rate)	p-m	300.0		90	27.0	0.0%	-
Sub-totals					243.4		-
Other general TA programme costs		25%			60.8		-
Specific other TA programme costs		25%			60.8	0.0%	-
<b>Total TA Costs</b>					<b>365.0</b>		-
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-
<b>Overall Programme Costs</b>					<b>365.0</b>		-



**Disaster Management Bureau Capacity Building**

Ref: ID 008

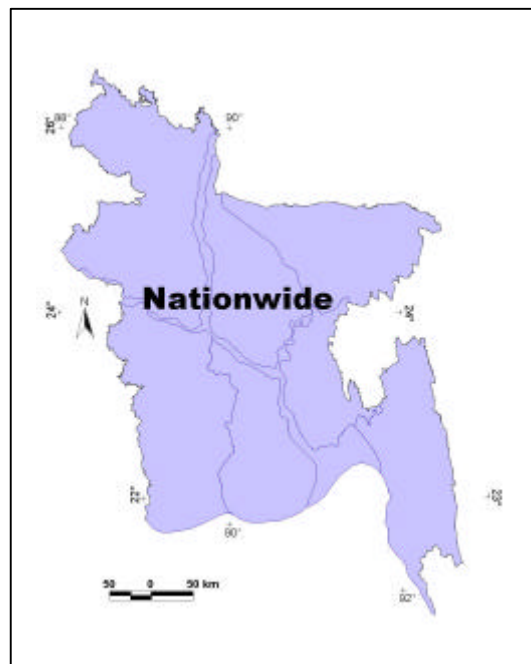
**Basic Data**

NWMP Sub-sector     **Institutional Development**

Region(s)                **Nationwide Significance**

**Relevance to NWPo**

§4.2(c) of the NWPo requires that the NWMP and all related plans will be prepared in a comprehensive manner with regard to the interests of all water-related sectors. In Section (o) it stipulates that responsible agencies will develop early warning and flood-proofing systems to manage natural disasters. In §4.4, the NWPo makes clear that the Government's intervention will be directed towards ... addressing specific problems and protecting particular community interests. It further states that appropriate institutions will provide information to local community organisations for managing water resources efficiently.

**Purpose of Programme**

The Government's Development Strategy for the NWMP makes clear its intentions towards disaster management. Disaster management (including disaster preparedness) involves prevention and mitigation measures, preparedness plans and related warning systems, emergency response measures and post-disaster reconstruction and rehabilitation. Accordingly, in acknowledging that some people will always be at risk, the main aims for water-related disaster management are to provide the means by which, through a combination of structural and non-structural measures and to the extent feasible and affordable, people are adequately warned of an approaching disaster, are equipped to survive the disaster with as much as possible of their assets intact, and are adequately supported in rebuilding their lives thereafter.

Over the last decade, disaster management has become recognised as both a necessary and legitimate element of overall water management. The Disaster Management Bureau (DMB) was created in June 1994 as a UNDP/UNICEF funded project under the administrative control of the Ministry of Disaster Management and Relief. DMB is headed by a Director-General and is supported by four functional Directors (i) Planning, (ii) Training, (iii) MIS and GIS, and (iv) Administration and Logistics. The Bureau carries out its responsibility through disaster management committees at Union, Upazila and District level. There is a co-ordination committee at Ministry level, and a Disaster Management Council at national level chaired by the Prime Minister. The Bureau provides services such as awareness raising, collecting, preserving and disseminating management and geographical information - including mapping and damage assessment. It is also responsible for all stages (ie pre, during and post) of managing disasters whether caused by flood, cyclone, drought, earthquake etc.

In the context of the NWMP, DMB has a key role to play as an interface between the forecasting agencies (principally BWDB and Department of Meteorology) in terms of disseminating information on water-related disasters and assisting those afflicted by such disasters, including ensuring they are fully prepared when disasters strike.

The purpose of this programme is to provide the necessary support to DMB to enable the agency to be fully responsive to water-related disasters.

## Programme Outline

The programme represents a continuation of earlier work to establish and build up the capacity of the DMB. This entails primarily supporting the outreach of DMB to District, Thana, Union and village levels, and strengthening at each level. In principle, most of these structures are in place, and the issue is one of “making things work”.

The Comprehensive Disaster Management Programme under preparation by the Ministry of Disaster Management Bureau with UNDP support (BGD/92/02), lists the potential areas for further support as follows:

Physical Support		Non-Structural Support	
• Multi-purpose shelters	DM 001	• Public awareness campaigns	EE 010
• Embankments/dykes	AW 007	• DP education	ID 008
• Access roads	DM 004	• Training	<b>ID 008</b>
• River bank protection	MR 010	• Community mobilisation	<b>ID 008</b>
• Urban mitigation	TR 007	• Risk/hazard mapping	EE 004
• Communication equipment	ID 008	• Vulnerability profiles	EE 004
• Wind and flood resistant buildings	DM 002	• Environmental threats	EA 010
• Safe water supplies	TR 003-4	• Community focus and NGOs	ID 008
• Sanitation facilities	TR 005-6	• Standing Orders and Coordination	<b>ID 008</b>
• Heavy lifting equipment	ID 008	• Enhancement of EOC	<b>ID 008</b>
• Fire fighting appliances	<b>ID 008</b>	• MIS and GIS	<b>ID 008</b>
• Ambulances	<b>ID 008</b>	• Warning systems	ID 009
• Telecommunications support	<b>ID 008</b>	• Cross border co-operation	ID 009, 010
		• Pollution monitoring	EA 003
		• Arsenic detection and mitigation	TR 002

Most of these support measures are already covered in one form or another under different NWMP programmes, leaving the following to be covered under this programme:

1. Communication equipment
2. Heavy lifting equipment
3. Fire fighting appliances
4. Ambulances
5. Telecommunications support
6. DP education
7. Training
8. Community mobilisation
9. Community focus and NGOs
10. Standing Orders and Coordination
11. Enhancement of EOC
12. MIS and GIS

It is assumed that this programme will require a further 10 years to complete, and will be guided by the ongoing preparatory work.

## Financing Arrangements

No reliable estimate is available for the cost of the above programme components. Given the prevalence of natural water-related disasters in Bangladesh, and the time that it will take to mitigate the risks through other programmes, significant expenditure on disaster preparedness and relief appears well justified. Provisionally a sum of Tk2200M is set aside for this. Together with programmes listed above, this would represent very approximately one-third of the total plan investments. The programme is suitable for Government funding with the potential for donor support.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Disaster Management Bureau capacity building programme agreed by the DMB and WARPO	I1	• Signed Project Document	2004
• Disaster Management Bureau capacity building programme completed	K	• Ex-post evaluation • Programme completion report	2014
• Capacities of Bangladesh's restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) independent training reviews	2026

## Institutional Arrangements

The programme will be implemented by DMB. Close co-operation will be needed with many water sector agencies with direct and indirect stake in disaster management. These include Municipalities, Zila parishads, BWDB, Department of Meteorology, LGED, DPHE, community organisations and NGOs.

## Existing Documentation

The topic of disaster management is discussed extensively in DSR, Main Report. Cyclone Protection is covered in Cyclone Shelter Preparatory Study, June 1998, for European Commission with LGED. The Comprehensive Disaster Management Programme is being prepared for Ministry of Disaster Management Relief with UNDP support under programme ref. BGD/92/002.

## Linkages

Linkages are described in the table above.

## Risks and Assumptions

The main challenge for this programme will be to sustain the benefits of increased capacity in the form described above. Whilst this necessitates a commitment from Government to a significant level of recurrent expenditure, much is to be gained from mobilising community support for disaster management. It is assumed that the programme design will reflect this.

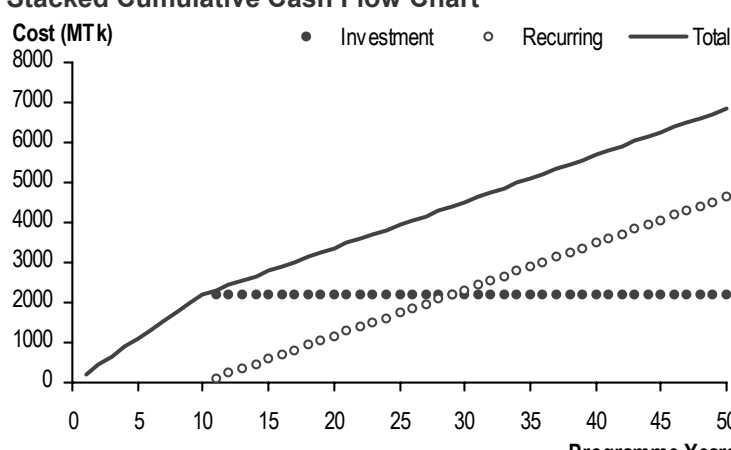
**Disaster Management Bureau Capacity Building**

Ref :

**ID 008**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Disaster Management Bureau</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>10 year(s)</b>
		Agency(s) Responsible :	<b>DMB</b> (Lead) <b>None</b> (Supporting)
Short Description :	This programme will provide the resources necessary to continue ongoing capacity building activities throughout the short and medium terms in order that the DMB can address its mandate in an increasingly effective fashion.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 008 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 008 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme		Year	
	Total Capital <sup>3</sup>		2,200.00 MTk	0%	100%	0%		10	
	Ultimate Recurring		116.00 MTk/yr	n/a	100%	0%		11	
	Date of Data :		31 07 01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring	— Total		
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Disaster Management Bureau capacity building programme agreed by the DMB and WARPO	• Signed Project Document	NYD
• Disaster Management Bureau capacity building programme completed	• Ex-post evaluation • Programme complete report	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 008
Title	Disaster Management Bureau Capacity Building

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	10.0	years	

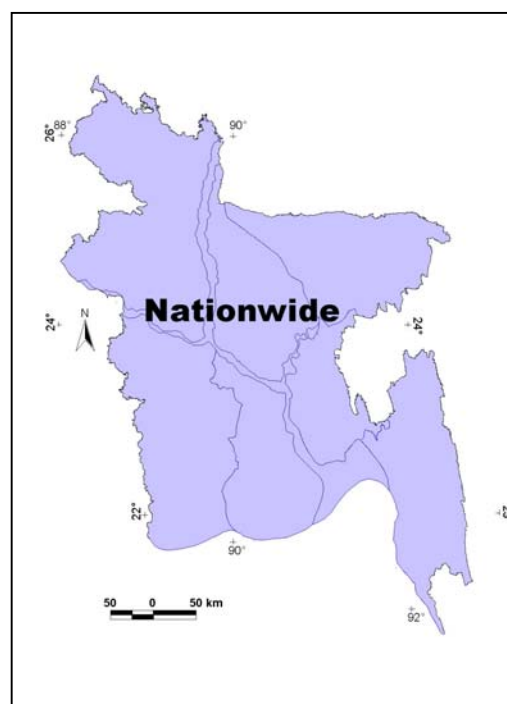
Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Programme preparation is ongoing with UNDP support							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Communications and related equipment					300.0	20.0%	60.0
2. Disaster relief equipment					500.0	10.0%	50.0
3. Education and training					1,100.0	0.0%	-
4. Central services					300.0	2.0%	6.0
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					2,200.0		116.0
<b>Overall Programme Costs</b>					2,200.0		116.0

**Capacity Building for Other Organisations**

Ref: ID 009

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide Significance****Relevance to NWPo**

The preamble to §4.2 of the NWPo recognises that “...the process of planning and managing water resources requires a comprehensive and integrated analysis of relevant hydrological....factors across all related water-using sectors.”. Clause o) of the same section calls for “..early warning systems to manage natural disasters like flood and drought.” §4.13 notes that “water bodies like haors, baors and beels are precious assets” and should be “preserved for maintaining the aquatic environment and facilitating drainage”.

**Purpose of Programme**

It is important to realise that in Bangladesh floods can have at least three primary causes: i) cyclones, which affect largely the coastal belt; ii) excessive local seasonal rainfall and iii) excessive in-stream flows, the last two of which are often greatly exacerbated by secondary problems such as impeded drainage or accretion in the case of natural channels.

As far as cyclones are concerned, Bangladesh’s existing forecasting system is limited to the use of satellite imagery to monitor the formation of cyclones. Although it is constantly being upgraded, no technology is as yet available whereby cyclone intensity, speed and direction can be predicted with any degree of reliability. Current methods are predominantly empirical and subjective, thus there is a pressing need for the introduction of numerical methods. Furthermore, tropical cyclones frequently change course and intensity and the resulting uncertainties reduce public confidence in the warning, and response to warnings when they are issued. To increase confidence to levels where the need for prompt action is rarely questioned, it will be important to distinguish between the **possibility** of a cyclone striking Bangladesh and the **probability** of landfall, where and when.

Despite the high rainfall and great rivers that typify Bangladesh, every year brings months without rainfall that bring hardship to people living in areas with poor access to surface and groundwater resources. Low monsoon rainfall can seriously damage the aman crop while droughts in April and May has the same effect on the aus. Furthermore, the depressed groundwater tables that result often render ineffective village hand pumps in the area, driving women to seek water from contaminated surface sources. Adequate notice of drought conditions would be helpful to those responsible for arranging food imports or releases from Government godowns. And of particular usefulness would be a system that forecasts droughts for the period April to October. Advance warning of potentially disastrous flood and drought events would not only preserve live and livelihoods; it could also pre-empt knock on food security and other economic shocks.

Inland floods affect much of Bangladesh every year, and agriculture and human settlements have adapted to normal floods caused by rainfall or lateral flow from rivers. However, severe monsoon floods, like those of 1998, cause significant damage to crops and property. Floods can also be associated with major changes in river planform and sedimentation, the sources of erosion, accretion and disruption of navigation in the lean season. Understanding the behaviour of rivers is crucial in a country like Bangladesh.

The area of naturally-occurring water bodies has declined as a result of the increasing pressure on land and man's interventions. The eco-systems that depend on these water bodies are changing as a consequence, leading to loss of suitable habitats for a wide variety of aquatic vegetation and other natural resources, which are themselves important for the poor in particular. The Government is committed to preserving the natural environment and has given special, but by no means exclusive, emphasis to the wetlands found in the NE of the country.

This programme provides for capacity building in three important organisations who must respond to these policy directives: (i) the Department of Meteorology, (ii) the River Research Institute and (iii) the Bangladesh Haor and Wetland Development Board.

## Programme Outline

### (i) Bangladesh Meteorological Department (BMD)

Essentially, the whole point of improving the Bangladesh Meteorological Department's ability to forecast and quantify extreme climatic events, be they coastal floods, inland floods or droughts, is to provide time for adequate responses or preparations to be made as appropriate:

Event	Rapid Response needed	Advance Warning needed
Cyclones	<ul style="list-style-type: none"> <li>Evacuation of people and livestock to shelters, killas, embankments and high ground</li> <li>Securing of ships and boats</li> </ul>	<ul style="list-style-type: none"> <li>Safe havens provided</li> </ul>
Inland Floods	<ul style="list-style-type: none"> <li>Evacuation of people and livestock to embankments and high ground</li> </ul>	<ul style="list-style-type: none"> <li>Stock piling of food, blankets and medicines</li> </ul>
Droughts	<ul style="list-style-type: none"> <li>Not applicable</li> </ul>	<ul style="list-style-type: none"> <li>Macro food security measures</li> </ul>

Thus the programme, which is scheduled for the short term, provides for the establishment in Bangladesh of digital equipment with which to make more accurate forecasts not only of cyclone intensity, but also time and location of landfall. Equally, multi-parameter warning systems, ideally based on regional rather than local monitoring, will be introduced for the purpose of forecasting extreme hydrological events and lines already being considered, at least conceptually, by USAID. Finally, the programme will ensure that all relevant staff are adequately trained in the use of the new facilities.

### (ii) River Research Institute (RRI)

Under the Ministry of Water Resources, the River Research Institute is mandated to undertake studies of river behaviour. Currently established in Faridpur, RRI conducts physical modelling of rivers as well as undertaking engineering soil testing, mainly in support of BWDB activities. A part of its income is derived from contracting out these services to other agencies and projects. Whilst increasing use is made of mathematical models, it is considered by many important to retain and improve domestic capacity for physical modelling. Given the significance of sediment transport in Bangladesh and the greater focus on integrated river system management in the

NWMP, it is anticipated that there will be an increase in demand upon RRI's services and a consequent need to upgrade their skills and capacity in modelling sediment transport.

### (iii) Bangladesh Haor and Wetland Development Board (BHWDB)

The newly formed Bangladesh Haor and Wetland Development Board is faced with the demanding task of preserving the declining wetlands of Bangladesh, especially those in the Northeast. Whilst many of necessary the skills for river engineering have been imported with staff deputed from BWDB, there is a dearth of environmental knowledge. To address this will require a proper skills inventory, with a downstream capacity building programme involving both training and recruitment. This programme will support these activities.

## **Financing Arrangements**

The programme is suitable for GoB funding, possibly with donor or development bank assistance and is expected to cost some Tk300M, all of which will be required in the first five years of the NWMP.

## **Objectives and Indicators**

<b>Objective</b>	<b>Suffix</b>	<b>Indicators/Mean of Verification</b>	<b>Due</b>
• Capacity building programmes agreed for BMD, RRI and BHWDB	I1	• Signed Project Documents	2005
• State of the art climate forecasting facilities available to the BMD	I2	• Equipment inventory	2010
• Reliable predictions of extreme climatic events (both short and long term), and morphological changes; and effective wetland management procedures	K	• Annual performance reviews	2012
• Capacities of Bangladesh's restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) independent training reviews	2027

## **Institutional Arrangements**

It is intended that the programme by the concerned organisations with some international technical assistance. Close association with the Disaster Management Bureau, co-operation with BWDB's Flood Forecasting and Warning Centre, the Field Service Wing of DAE and the Integrated Coastal Management Programme will be desirable for the DoM programme, and with DoE for the BHWDB programme.

## **Existing Documentation**

A useful, fairly detailed description of the cyclone warning challenge can be found in "Flood Forecasting in Coastal Areas" Danish Hydraulics Research Institute, May 2000; but no existing documentation relative to the forecasting of long term hydrological extremes, or for RRI and BHWDB strengthening, has so far been located.

## **Linkages**

There are obvious links with NWMP Programmes DM 001 (Cyclone Shelters and Killas), DM 002 (Bari-level Cyclone Shelters), ID 008 (Disaster Management Bureau Capacity Building), ID 010 (BWDB Capacity Building), MR 001 (Main River Studies and Research) and MR 006 (Regional River Management and Improvement).



## **Risks and Assumptions**

Two classic risks are associated with early warning systems of this kind. First is the risk that people will feel over-confident to the extent that they will wait for the warnings from the official system, which may have failed even as the event approaches. Secondly, communities can become complacent or cynical in the wake of false alarms. It is assumed that both risks can be obviated by appropriate levels of community involvement especially as regards the selection of community contact individuals and emergency task groups. People will be more likely to trust community members that they themselves have given responsibility to. There is also a risk that recurring costs will not be met by official sources; but it may be possible to establish the early warning system on a revenue basis whereby users of the information are required to pay a small sum for the privilege of doing so.

For RRI, as primarily a service agency, the risk is of course is that there is insufficient demand for the services provided. Whilst in principle the demand will exist and indeed increase as a result of other NWMP programmes, the strength of demand will depend upon the quality and cost-effectiveness of the services provided by RRI. Building the skills and capacity of RRI should therefore be seen as a holistic exercise embracing all employees who contribute to the service, not just for a limited number of specialists.

As a relatively young organisation, BHWDB faces many challenges ahead in resolving the intricate problems of wetland management. The risk for BHWDB, given its roots, is that it becomes an implementing agency for engineering works, alienated from both the environmental and local communities, without whose support the BHWDB will not prosper. The programme seeks to avert this by broadening the skill base, and it is assumed that the top management will fully support a pro-active stance towards environmental issues.

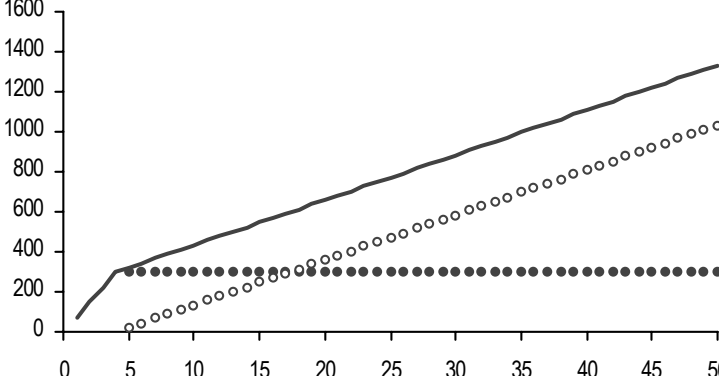
**Capacity Building for Other Organisations**

Ref :

**ID 009**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Other Agencies</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>4 year(s)</b>
		Agency(s) Responsible :	<b>BMD, RRI, (Lead) BHWDB (Supporting) None</b>
Short Description :	The NWPo §4.02(o) requires the GoB or its responsible agencies to undertake comprehensive and integrated analysis of relevant hydrological factors across all related water-using sectors for the purpose of managing the river systems and providing early warning systems of natural disasters like flood and drought. NWPo §4.13 also requires water bodies like haors, baors and beels are preserved for maintaining the aquatic environment and facilitating drainage. This programme provides for capacity building of three key agencies involved in these activities, namely: Bangladesh Meteorological Department, River Research Institute and Bangladesh Haor and Wetland Development Board.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 009 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 009 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme		Year	
	Total Capital <sup>3</sup>		300.00 MTk	0%	100%	0%		4	
	Ultimate Recurring		22.50 MTk/yr	n/a	100%	0%		5	
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment ○ Recurring — Total				
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Capacity building programmes agreed for DoM, RRI and BHWDB	• Signed Project Documents	NYD
• State of the art climate forecasting facilities available to the BMD	• Equipment inventory	NYD
• Reliable predictions of extreme climatic events (both short and long term), and morphological changes; and effective wetland management procedures	• Annual performance reviews	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design ,supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	<b>ID 009</b>
Title	<b>Capacity Building for Other Organisations</b>

*Assumptions:*

Taka/US\$	51.000	TA duration	4.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	84.0	20,000		85.7		
Senior National consultants (all-in rate)	p-m	104.0		150	15.6	0.0%	-
Mid-level National consultants (all-in rate)	p-m	208.0		90	18.7	0.0%	-
Sub-totals					120.0		-
Other general TA programme costs		25%			30.0		-
Specific other TA programme costs	Equipment and training				150.0	15.0%	22.5
<b>Total TA Costs</b>					<b>300.0</b>		<b>22.5</b>

**Other Programme Costs**

1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-

<b>Overall Programme Costs</b>					<b>300.0</b>		<b>22.5</b>
--------------------------------	--	--	--	--	--------------	--	-------------

**Break up**

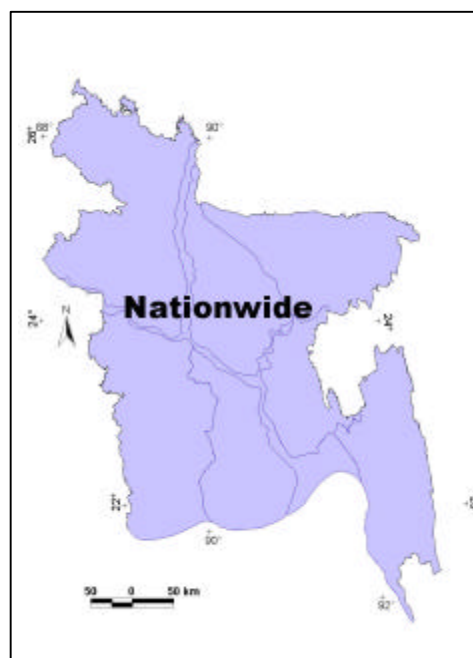
Technical Assistance	Expat	National 1	National 2	TA Total (TkM)	Equipment and Training (TkM)	Total (TkM)
1. BMD Capacity Building	40.0	60.0	120.0	75.8	37.50	113.3
1. RRI Capacity Building	30.0	30.0	60.0	50.6	75.00	125.6
1. BHWDB Capacity Building	14.0	14.0	28.0	23.6	37.50	61.1

**BWDB Capacity Building**

Ref: ID 010

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide Significance****Relevance to NWPo**

§3 of the NWPo confirms that all agencies working in the water sector are subject to the policy which is intended to result in sustainable public and private water delivery systems (§3.c); institutional changes that will help decentralize water resources management (§3.d) and a legal and regulatory environment that helps the process of decentralization. The preamble to §5 states that Government will restructure and strengthen...the existing institutions to ensure that the agenda for reform ...is implemented efficiently. §5.a confirms that the Government will formulate a framework for institutional reforms to guide all water sector activities and review the mandates of all water sector institutions. Finally and where appropriate, Government will restructure its present institutions (§4.1) and to this end, public water schemes are designed with specific provision for future disinvestments if and when feasible.

**Purpose of Programme**

Under the BWDB Act 2000, BWDB is repositioned to place a central role in water resource development and management, with a mandate fully consistent with the Policy. Many of BWDB's earlier functions are retained and it is assumed that in-service training, supported by project assistance as needed, will continue. However, in a number of key areas, new functions are included and existing ones are to be undertaken in modified ways. BWDB needs to respond to these challenges in a number of ways. This programme, together with ID 003: FCD and FCD/I Management Rationalisation and ID 004: BWDB Regional and Sub-Regional Management, is designed to provide support for BWDB to bring about the necessary internal changes and restructured skill mix envisaged under NWPo. It will be incumbent upon BWDB to review its staffing mix, and to recruit a significant proportion of non-engineering professionals to complement the efforts to re-train staff included within this programme. Efforts will also be needed for institutional development and HRD of the RRI and BHWDB.

**Programme Outline**

The programme aims to strengthen BWDB in four specific areas, to provide induction and in-service training within a broader framework of promoting a truly integrated and participatory approach to water resource management, and to upgrade BWDB's office accommodation consistent with its revised role. The important elements of the programme are as follows, which would be preceded by a preparatory technical assistance to assist in programme design and planning:

- Support for flood forecasting and warning dissemination
- Strengthening surface and groundwater monitoring and dissemination
- Support for erosion and accretion forecasting
- Support for Planning, design and O&M activities
- Support for drought forecasting
- Re-orientation programmes
- Management Information System (MIS) for BWDB
- Human Resource Development (HRD) for different departments of BWDB
- New central office
- Upgrading regional centres

It is envisaged that the programme would take 10 years to complete.

### **Financing Arrangements**

The total cost of the programme over 10 years is estimated to be Tk1316M, of which Tk50M is for preparation and Tk300M is for new office and upgrades. The re-orientation programmes are targeted at 3000 BWDB staff and are estimated to cost Tk302M, with remaining four specific programmes costing Tk190M, Tk163M, Tk222M and Tk89M respectively. Financing is appropriately from Government with the potential for donor support.

### **Objectives and Indicators**

<b>Objective</b>	<b>Suffix</b>	<b>Indicators/Mean of Verification</b>	<b>Due</b>
• BWDB long term needs assessed	I1	• Needs Assessment Report	2003
• Future roles and responsibilities of BWDB agreed	I2	• Acceptance of the Needs Assessment Report	2003
• BWDB capacity building programme agreed	I3	• Signed Project Document	2003
• BWDB capacity building programme completed	K	• Ex-post evaluation	2013
		• Programme completion report	
• Capacities of Bangladesh's restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) independent training reviews	2025

### **Institutional Arrangements**

BWDB will take a lead and pro-active role in developing its own organisation under the guidance of its management board. Co-operation will be needed with Disaster Management Bureau, Department of Meteorology, Department of Environment, Local Government and with data collecting agencies for the different programme components.

### **Existing Documentation**

Various reports are available with BWDB on flood forecasting. EGIS are working on erosion forecasting. USAID are supporting long range weather forecasting. DSR Chapter 4 describes new directions for BWDB. Copies of relevant legislation are held by WARPO on NWRD.

### **Linkages**

The programme has direct linkages with ID 003: FCD and FCD/I Management Rationalisation and ID 004: BWDB Regional and Sub-Regional Management. It also has bearing on EE 007: NWRD Improved Data Collection and Processing Facilities, MR 006: Regional River Management and Improvement, MR 010: Main Rivers Erosion Control at Selected Locations,

DM 006: Supplementary Irrigation and Drought Proofing of Rural Water Supplies, and EA 003: National Water Quality Monitoring.

### **Risks and Assumptions**

The principle risk for the programme is a lack of commitment from within BWDB to embrace the changes ordained by NWPo and the BWDB Act 2000. The impetus for change must come from the Board of Directors, but it is up to the Director General and his staff to stimulate the organisation as a whole to willingly cooperate. This will require rapid establishment of a common vision for what BWDB will be like in 10 years time along and thereafter a sustained effort to achieve it. Frequent changes in top management, as happens now, are not conducive to carrying through change programmes, and it is assumed that BWDB will introduce new arrangements to ensure more continuity.

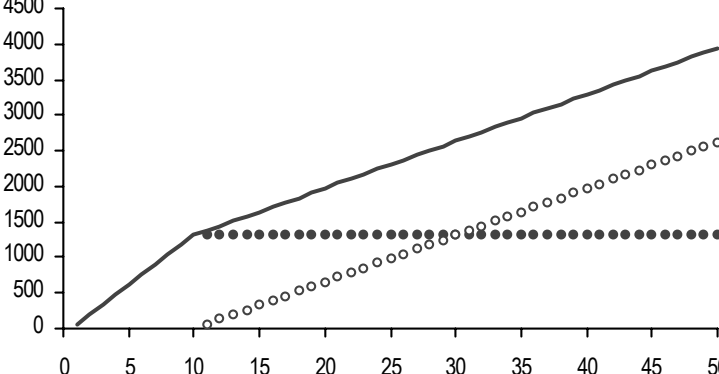
**BWDB Capacity Building**

Ref :

**ID 010**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Bangladesh Water Development Board</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>10 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>None</b> (Supporting)
Short Description :	This programme is intended to strengthen BWDB in several ways: improved flood forecasting and warning; strengthened surface and groundwater monitoring and dissemination; support for erosion and accretion forecasting; support for drought forecasting; re-orientation programmes especially with regard to the social and environmental dimensions of water resources management, MIS, HRD and other related fields of BWDB; a new central office and upgraded regional centres.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 010 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 010 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme		Year	
	Total Capital <sup>3</sup>		1,316.00 MTk	0%	100%	0%	10		
	Ultimate Recurring		65.70 MTk/yr	n/a	100%	0%	11		
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment ○ Recurring — Total				
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• BWDB long term needs assessed	• Needs Assessment Report	NYD
• Future roles and responsibilities of BWDB agreed	• Acceptance of the Needs Assessment Report	NYD
• BWDB capacity building programme agreed	• Signed Project Document	NYD
• BWDB capacity building programme completed	• Ex-post evaluation • Programme complete report	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 010
Title	BWDB Capacity Building

### Assumptions:

Taka/US\$	51.000	TA duration	1.0	years	All prices in mid-2000 values
		Investment duration	9.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
Technical Assistance	Programme design						
Expatriate consultants (all-in rate)	p-m	28.0	20,000		28.6		
Senior National consultants (all-in rate)	p-m	48.0		150	7.2	0.0%	-
Mid-level National consultants (all-in rate)	p-m	47.0		90	4.2	0.0%	-
Sub-totals					40.0		
Other general TA programme costs		25%			10.0		-
Specific other TA programme costs					-	0.0%	-
Total TA Costs					50.0		-
Other Programme Costs							
1. Support for Flood Forecasting and Warning Dissemination				PS	190.0	4.0%	7.6
2. Strengthening surface and groundwater monitoring and dissemination				PS	163.0	5.0%	8.2
3. Support for erosion and accretion forecasting				PS	222.0	1.0%	2.2
4. Support for drought forecasting				PS	89.0	3.0%	2.7
5. Re-orientation programmes				PS	302.0	5.0%	15.1
6. New central office				PS	100.0	10.0%	10.0
7. Upgrading 8 regional centres				PS	200.0	10.0%	20.0
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
Total Other Programme Costs					1,266.0		65.7
Overall Programme Costs					1,316.0		65.7

### Break up

<b>Technical Assistance</b>	Expat	National 1	National 2	Total (TkM)		
1. Flood Forecasting and Warning	80	80	160	135.0		
2. Water monitoring	80	80	160	108.0		
3. Erosion and accretion forecasting	120	120	240	162.0		
4. Drought forecasting	40	40	80	54.0		
5. Re-orientation programmes	120	120	240	162.0		
<b>Capacity Building</b>	Trainees	Unit rate	Total (TkM)	Equipment	Total (TkM)	O&M
1. Flood Forecasting and Warning	600	50,000	30.0	25.0	55.0	4.0%
2. Water monitoring	600	50,000	30.0	25.0	55.0	5.0%
3. Erosion and accretion forecasting	100	500,000	50.0	10.0	60.0	1.0%
4. Drought forecasting	50	500,000	25.0	10.0	35.0	3.0%
5. Re-orientation programmes	3,000	30,000	90.0	50.0	140.0	5.0%



# **Institutional Development**

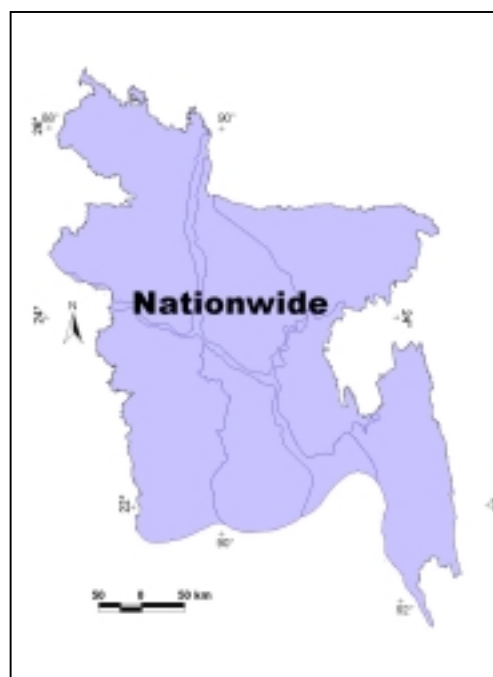


**Local Government Needs Assessment for Water Management**

Ref: ID 001

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide Significance****Relevance to NWPo**

The NWPo introduces significant new roles and responsibilities for Local Government Institutions. In particular §4.2 Article e requires LGI's to implement FCD/I projects having a command area less than or equal to 1000ha, while Article f calls upon LGI's to be the principle agencies for coordinating stakeholder participation at all stages of water sector project cycles. Equally §4.3 Article e allows the central Government to decentralize water allocation rights to the LGI's. The preamble to §4.4 establishes the principle that LGI's have a role to play in the community level resource management. §4.4b Article e provides for the possibility of LGI involvement in the joint management of non-municipal water schemes over 5000ha, while Article f requires the ownership of FCD and FCD/I projects with command areas less than or equal to 1000 ha to be transferred to LGI's.

**Purpose of Programme**

As a result of the NWPo, LGI's will become progressively responsible (with community groups) for the management of all FCD schemes up to 5000ha, and for the raising of operation and maintenance tariffs through local resources. They may also play an important role in supporting the management of larger schemes by autonomous bodies. In addition, LGI's will be responsible for development of community cyclone protection and will work with NGO's in support of bari-level cyclone and flood proofing programmes. They will also have essential roles to play as regards the development of improved water supply and sanitation facilities in the rural areas. Equally, in the urban sector, paurashava and city corporations will become increasingly autonomous and responsible (directly or through WASA's) for the provision of all water-related services. Such new responsibilities clearly represent a challenge for the LGI's which have little or no historic experience of water sector development and are in any case generally weak or non-existent (the DSR reports that three out of four levels of Parishad have yet to be established). The DSR also concludes that considerable efforts will be needed to strengthen local planning and management capacity if it is to evolve in a manner that adequately reflects local issues while remaining, or indeed becoming compatible with national plans as well as with those of the line agencies. To this end the programme has two objectives and they are linked. The first objective is to identify management structures, procedures and human resources needed by the LGI's if they are to take on the management of local water resources and channel systems; water supply and sanitation development; urban and peri-urban services as well as cyclone protection facilities. An expected feature of the resulting management structure is likely to be a central training support unit based within the Ministry of Local Government and Rural Development. The

second objective is to identify the steps necessary to achieve these ends and the human resource training needs.

## Programme Outline

In acknowledgement of the need to make solid progress in the water sector decentralization process, the programme will take place in the short term while the outstanding LGI's are still being established. In fact, by identifying suitable institutional arrangements and their associated capacity building implications and during or before LGI establishment will increase the chances of the institutions becoming effective as early as possible. Management and training needs assessments will therefore be carried out as follows. A study of potential LGI water sector operations will identify appropriate measures to allow LGIs control over development funding in their areas of responsibility in the water sector and will cover Paurashavas and each level of Parishad. Inter-alia, the study will cover accountability; loan modalities; alternative means of generating funds; tariffs; oversight and audit; institutional, legal and management requirements and human resource development. At the same time, a parallel study at Zila level will identify and develop appropriate planning mechanisms at Zila level and below. Each will take around 18 months and cover a few contiguous Districts and should explore the modalities of implementing the new policy. Together the studies will inform the preparation of realistic development, capacity building and training plans reflecting the results of broad consultation with all parties and including details of costs, benefits, financing plans, cost recovery, and long term management. Such plans should seek to integrate private sector activities wherever possible, including the employment of Bangladeshi consulting firms while including plans for disposition of FCD projects within the jurisdictional area

Once the two studies are concluded, they will be used to design a responsive training and capacity building programme.

## Financing Arrangements

On the assumption that the studies take place in say, eight locations across the country (each representing one or more Districts with differing development constraints), the costs are expected to total some Tk40M and Tk130M for the LGI and Zila level studies respectively and will be appropriate for Government funding.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"> <li>Outline management structure, procedures and human resource requirements for local water sector development and management by LGI's agreed by all stakeholders</li> </ul>	K	<ul style="list-style-type: none"> <li>Formal agreement of stakeholder agencies</li> </ul>	2004
<ul style="list-style-type: none"> <li>Bangladesh's institutional framework for the water sector regulated, decentralised and devolved according to subsidiarity principles</li> </ul>	D	<ul style="list-style-type: none"> <li>Ratified legal framework</li> </ul>	2019

## Institutional Arrangements

By their very nature, the studies will have to cross ministry boundaries, but should preferably be led by the LGD in collaboration with WARPO and with the support of consultants. The study team themselves should be lead by a senior official in Local Government Division and include

representatives of existing LGIs and CBOs with units from DPHE, LGED and BWDB. WARPO should also participate in an advisory role, both to ensure consistency with NWMP and to help develop linkages between the National Water Resources Database and the local level plans. Community organisations should take a prominent role in setting forth plans for their immediate areas.

### **Existing Documentation**

Background analyses leading to the identification of this programme can be found in Section 4 of the DSR, where specific details are provided in sub-sections 4-4 and 4-5. Other than that, no additional documentation has been identified.

### **Linkages**

There is a clear and direct link with Programme ID 005 (Local Government Capacity Building for Water Management) for which this programme essentially represents the preparatory phase. Less direct, but equally important links also exist with programmes ID 002 (Independent Regulatory Bodies for Water Supply and Sanitation Service Sector); ID 003 (FCD and FCD/I Management Rationalisation); and ID 004 (BWDB Regional and Sub-regional Management Strengthening).

### **Risks and Assumptions**

The main risk will be that continuing delays in LGI establishment will compromise the validity of the programme or delay its execution. It is assumed however, that the Government's clearly enunciated and repeated commitment to decentralization along with the advice and support of the donor community will be sufficient to overcome the remaining inertia.

**Local Government Needs Assessment for Water Management**Ref : **ID 001**

Cluster :	Institutional Development		Region(s) :	All	
Focus/Foci :	Local Government Institutions		Location :	Nationwide	
Start Year <sup>1</sup> :	2002	Duration <sup>2</sup> :	2 year(s)	Agency(s) Responsible :	LGD (Lead) None (Supporting)
Short Description :	The NWPo creates new roles for and places new responsibilities on Local Government Institutions. In particular §4.2.e requires LGI's to implement FCD/I projects having a command area less than or equal to 1000ha, while §4.2.f calls upon LGI's to coordinate stakeholder participation at all stages of water sector project cycles. Furthermore, as a result of §4.4.d LGI's will become progressively responsible for the management of all FCD schemes up to 5000ha, as well as for the raising of operation and maintenance tariffs through local resources. This programme assesses the implications of these challenges in terms of the institutional framework and human resource requirements and presents them in the form of a institutional capacity building and human resource development programme document.				

<b>MIS Links</b>	Cost Calculation :	ID Programme costing.xls	Map :	ID 001 Map.jpg
	Disb't Schedule :	ID Programme costing.xls	Description :	ID 001 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private		GoB	Beneficiaries	Programme	Year	
	Total Capital <sup>3</sup>		170.00 MTk		0%	100%	0%	2	
	Ultimate Recurring		0.00 MTk/yr		n/a	n/a	n/a	n/a	
	Date of Data :		31	07	01	Stacked Cumulative Cash Flow Chart			
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment    ○ Recurring    — Total				
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Outline management structure, procedures and human resource requirements for local water sector development and management by LGI's agreed by all stakeholders	• Formal agreement of stakeholder agencies	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 001
Title	Local Government Needs Assessment for Water Management

### Assumptions:

Taka/US\$	51.000	TA duration	2.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	84.0	20,000		85.7	0.0%	-
Senior National consultants (all-in rate)	p-m	124.0		150	18.6	0.0%	-
Mid-level National consultants (all-in rate)	p-m	312.0		90	28.1	0.0%	-
Sub-totals					132.4		-
Other general TA programme costs		25%			33.1		-
Specific other TA programme costs	Study tour	2	45000		4.6	0.0%	-
<b>Total TA Costs</b>					<b>170.0</b>		-
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-
<b>Overall Programme Costs</b>							
					170.0		-

### Notes

	Expat	National-1	National-2	Total	
Potential LGI water sector operations	24.0	24.0	40.0	88.0	p-m
Planning mechanisms at Zila level	60.0	100.0	272.0	432.0	p-m
Totals	84.0	124.0	312.0	520.0	p-m

## Independent Regulatory Body for Water Supply and Sanitation Service Sector

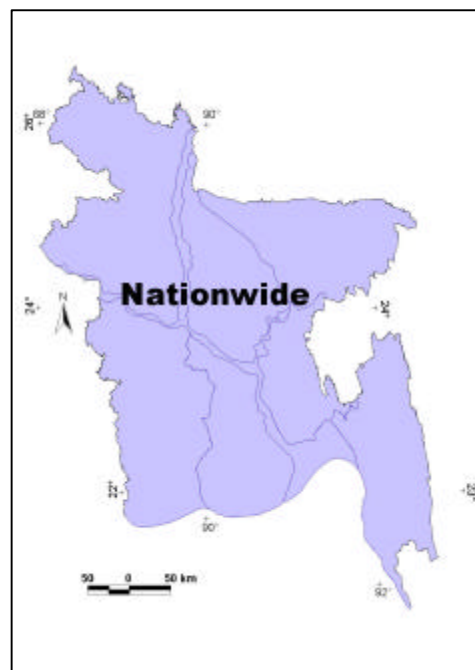
Ref: ID 002

### Basic Data

NWMP Sub-sector      **Institutional Development**Region(s)              **National Significance**

### Relevance to NWPo

NWPo and the National Policy for Safe Water Supply and Sanitation (NPSWSS) both clearly state that private sector participation (PSP) in the water supply and sanitation sector will be promoted in order to access the capital resources, management expertise and performance efficiency of private enterprise. However, for such a partnership to operate satisfactorily in the long term interests of both the consumer and the private investor, there is a clear need for an independent regulatory framework to supervise and monitor the contractual relationship, performance and pricing in a fair and even-handed manner. The NWPo supports this initiative in several key phrases. For example, policy highlights the need “To develop a legal and regulatory environment that will help the process of decentralisation, sound environmental management, and improve the investment climate for the private sector in water development and management”, and that “...there should be a separation of policy, planning and regulatory functions from implementation and operational functions at each level of government”, and “...each institution must be held accountable for financial and operational performance.” The NWMP suggests that independent regulation of the private sector can or will control monopolistic tendencies, improve economic efficiency by encouraging natural monopolies to perform at a socially optimal level, and maintain balance between the potentially competing interests of government, regulated utilities and consumers.



### Purpose of Programme

The main purpose of the programme is to establish an independent regulatory body which will provide a fair and pragmatic framework for the supervision, control and monitoring of private (and possibly public) sector contracts, investment, management and operations in the water supply and sanitation sector. The major challenge will be to establish a regulatory framework which is independent and fair to all parties in setting standards, guidelines and pricing parameters which encourage private investment and give confidence to the consumer that services will improve at an affordable price.

The international trend has been to promote a framework of national principles and guidelines, coupled with regional or local instruments to resolve specific issues and potential conflicts. Lessons for Bangladesh from these experiences are:

- (a) A realistic assessment is needed of actual institutions and government effectiveness. In establishing an effective regulatory framework, institutional restructuring, strengthening and technical training will be key factors;



- (b) The quality and structure of incentives and instruments to be used in the regulatory process are important factors in the creation of a fair balance between the consumer and private sector companies;
- (c) Creation of a regulatory framework does not guarantee effective regulation. Implementation of the regulatory controls needs to be monitored carefully;
- (d) Administrative and financial independence is a central requirement if a regulatory agency is to function effectively. Regulatory and operational functions must be clearly separated;
- (e) GoB needs to develop an innovative regulatory framework with incentives to attract private investment to small cities and towns. Local private companies, with relevant expertise, should be encouraged to participate in order to increase competition; and
- (f) Fully “independent” regulation is difficult to achieve without strong safeguards and a willingness to limit political interference. In this context, the Government needs to guarantee, formalise and institutionalise its commitments to consumers and investors.

In theory, the scope of an independent regulatory framework could also be broadened to cover public sector operators (e.g. DWASA, CWASA and municipal operations) and community-based schemes in the water supply and sanitation sector. This may present considerable difficulties in the short to medium term given the poor performance of most public sector operators in the sector. However, the proposed study will examine the implications of this alternative.

The Government will also complement this initiative with parallel and supporting programmes under the NWMP (see “Linkages”). It should be stated also that the proposed regulatory body will not have any direct responsibility for environmental regulation (e.g. polluting wastewater discharges to surface water and groundwater). This is the responsibility of the Department of Environment, and is currently being strengthened with external assistance from UNDP and Canada.

### **Programme Outline**

The study and manual for an Independent Regulatory Body for the Water Supply and Sanitation Sector will be commissioned within the next two years. It is expected that the project programme will cover the following major topics, among others:

- (a) Review of international experience with regulatory bodies in the water supply and sanitation sector;
- (b) Review of relevant institutional, financial and legal issues in Bangladesh;
- (c) Analysis of alternative independent regulatory structure appropriate for Bangladesh;
- (d) Results of wide-ranging stakeholder consultation process;
- (e) Institutional and legal requirements for an Independent Regulatory Body;
- (f) Financing and training requirements for an Independent Regulatory Body;
- (g) Detailed regulatory framework and manual; and
- (h) Recommendations for a time-bound Action Plan to establish the Independent Regulatory Body.

Within the analysis of alternative independent regulatory structures (see: item (c) above), it is expected that the presentation will include, among other options: (i) private sector involvement only; (ii) public and private sector operations (i.e. including DWASA, CWASA, municipal operations, and community-based schemes); (iii) central or regional IRBs; (iv) water supply and sewerage only, excluding sanitation; (v) urban and/or rural water services; and (vi) other combinations.

The first few years of the implementation programme will demonstrate GoB's serious intent to push forward with the process of private sector participation (PSP) and the establishment of an Independent Regulatory Body for the Water Supply and Sanitation Sector.

## Financing Arrangements

The proposed programme (study, manual and action plan) for establishing an Independent Regulatory Body (IRB) for the Water Supply and Sanitation Sector is suitable for GoB funding with the support of the international donor community. The initial funding requirement for Technical Assistance is estimated at Tk75M at mid-2000 prices.

One of the principal outputs of the study will be the Action Plan for the establishment of the IRB. The implementation plan will be costed in detail to cover the first 5 years of operation. The NWMP provides a provisional estimate of Tk1,200M.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Regulatory Framework agreed by Government Stakeholders	I1	• The framework	2006
• Regulatory manual completed and agreed	I2	• The manual • The agreement	2007
• Independent regulatory bodies for water supply and sanitation services established and fully functional	K	• Operational charters of the regulatory bodies • Legal status of the regulatory bodies	2011
• Bangladesh's institutional framework for the water sector regulated, decentralised and devolved according to subsidiarity principles	D	• Ratified legal framework	2019

## Institutional Arrangements

The Local Government Division, in co-ordination with the Ministry of Finance, will be responsible for commissioning the study for Regulatory and Economic Instruments. LGD will be the executing agency, and be responsible for preparing the Terms of Reference and other background documentation.

Institutional arrangements for the implementation of the action plan on an Independent Regulatory Body for the Water and Sanitation Sector will depend on the detailed recommendations of the proposed study.

## References and Documentation

- (a) Strategy Study to Mobilise Finance and Increase Efficiency in the Dhaka Water Supply and Sewerage Sector, Halcrow Management Services Limited, August 1998
- (b) The Water Supply and Sewerage Authority Act (1996) and other legislation

## Linkages

The programme for an Independent Regulatory Body for the Water Supply and Sanitation Sector should be closely linked and co-ordinated with other NWMP programmes, namely: (a) Local Government Needs Assessment for Water Management (ID 001); (b) Local Government Capacity Building for Water Management (ID 005); (c) Field Testing of Participatory Management Models (EE 002); (d) Project Preparation Procedures - Guidelines and Manuals (EE 007); (e) Regulatory and Economic Instruments (EE 005); (f) Raising Public Awareness in the Wise Use and Management of Water (EE 010); (g) Private Sector Participation in Water

Management (EE 011); (h) Water and Environment Funds (EE 012); (i) Alternative Financing Methods for Water Management (EE 013); and (j) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

Preparation and development of the Independent Regulatory Body for Water Supply and Sanitation should also be co-ordinated with Ministry of Water Resources (MoWR), WARPO, Ministry of Industry (MoI), Ministry of Agriculture (MoA), Ministry of Environment and Forests (MoEF), Bangladesh Water Development Board (BWDB), Department of Public Health Engineering (DPHE), Local Government Engineering Department (LGED), Department of Environment (DoE), DWASA, CWASA, Local Government authorities, NGOs, the private sector and other stakeholders.

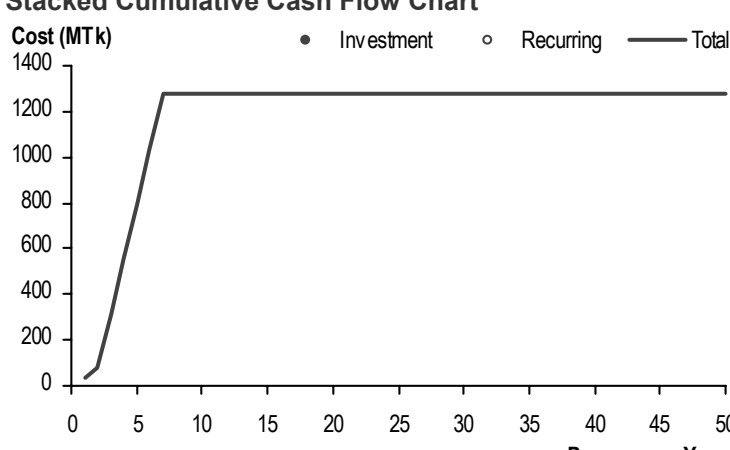
### **Risks and Assumptions**

The risks associated with the commissioning and execution of the proposed IRB Study and Manual are minimal, providing well qualified international consultants are engaged to carry out the work. The main risks will arise after the study and manual have been completed. They will fall into two categories: institutional and financial. The institutional risks are twofold: firstly, whether there is sufficient political will and commitment to carry out the IRB programme; and secondly, whether government line agencies and enterprises will provide effective support and co-operation to implement the proposals. The NWPo and NPSWSS give clear statements that private sector participation is an integral part of water sector policy; therefore, GoB must give sustained support if the additional financial resources and management expertise are to be forthcoming from the private sector. In this context, parallel co-ordination and implementation of the EE Programmes will be crucial. The main financial risk is that if the IRB programme is not effectively implemented then the private sector may not have the necessary confidence that the Government will regulate the sector in a fair and acceptable manner. This will result in less domestic private sector investment and will delay indefinitely the possibility of foreign private investment. It may also discourage some international donor support for the water sector.

**Independent Regulatory Bodies for Water Supply and Sanitation Service Sector**Ref : **ID 002**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>New Regulatory Bodies</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>7 year(s)</b>
		Agency(s) Responsible :	<b>LGD</b> (Lead) <b>MoFinance,</b> (Supporting) <b>New agencies</b>
Short Description :	Initially, this programme will begin by studying options for the establishment of a regulatory framework for water supply and sanitation as well as the institutional demands thereof. This preliminary stage will be followed by the establishment and mandating of the institutions themselves. It is anticipated that existing institutions will be able to accept some of the responsibility; even so a clear need for new, specialist agencies is foreseen.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 002 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 002 PgP.doc

Finance							
	Costs		Private	Funding (%)	Expected by		
				GoB	Beneficiaries		
					ProgrammeYear		
Total Capital <sup>3</sup>	1,275.00 MTk		0%	100%	0%	7	
Ultimate Recurring	0.00 MTk/yr		n/a	n/a	n/a	n/a	
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart			
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring	— Total
Status :	Identified						
Financial Base Year:	mid-2000						
Planned Expenditure (to date) :	0 MTk						
Actual Expenditure <sup>4</sup> (to date) :	0 MTk						
							

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Regulatory Framework agreed by Government Stakeholders	• The framework	NYD
• Regulatory manual completed and agreed	• The manual • The agreement	NYD
• Independent regulatory bodies for water supply and sanitation services established and fully functional	• Operational charters of the regulatory bodies • Legal status of the regulatory bodies	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	ID 002
Title	Independent Regulatory Bodies for Water Supply and Sanitation Service Sector

*Assumptions:*

Taka/US\$	51.000	TA duration	2.0	years	All prices in mid-2000 values
		Investment duration	5.0	years	

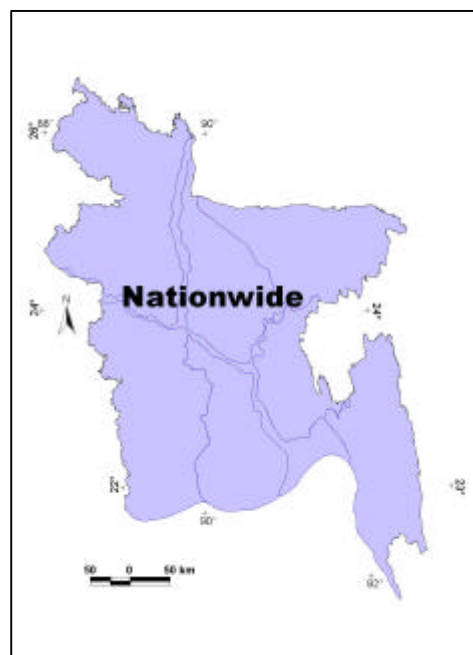
Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	48.0	20,000		49.0		
Senior National consultants (all-in rate)	p-m	36.0		150	5.4		
Mid-level National consultants (all-in rate)	p-m	63.0		90	5.7		
Sub-totals					60.0		
Other general TA programme costs		25%			15.0		
Specific other TA programme costs					-		
<b>Total TA Costs</b>					<b>75.0</b>		
<b>Other Programme Costs</b>							
1. Provision for setting up body(ies)	LS	1			1,200.0	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>1,200.0</b>		-
<b>Overall Programme Costs</b>							
					<b>1,275.0</b>		-

**FCD and FCD/I Management Rationalisation**

Ref: ID 003

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **National Significance****Relevance to NWPo**

Realising that the ultimate success of public water resources management projects depends on the peoples acceptance and ownership of each project, it is the policy of the Government that: *'The management of public water schemes, barring municipal schemes, with a command area up to 5000ha will be gradually made over to local and community organisations and their O&M will be financed through local resources.'* (Clause 4.04d) and; *'Ownership of FCD and FCDI projects with command area of 1000ha or less will gradually be transferred to the local governments, beginning with the ones that are being satisfactorily managed and operated by the beneficiary/ community organisations.'* (Clause 4.04f)

**Purpose of Programme**

In adhering to the principles outlined by policy, a future institutional framework is expected to include measures to enable: a) Existing FCD infrastructure (up to 5000ha), currently operated by BWDB/LGED, will be handed over to local government and/or community groups as soon as sustainable mechanisms to effect the transfer are established. And; b) Existing and new FCD(I) projects over 5000ha will be progressively transferred to autonomous operating authorities, constituted in a manner determined through trial and testing. The purpose of this programme therefore, is to carry out pilot studies of alternative institutional models to effect the management transfer of FCD(I) schemes to local Government, community organisations, or new autonomous bodies in accordance with policy.

**Programme Outline**

Year 1 of the programme would be spent preparing detailed plans for the pilot phase testing. Some six to eight schemes would be carefully selected for the testing. Four possible modes have been suggested:

- i) Hand-over to Local Government
- ii) Hand-over to beneficiaries
- iii) Joint management by BWDB and beneficiaries
- iv) Establishment of a joint non-profit making management company owned by BWDB and Local Government Institutions.

Other models may be considered providing they comply with Government Policy and efforts would be made at an early stage to identify these through intensive local consultation.

These models would be tested during years 2 to 6, concurrently with environmental audit (in accordance with NEMAP requirements) and requisite civil works arising from the outcome of participatory planning involving all stakeholders.

In parallel to the above a full inventory would be made of BWDB schemes including an assessment of the physical condition of the works. A programme of environmental audit would also be launched.

The results of the pilot testing, the asset survey and the audits conducted would be compiled in years 4 to 6 and a plan of action would be drawn up for the remaining BWDB schemes. Up to a further ten years may be required to implement this proposed management plan for the existing BWDB schemes (which would be implemented under Programmes AW 002 and AW 007).

## Financing Arrangements

This programme is suitable for GoB funding (possibly with donor assistance) and is expected to cost approximately 1,300 TkM.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Reduction in the number of schemes directly managed by BWDB	I1	• Nationwide FCD(/I) statistics	2019
• Increase in funds for O&M after turnover of scheme	I2	• Scheme accounts	N/A
• 75% of decentralised FCD/I schemes considered sustainable within 10 years of transfer	K	• National FCD/I scheme statistics	2019
• Bangladesh's institutional framework for the water sector regulated, decentralised and devolved according to subsidiarity principles	D	• Ratified legal framework	2019

## Institutional Arrangements

Preparation of the management plan would be the responsibility of BWDB. In view of the wide range of skills required, Technical Assistance (TA) would be required. Implementation arrangements will be determined on the basis of the management plan but are expected to involve LGIs, CBOs, and WUGs as well as further TA.

## Existing Documentation

A start was made on a scheme-by-scheme assessment during the Water Sector Improvement Project preparatory studies, but handover was not considered in detail. Documentation on the CARE flood proofing project and the LGED Small Scale Water Resources Development Project may also provide useful information regarding previous management transfer attempts in the Bangladesh water sector.

## Linkages

There will be an obvious linkage with AW 007 'Rationalisation of Existing FCD Infrastructure' as well as possible links with AW 008 'Coastal Protection and Aforestation' and MR 006 'Regional River Management and Improvement'.

## **Risks and Assumptions**

Transfer of management responsibilities may meet with considerable resistance, particularly when financial responsibilities are included as well. However a suitably tactful and consultative process at all stages of the programme should minimise these problems. Other risks include inadequate or subjective evaluation of pilot schemes that would result in further unsustainability at scheme level.



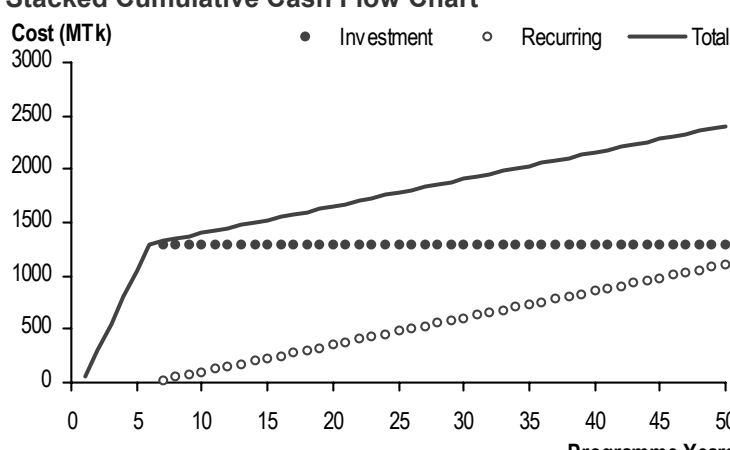
**FCD and FCD/I Management Rationalisation**

Ref :

**ID 003**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Bangladesh Water Development Board</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>6 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>None</b> (Supporting)
Short Description :	This programme is intended to facilitate the transfer of FCD/I scheme management as per policy. Three steps will be involved. In the short term BWDB will receive capacity building with respect to environmental and social issues, while in consultation with the stakeholders a range of transfer options will be identified and prepared. Finally these options will be pilot tested at selected locations during the short and medium term.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 003 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 003 PgP.doc

Finance					
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	1,300.00 MTk	0%	85%	15%	6
Ultimate Recurring	25.20 MTk/yr	n/a	50%	50%	7
Date of Data :	31 07 01	<div>Stacked Cumulative Cash Flow Chart</div> <div>Cost (MTk)</div> <div>● Investment ○ Recurring — Total</div>  <div>3000</div> <div>2500</div> <div>2000</div> <div>1500</div> <div>1000</div> <div>500</div> <div>0</div> <div>0 5 10 15 20 25 30 35 40 45 50</div> <div>Programme Years</div>			
	(dd) (mm) (yy)				
Status :	Identified				
Financial Base Year:	mid-2000				
Planned Expenditure (to date) :	MTk				
Actual Expenditure <sup>4</sup> (to date) :	MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Reduction in the number of schemes directly managed by BWDB	• Nationwide FCD(I) statistics	NYD
• Increase in funds for O&M after turnover of scheme	• Scheme accounts	NYD
• 75% of decentralised FCD/I schemes considered sustainable within 10 years of transfer	• National FCD/I scheme statistics	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 003
Title	FCD and FCD/I Management Rationalisation

### Assumptions:

Taka/US\$	51.000	TA duration	1.0	years	All prices in mid-2000 values
		Investment duration	5.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	28.0	20,000		28.6		
Senior National consultants (all-in rate)	p-m	28.0		150	4.2	0.0%	-
Mid-level National consultants (all-in rate)	p-m	80.0		90	7.2	0.0%	-
Sub-totals					40.0		-
Other general TA programme costs		25%			10.0		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					<b>50.0</b>		<b>-</b>
<b>Other Programme Costs</b>							
1. Pilot scheme investment (rehabilitation)	ha	45,000		20	900.0	2.8%	25.2
2. TA support for environmental audit	year	5		50,000	250.0	0.0%	-
3. TA support for evaluation of pilot schemes	year	1		50,000	50.0	0.0%	-
4. TA support for long-term management plan	year	1		50,000	50.0	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>1,250.0</b>		<b>25.2</b>
<b>Overall Programme Costs</b>					<b>1,300.0</b>		<b>25.2</b>

### Notes:

Rehabilitation rate is based on NWMPP estimates derived from actual BWDB costs

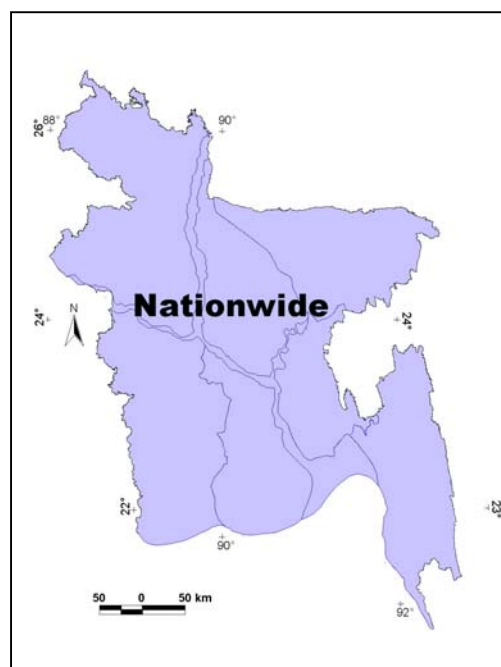
**BWDB Regional and Sub-regional Management Strengthening**

Ref: ID 004

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide Significance****Relevance to NWPo**

The Introduction to the NWPo acknowledges that the most critical issues for water resources management include alternating flood and water scarcity, meeting ever-expanding water needs and massive river sedimentation and bank erosion. Provision of total water quality management and maintenance of the eco-system are also major concerns of Policy. In §3, Policy objectives include harnessing and development of all forms of surface water and ground water in an efficient and equitable manner and bringing about institutional changes to help decentralise the management of water resources.

In §4.2, NWPo directs that, within the macro framework of the NWMP, and (d) sector agencies and local bodies will prepare and implement sub-regional and local water-management plans, (f) ensuring the participation of all project affected persons. Furthermore, agencies will (j) undertake comprehensive development and management of the main rivers (k) for multipurpose use, (l) de-silt watercourses to maintain navigation channels and proper drainage, (n) protect water quality, (p) designate and provide desired levels of flood protection, and (q) develop and implement master plans for river training and erosion control works and for (q) reclamation of land from rivers.

**Purpose of Programme**

Under its Act (2000), BWDB is responsible for controlling the flow of water in all rivers and channels and aquifers. Local Government institutions are already vested with authority to manage local water resources. Recognising this, the Government's strategy is that river improvement programmes will be prepared in an integrated manner giving due importance to all users and environmental and fish migration requirements. The plans will identify dredging and erosion control measures, taking account of new flood protection requirements for areas of high economic importance as defined by Policy. Potential and actual sources of pollution will be identified along with areas of encroachment. In formulating programmes, actions will be prioritised taking account of social, environmental and economic criteria. Activities on regional river systems will be coordinated with improvements to local channel systems in a manner that leads to cost-effective and sustainable improvement of the surface water resource system by all concerned. The purpose of this programme is to provide the necessary support to BWDB to enable the agency to prepare river improvement plans at regional and sub-regional level consistent with the above strategy.

## Programme Outline

The programme will address four main issues to fulfil the objectives above. Firstly support will be provided to establish an inventory of river systems, cataloguing inter alia the condition and general requirements on each river and, whilst doing so, demarcating in principle a mutually acceptable division of responsibilities between BWDB and Local Government. Secondly, support will be provided to BWDB to allocate responsibilities within the organisation for each river and to determine the management structures most suited to ensure effective implementation. Thirdly, within this framework, at least one river will be selected in each of eight hydrological regions, and support provided for BWDB to prepare improvement programmes for each. Lastly, on the basis of the above, support will be provided to BWDB to determine an overall procedure for river improvement programmes, identify and overcome skill and resource gaps and introduce a system for monitoring performance and impacts of the programmes.

## Financing Arrangements

The programme is expected to take 3 years to reach the stage of an agreed approach to river improvement, with a further 3 years to provide training and capacity building necessary for the approach to be made sustainable. The first phase is expected to cost Tk179M and the second Tk71M. Both are suitable for Government funding with the potential for donor support.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Establishment of river inventory with demarcation of BWDB responsibility	I1	• Reports issues and approved by GoB	2004
• BWDB internal organisation structured to plan, develop and manage river improvement programmes with established capacity	K	• Reports issues and approved by GoB and implemented by BWDB • River improvement plans produced at an acceptable quality	2006
• Bangladesh's institutional framework for the water sector regulated, decentralized and devolved according to subsidiarity principles	D	• Ratified legal framework	2019

## Institutional Arrangements

The programme will be implemented by BWDB. Close co-operation will be needed with many water sector agencies with direct and indirect stake in river management. These include WARPO, DoE, BIWTA, Municipalities, Zila parishads, WASAs, LGED, community organisations, irrigation project authorities, private sector (power companies, industry, boat-owners, irrigators, land owners and developers) etc. A critical factor will be achieving consensus between these different groups on planning procedures, dispute resolution and legal enforcement where required. Thus from the outset, BWDB will need to establish a consultative approach with an appropriate forum for debate.

## Existing Documentation

There are many previous studies of existing rivers and river systems available in both WARPO and BWDB archives. The BWDB Act 2000 defines the responsibilities and mandate of the organisation. The various Parishad Acts set out Local Government responsibilities. EGIS has been working on river erosion forecasting, and BWDB and BIWTA have records of sedimentation and dredging. DoE has identified pollution hot-spots and WARPO is working on

fish migration and habitat preservation requirements. SWMC have provided WARPO with hydrodynamic 1-D models of the main rivers of each hydrological region.

### **Linkages**

As stated, this programme will be complemented by other institutional capacity building programmes. It will also have some bearing on several of the Enabling Environment programmes, notably EE 001: Support to Preparation of New legislation, EE 004: Project Preparation Procedures – Guidelines and Manuals, and EE 008: Water Resources Management Research and Development Studies. It will have to fully integrate with all the Main River programmes, and specifically will provide the basis for investment under MR 006: Regional River Management and Improvement, and MR 011: River Dredging for Navigation. Plans for Flood Protection and Stormwater drainage under the MC and TR programmes will need to be taken account of, along with DM 003: Flood Proofing in the Charlands and Haor Basin. Similarly, inter-action with Agriculture and Water Management Programmes will be required, particularly AW 005 and AW 006 dealing with improvements to water management and at Local Government and Community levels. Finally, there is strong linkage with virtually all the Environment and Aquatic Resource programmes.

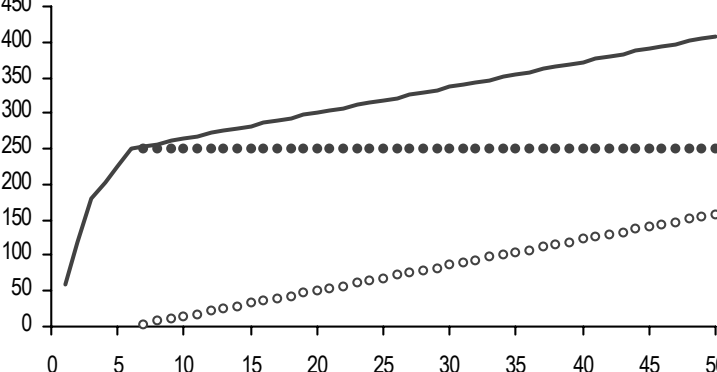
### **Risks and Assumptions**

The main concern relates to the culture change needed within BWDB to move from a centrally driven project-orientated approach to that of long-term integrated management of the river systems in a manner responsive to different needs. The programme seeks to address this through supporting BWDB in finding suitable organisation arrangements and in providing capacity building to help build up the ability of the organisation to field the broad spectrum of skills needed. A second concern is to overcome the ad hoc approach to river management that has characterised many past projects, often driven by political expediency. The sooner BWDB has integrated plans, and the legal backing to enforce them, the quicker this can be overcome.

**BWDB Regional and Sub-regional Management Strengthening**Ref : **ID 004**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Bangladesh Water Development Board</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>6 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>None</b> (Supporting)
Short Description :	According to its Act, BWDB is responsible for controlling the flow of water in all rivers and aquifers. To this end it is the strategy of GoB to prepare integrated river improvement initiatives which give due importance to all stakeholders. This programme is intended to provide the necessary support to BWDB to enable it to prepare such initiatives at regional and sub-regional levels consistent with the GoB strategy.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 004 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 004 PgP.doc

Finance						
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear	
Total Capital <sup>3</sup>	250.00 MTk	0%	100%	0%	6	
Ultimate Recurring	3.60 MTk/yr	n/a	100%	0%	7	
Date of Data :	31 07 01	Stacked Cumulative Cash Flow Chart				
	(dd) (mm) (yy)	Cost (MTk)				
Status :	Identified	● Investment ○ Recurring — Total				
Financial Base Year:	mid-2000					
Planned Expenditure (to date) :	0 MTk					
Actual Expenditure <sup>4</sup> (to date) :	0 MTk					

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Establishment of river inventory with demarcation of BWDB responsibility	• Reports issued and approved by GoB	NYD
• BWDB internal organisation structured to plan, develop and manage river improvement programmes with established capacity	• Reports issued and approved by GoB and implemented by BWDB • River improvement plans produced at an acceptable quality	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	<b>ID 004</b>
Title	<b>BWDB Regional and Sub-regional Management Strengthening</b>

*Assumptions:*

Taka/US\$	51.000	TA duration	3.0	years	All prices in mid-2000 values
		Investment duration	3.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	84.0	20,000		85.7		
Senior National consultants (all-in rate)	p-m	130.0		150	19.5	0.0%	-
Mid-level National consultants (all-in rate)	p-m	136.0		90	12.2	0.0%	-
Sub-totals					117.4		-
Other general TA programme costs		25%			29.4		-
Specific other TA programme costs	River models	8		4,000	32.0	0.0%	-
<b>Total TA Costs</b>					<b>178.8</b>		<b>-</b>
<b>Other Programme Costs</b>				TkM			
1. Training/HRD for BWDB staff in integrated river planning		8		7.1	56.8	0.0%	-
2. Equipment for BWDB Offices		8		1.8	14.4	25.0%	3.6
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>71.2</b>		<b>3.6</b>
<b>Overall Programme Costs</b>					<b>250.0</b>		<b>3.6</b>

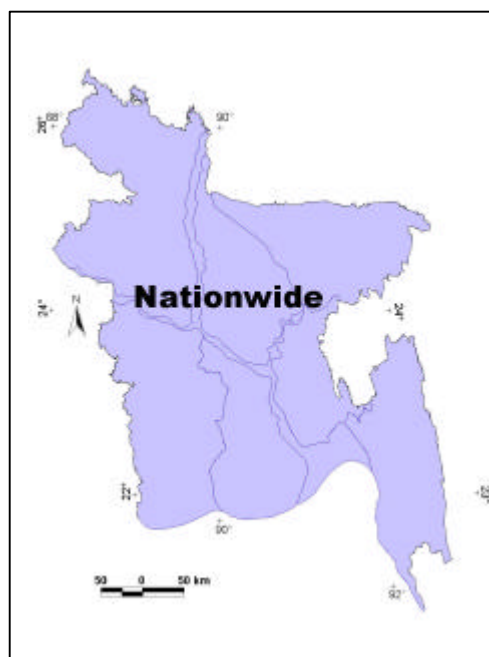
<b>Training Programmes</b>			<b>Regional Design Units</b>		<b>8 No.</b>
Trainees	25	per Regional Unit	Computer equipment	1,125,000	Tk/unit
80% Local	100,000	Tk/trainee	Communication support	200,000	Tk/unit
20% O/seas	20,000	\$/trainee	Miscellaneous other	500,000	Tk/unit
Total	<b>7.1</b>	TkM/unit	Total	<b>1.8</b>	TkM/unit

**Local Government Capacity Building for Water Management**

Ref: ID 005

**Basic Data**NWMP Sub-sector **Institutional Development**Region(s) **Nationwide Significance****Relevance to NWPo**

The NWPo introduces significant new roles and responsibilities for Local Government Institutions. In particular §4.2 Article e requires LG's to implement FCD/I projects having a command area less than or equal to 1000ha, while Article f calls upon LG's to be the principle agencies for coordinating stakeholder participation at all stages of water sector project cycles. Equally §4.3 Article e allows the central Government to decentralize water allocation rights to the LG's. The preamble to §4.4 establishes the principle that LG's have a role to play in the community level resource management. §4.4b Article e provides for the possibility of LG involvement in the joint management of non-municipal water schemes over 5000ha, while Article f requires the ownership of FCD and FCD/I projects with command areas less than or equal to 1000ha to be transferred to LG's.

**Purpose of Programme**

As a result of the NWPo, LGI's will become progressively responsible (with community groups) for the management of all FCD schemes up to 5000ha, and for the raising of operation and maintenance tariffs through local resources. They may also play an important role in supporting the management of larger schemes by autonomous bodies. In addition, LGI's will be responsible for development of community cyclone protection and will work with NGO's in support of barrier-level cyclone and flood proofing programmes. They will also have essential roles to play as regards the development of improved water supply and sanitation facilities in the rural areas. Equally, in the urban sector, paurashava and city corporations will become increasingly autonomous and responsible (directly or through WASA's) for the provision of all water-related services. Such new responsibilities clearly represent a challenge for the LGI's which have little or no historic experience of water sector development and are in any case generally weak or non-existent (the DSR reports that three out of four levels of Parishad have yet to be established). The DSR also concludes that considerable efforts will be needed to strengthen local planning and management capacity if it is to evolve in a manner that adequately reflects local issues while remaining, or indeed becoming compatible with national plans as well as with those of the line agencies. This programme is intended to deliver the necessary capacity building and human resource development in response to the needs assessments carried out under Programme ID 001 (Local Government Needs Assessment for Water Management). However, despite this programme's local focus, it will be necessary to include within its components to address the training needs of the LGED, especially in terms of the participatory implementation of small water projects/schemes and of the DPHE in terms of mobilising and working with the private sector.



## Programme Outline

The details of this programme will be defined by ID 001. It is anticipated nevertheless that this programme will begin with the establishment of the Central Training Unit and thereafter comprise a long and sustained effort beginning in the short term of the NWMP and continuing throughout the remainder of its 25 years. During that time it is intended to train a total of 737,900 LGI employees made up as follows:

Civil Administrative level	No of Institutional Entities	Estimated No of Trainees per Entities	Total No of Trainees
Paurashava	206	25	5,150
Zila Parishad	64	20	1,280
Upazila Parishad	464	15	6,960
Union Parishad	4,451	10	44,510
Gram Parishad	68,000	10	680,000
<b>Totals</b>	<b>73,815</b>		<b>737,900</b>

## Financing Arrangements

The programme is expected to cost some Tk12,100M inclusive of 2.5% monitoring and evaluation costs. It is suitable for Government funding.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Programme document for LGI capacity building for local water sector management and development by LGI's	I1	• Signed project document	2005
• Central Training Unit established at the Ministry of Local Government and Rural Development	I2	• Operational charter of the Central Training Unit	2006
• LGI water management operational capacity consistent with the needs of decentralised water management in Bangladesh	K	• Legal status of the Central Training Unit	2027
• Capacities of Bangladesh's restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) management reviews	2027
		• Regular (5 yearly) Independent training review	2027

## Institutional Arrangements

The proposed Central Training Unit (CTU) will be responsible for overall coordination of the programme and will begin by nominating and training District Level Human Resource Development Units (DLHRDUs), one for each District. With CTU assistance these will be responsible for developing their own long term capacity building strategies targeted at decentralised water management and reflecting closely the recommendations of ID 001. Such strategies will then be grant funded from the programme budget which will remain under the control of the CTU which will also provide training materials (as identified by ID 001) while monitoring and evaluating progress. Ideally, District training strategies will have measurable interim objectives which once reached would qualify the District in question for capital funding commensurate with the level of institutional reform and capacity reached as a direct or indirect result of the training and capacity building activities.

## Existing Documentation

Background analyses leading to the identification of this programme can be found in §4 of the DSR, where specific details are provided in sub-sections 4-4 and 4-5. Other than that, no additional documentation has been identified.

## **Linkages**

There is a clear and direct link with Programme ID 001 which represents the preparatory phase for this programme. Less direct, but equally important links also exist with programmes ID 002 (Independent Regulatory Bodies for Water Supply and Sanitation Service Sector); ID 003 (FCD and FCD/I Management Rationalisation); and ID 004 (BWDB Regional and Sub-regional Management Strengthening).

## **Risks and Assumptions**

The main risk will be that continuing delays in LGI establishment will compromise the validity of the programme or delay its execution. It is assumed however, that the Government's clearly enunciated and repeated commitment to decentralisation along with the advice and support of the donor community will be sufficient to overcome the remaining inertia.

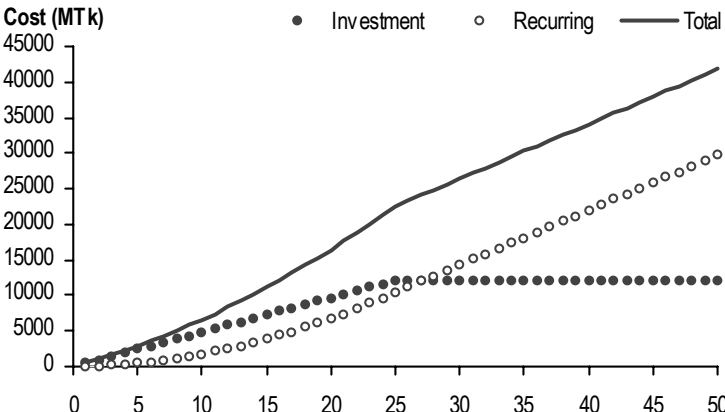
**Local Government Capacity Building for Water Management**Ref : **ID 005**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>		
Focus/Foci :	<b>Local Government Institutions</b>	Location :	<b>Nationwide</b>		
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>25 year(s)</b>	Agency(s) Responsible :	<b>LGIs</b> (Lead) <b>None</b> (Supporting)
Short Description :	The NWPo creates new roles for and places new responsibilities on Local Government Institutions. In particular §4.2.e requires LGI's to implement FCD/I projects having a command area less than or equal to 1000ha, while §4.2.f calls upon LGI's to coordinate stakeholder participation at all stages of water sector project cycles. Furthermore, as a result of §4.4.d LGI's will become progressively responsible for the management of all FCD schemes up to 5000ha, as well as for the raising of operation and maintenance tariffs through local resources. This programme is intended to deliver the necessary capacity building and human resource development in response to the needs assessments carried out under Programme ID 001 (Local Government Needs Assessment for Water Management). The programme will begin with the establishment of a Central Training Unit and thereafter comprise a long and sustained effort beginning in the short term of the NWMP and continuing throughout the remainder of its 25 years. The programme will include training for both LGED and DPHE to strengthen their				

**MIS Links**

Cost Calculation :	ID Programme costing.xls	Map :	ID 005 Map.jpg
Disb't Schedule :	ID Programme costing.xls	Description :	ID 005 PgP.doc

**Finance**

	Costs			Private	Funding (%)	Beneficiaries	Expected by
					GoB		ProgrammeYear
Total Capital <sup>3</sup>	12,100.00	MTk		0%	100%	0%	25
Ultimate Recurring	771.90	MTk/yr		n/a	100%	0%	26
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart			
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring	— Total
Status :	Identified						
Financial Base Year:	mid-2000						
Planned Expenditure (to date) :	0 MTk						
Actual Expenditure <sup>4</sup> (to date) :	0 MTk						

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Programme document for LGI capacity building for local water sector management and development by LGI's	• Signed project document	NYD
• Central Training Unit established at the Ministry of Local Government and Rural Development	• Operational charter of the Central Training Unit • Legal status of the Central Training Unit	NYD
• LGI water management operational capacity consistent with the needs of decentralised water management in Bangladesh	• Regular (5 yearly) management reviews	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design ,supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

## National Water Management Plan

### Programme Costing Sheet

Programme Ref	ID 005
Title	Local Government Capacity Building for Water Management

#### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Local Government staff training					6,768.7	0.0%	-
2. Office equipment					3,859.3	20.0%	771.9
3. Monitoring and evaluation		2.5%			272.0	0.0%	-
4. Strengthening LGED support capacity					600.0	0.0%	-
5. Strengthening DPHE support capacity					600.0	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					12,100.0		771.9
<b>Overall Programme Costs</b>					<b>12,100.0</b>		<b>771.9</b>

#### Local Government Training Costs

Urban centres, consisting of four city corporations (Dhaka, Chittagong, Rajshahi and, added in 1990, Khulna) and 206 Paurashavas, are independent of the Bangladesh territorial administrative structure of six Divisions 64 Zilas, 464 Upazilas, 4451 Unions and 68,000 villages.

	No.	Trainees per entity	Cost per trainee	Total training cost (TkM)	Equipment per entity	Total equip. cost (TkM)	Total cost (TkM)
Paurashava	206	25	42,500	219	250,000	52	270
Zila parishads	64	20	42,500	54	250,000	16	70
Upazila Parishads	464	15	21,250	148	125,000	58	206
Union Parishads	4,451	10	12,750	568	75,000	334	901
Gram Parishads	68,000	10	8,500	5,780	50,000	3,400	9,180
<b>Totals</b>	<b>73,185</b>			<b>6,769</b>		<b>3,859</b>	<b>10,628</b>

**WARPO Capacity Building**

Ref: ID 006

**Basic Data**

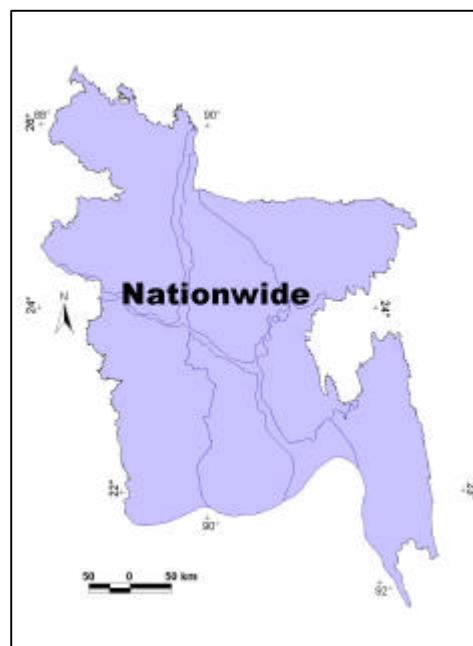
NWMP Sub-sector **Institutional Development**

Region(s) **Nationwide Significance**
**Relevance to NWPo**

§5.d of the NWPo establishes WARPO i) as the exclusive government institution for macro-level water resources planning and ii) as the Executive Secretariat of the ECNWRC.

**Purpose of Programme**

The various responsibilities assigned to WARPO by §5.d of the NWPo can be said to fall into two categories, namely: routine core services and periodic services. They are defined as follows:


**Routine Core Services**

- Maintenance, updating and dissemination of the NWRD
- Upkeep of water resource assessment
- Monitoring implementation of the NWMP and its impacts
- Functioning as a “clearing house” for all water sector projects
- Secretariat to the NWRC/ECNWRC
- Responding to NWRC/ECNWRC requests for information and advice

**Periodic Services**

- Updates of the National Water Management Plan
- Contributions to Five Year Plans
- Provision of ad hoc advice on policy, strategy, institutional and legal issues
- Execution of special studies, research, etc as required from time to time

Clearly if these tasks are to be fulfilled adequately, it will be necessary for WARPO to attract and retain a cadre of focused, permanent staff supported as and when required by reliable, high calibre contracted experts. Equally, in the interests of continuity, WARPO will have to become an attractive career option in terms of long term employment, while housing itself in a permanent functional and purpose built office. Unfortunately however WARPO and indeed its predecessors have suffered considerably from a lack of permanence, with adequate funding support provided only during national plan preparations and little in-between. These cycles of disinterest in WARPO have lead to loss of information and institutional memory. Career opportunities have been very limited, even for WARPO’s few permanent staff, and it is difficult for WARPO to attract and retain the calibre of staff suggested by its new responsibilities under Policy. This programme comprises a pragmatic approach to solving these pernicious problems.

**Programme Outline**

Four parallel strategies will be involved, all deliverable during the short term of the NWMP. The first involves revision of WARPO’s legal establishment, including necessary adjustments to its mandate to bring it fully into line both with NWPo requirements and the functional needs identified in the NWMP. Specific attention will be given in this to WARPO’s role as Secretariat

to the ECNWRC, precise definition of its “clearing house” role and relationships with other planning and monitoring agencies, reinforcing its position of neutrality amongst the many agencies involved in the water sector and reviewing the composition of the WARPO Board of Governors to provide strong and appropriate stewardship. Secondly, steps will be taken to revise WARPO’s staffing structure commensurate with its redefined functions, acknowledging the potential benefits of short term employment of specialists to support periodic activities. Thirdly, a permanent, purpose built high-tech office will be constructed for WARPO, potentially sharing this facility to mutual benefit with other organisations such as SWMC, EGIS and the JRC. Finally, value will be added to these investments by means of a series of capacity building initiatives delivered over a three to five year period with a focus on further strengthening of planning and monitoring capabilities as well the establishment of stronger links with the LGI’s and with line agencies.

## Financing Arrangements

The total cost, all of which will be incurred in the NWMP short-term, is estimated to be Tk660M. All of this is suitable for GoB financing, perhaps with donor assistance.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• WARPO mandate and establishment in line with NWPO and NWMP requirements	I1	• Gazetted Act and approved establishment	2003
• WARPO housed in a purpose built fully equipped high tech facility	I2	• Registered address of WARPO	2004
• WARPO capacity building training programme	I3	• Signed Project Document	2003
• WARPO established as a centre of excellence	K	• Donor confidence	2008
		• Investor confidence	
		• Correlation between plans and actualities in the water sector	
• Capacities of Bangladesh’s restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) independent training reviews	2025

## Institutional Arrangements

WARPO will be the main executor of this programme. Interim steps will be agreed with WARPO’s Board of Governors with further endorsement from the Ministry of Water Resources to whom WARPO at present is administratively attached.

## Existing Documentation

A five year work plan for WARPO is available. It provides a preliminary outline of WARPO capacity building requirements.

## Linkages

Operational linkages will be encouraged with the SWMC for resource modelling; EGIS for NWRD maintenance and broader environmental impact monitoring of water sector development activities, and BIDS for economic and regulatory issues. Administrative linkages will have to be strengthened with the Planning Commission and ideally, philosophical linkages should be established with other related bodies around the world for the purpose of information sharing and exposure to other sectoral solutions/paradigms.

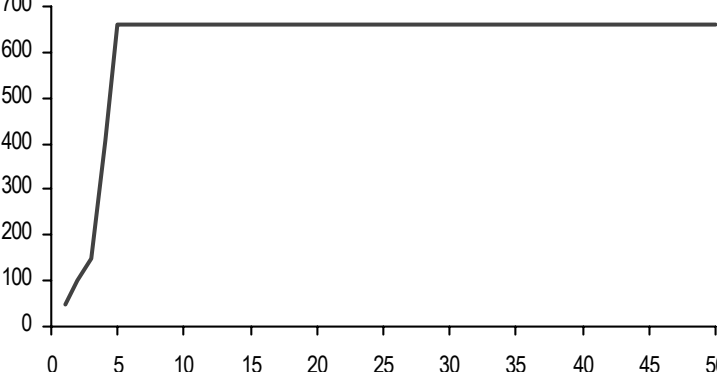
## **Risks and Assumptions**

The first main risk concerns the ability of WARPO to attract and retain staff of appropriate calibre. This will be mitigated by placing the organisation in an influential position with an attractive and efficient operating environment, including good career and training prospects. Wider civil service reforms, including the prospects for enhanced performance related employment conditions would also be of direct relevance to WARPO. The second risk is simply that of inaction, leading to a further cyclical collapse of WARPO at a time when it is clearly needed to champion the NWPo as well as guiding and monitoring its implementation under the NWMP. It is reasonable to assume however, that current, strongly enunciated central commitment to institutional reform will be sufficient to overcome this.

**WARPO Capacity Building**Ref : **ID 006**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>WARPO</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2001</b>	Duration <sup>2</sup> :	<b>5 year(s)</b>
		Agency(s) Responsible :	<b>WARPO</b> (Lead) <b>None</b> (Supporting)
Short Description :	WARPO has suffered considerably in the past from a lack of permanence, with adequate funding support being provided only during national plan preparations and little in-between. Furthermore, prevailing employment conditions then, make the appointment and retention of suitable staff difficult. This programme intends to render WARPO sustainable while building its capacity such that it becomes a centre of excellence characterized by committed high calibre staff. This will be achieved by revision of WARPO's legal establishment, restructuring of WARPO staffing, relocation to a permanent suitable office and various capacity building programmes.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 006 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 006 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme	Year		
	Total Capital <sup>3</sup>		660.00 MTk	0%	100%	0%		5	
	Ultimate Recurring		0.00 MTk/yr	n/a	n/a	n/a		n/a	
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment    ○ Recurring    — Total				
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• WARPO mandate and establishment in line with NWPo and NWMP requirements	• Gazetted Act and approved establishment	NYD
• WARPO housed in a purpose built fully equipped high tech facility	• Registered address of WARPO	NYD
• WARPO capacity building training programme	• Signed Project Document	NYD
• WARPO established as a centre of excellence	• Donor confidence • Investor confidence • Correlation between plans and actualities in the water sector	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done



# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 006
Title	WARPO Capacity Building

### Assumptions:

Taka/US\$	51.000	TA duration	5.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	115.0	20,000		117.3		
Senior National consultants (all-in rate)	p-m	115.0		150	17.3	0.0%	-
Mid-level National consultants (all-in rate)	p-m	283.0		90	25.5	0.0%	-
Sub-totals					160.0		-
Other general TA programme costs		25%			40.0		-
Specific other TA programme costs	Training and Study tours				50.0	0.0%	-
<b>Total TA Costs</b>					<b>250.0</b>		-
<b>Other Programme Costs</b>							
1. Provision for R&D support	PS				310.0	0.0%	-
2. Permanent building	PS	Upkeep covered by R&D Support			100.0	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>410.0</b>		-
<b>Overall Programme Costs</b>							
					<b>660.0</b>		-

**Department of Environment Capacity Building**

Ref: ID 007

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide****Relevance to NWPo**

Article 4.08 has three clauses with explicit operational implications for the Department of Environment (DoE): (b) requires that effluent disposal is monitored by relevant Government agencies; (c) instructs the DoE and (d) requires that industrial polluters pay for the clean-up of water bodies polluted by them. Equally, the Policy is characterised by numerous implicit references to environmental standards and objectives, most of which have implications for further DoE operations and capacity.

**Purpose of Programme**

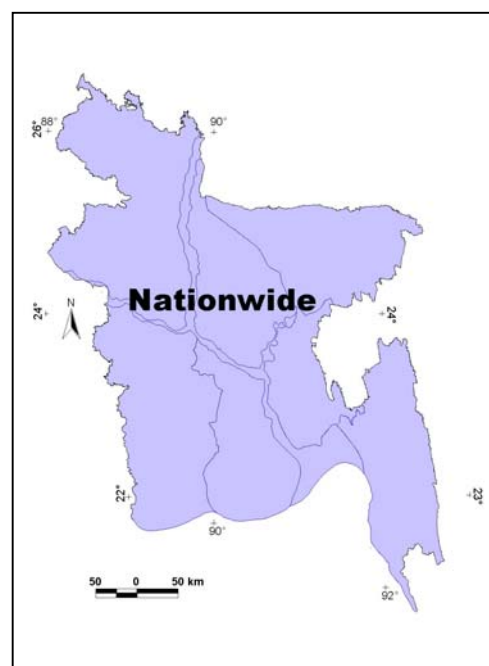
The purpose of the Programme is to strengthen DoE's ability to carry out its duties effectively.

**Programme Outline**

The DoE is the primary institution for environmental management and the setting and enforcement of the environmental regulations. Its key duties related to the water sector include:

- pollution control, including the monitoring of effluent sources and ensuring mitigation of environmental pollution;
- setting the Water Quality Standard (WQS) for particular uses of water and for discharges to water bodies;
- defining EIA procedures and issuing environmental clearance permits, the latter being legal requirements before proposed projects can proceed to implementation;
- providing advice or taking direct action to prevent degradation of the environment;
- declaring Environmentally Critical Areas (ECAs) where the ecosystem has been degraded to a critical state. ECA status confers protection on land and water resources through a series of environmental regulations.

However, the DoE has been consistently under-resourced and needs institutional strengthening. In 1999 the Sustainable Environmental Management Programme (SEMP) began this process, with UNDP and other donor support. SEMP includes a Policy and Institutions sub-programme within SEMP, which has a component on "Capacity Building for Environmental Legislation and Policy Analysis". Linked with this is the Bangladesh Environmental Management Project (BEMP), supported by the Canadian Government, which over a five-year period is strengthening the DoE.



BEMP forms the core of the DoE strengthening effort. Started in 1999, with a total budget of Tk391M, its emphasis is on human resource development, institutional planning, legal and policy matters, strategic planning, awareness raising and resource information systems, linked by practical demonstration projects. The “brown” rather than “green” environment is being given priority. Air pollution is the subject of the first demonstration project and the Buriganga River Pollution Prevention and Control Project is the second. BEMP’s approach is to work closely with industries. A serious constraint on BEMP impact so far has been DoE’s understaffing, which has resulted in low absorptive capacity to technical assistance. Increased staffing has been promised by GoB.

Despite this and other difficulties, BEMP has a vital contribution to make to the improvement of the water-related environment. An effective DoE, as the primary official body responsible, is essential. Due to its relative youth and lack of resources, the DoE will be unable to fulfil its role without a continuing strengthening programme, coupled with increased staffing and budget provisions from GoB. This is likely to be a long-term process.

It is therefore envisaged that the DoE strengthening programme will continue for a further five years after the end of the current phase in June 2004. Based on the cost data in the 2000/01 ADP, the budget remaining at the end of that fiscal year will be Tk218M. If this is fully utilised in the remaining three years, the average annual spend will be around Tk73M. The same level of spend has been assumed for the 5 year period after June 2004, the total cost of the new phase of the programme thus being Tk365M. Part of this continued strengthening programme will need to be put into establishment of DoE representation at Zila level to facilitate environmental oversight and regulation of local level activities as per law.

## Financing Arrangements

Financing will be by GoB, with a major donor contribution expected as at present.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"> <li>Department of Environment capacity building programme agreed by DoE and WARPO</li> </ul>	I1	<ul style="list-style-type: none"> <li>Signed Project Document</li> </ul>	2005
<ul style="list-style-type: none"> <li>Department of Environment capacity building programme completed</li> </ul>	K	<ul style="list-style-type: none"> <li>Ex-post evaluation</li> <li>Programme completion report</li> </ul>	2010
<ul style="list-style-type: none"> <li>Capacities of Bangladesh’s restructured water sector institutions strengthened in line with future demands on them</li> </ul>	D	<ul style="list-style-type: none"> <li>Regular (5 yearly) independent training reviews</li> </ul>	2026

## Institutional Arrangements

As at present, the host agency for the strengthening programme will be the DoE, as the institution being strengthened, and close liaison will be maintained with those SEMP components which are relevant to the Programme.

## Existing Documentation

Mainly BEMP, SEMP and donor agency reports.

**Linkages**

Links will be strong with Programme EA 010 Environmental Responsibility, Public Awareness Raising and Empowerment; and with other EA programmes. There will also be some linkage with other Institutional Development programmes.

**Risks and Assumptions**

The greatest risk is that GoB will fail to provide sufficient staff and funding to enable DoE to benefit fully from the technical assistance provided and thereafter to function effectively.

**Department of Environment Capacity Building**

Ref :

**ID 007**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>		
Focus/Foci :	<b>Department of Environment</b>	Location :	<b>Nationwide</b>		
Start Year <sup>1</sup> :	<b>2001</b>	Duration <sup>2</sup> :	<b>5 year(s)</b>	Agency(s) Responsible :	<b>DoE</b> (Lead) <b>None</b> (Supporting)
Short Description :	As far as aquatic resources are concerned, DoE is mandated to protect water quality and ensure efficiency of use and in particular to monitor (and establish standards of) effluent disposal to prevent water pollution. This programme allows for institutional capacity building of DoE including the establishment of representational offices down to District level.				

**MIS Links**

Cost Calculation :	ID Programme costing.xls	Map :	ID 007 Map.jpg
Disb't Schedule :	ID Programme costing.xls	Description :	ID 007 PgP.doc

**Finance**

	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>365.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>5</b>
Ultimate Recurring	<b>0.00</b> MTk/yr	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b> 			
Status :	<b>Preparation</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Department of Environment capacity building programme agreed by DoE and WARPO	• Signed Project Document	NYD
• Department of Environment capacity building programme completed	• Ex-post evaluation • Programme complete report	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 007
Title	Department of Environment Capacity Building

### Assumptions:

Taka/US\$	51.000	TA duration	5.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	168.0	20,000		171.4		
Senior National consultants (all-in rate)	p-m	300.0		150	45.0	0.0%	-
Mid-level National consultants (all-in rate)	p-m	300.0		90	27.0	0.0%	-
Sub-totals					243.4		-
Other general TA programme costs		25%			60.8		-
Specific other TA programme costs		25%			60.8	0.0%	-
<b>Total TA Costs</b>					<b>365.0</b>		-
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-
<b>Overall Programme Costs</b>					<b>365.0</b>		-

**Disaster Management Bureau Capacity Building**

Ref: ID 008

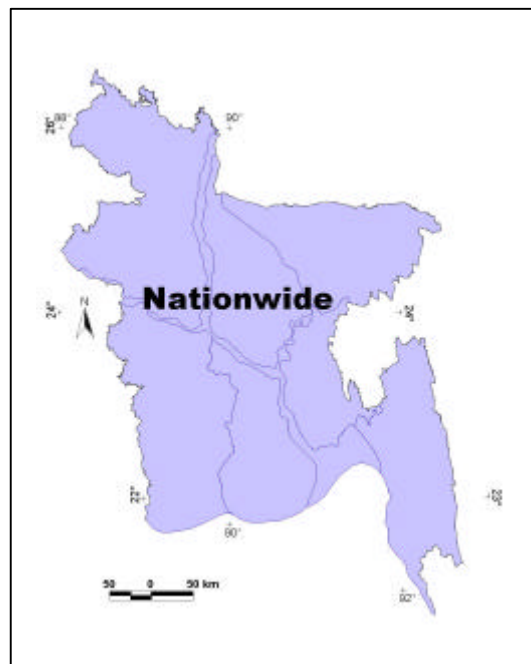
**Basic Data**

NWMP Sub-sector     **Institutional Development**

Region(s)                **Nationwide Significance**

**Relevance to NWPo**

§4.2(c) of the NWPo requires that the NWMP and all related plans will be prepared in a comprehensive manner with regard to the interests of all water-related sectors. In Section (o) it stipulates that responsible agencies will develop early warning and flood-proofing systems to manage natural disasters. In §4.4, the NWPo makes clear that the Government's intervention will be directed towards ... addressing specific problems and protecting particular community interests. It further states that appropriate institutions will provide information to local community organisations for managing water resources efficiently.

**Purpose of Programme**

The Government's Development Strategy for the NWMP makes clear its intentions towards disaster management. Disaster management (including disaster preparedness) involves prevention and mitigation measures, preparedness plans and related warning systems, emergency response measures and post-disaster reconstruction and rehabilitation. Accordingly, in acknowledging that some people will always be at risk, the main aims for water-related disaster management are to provide the means by which, through a combination of structural and non-structural measures and to the extent feasible and affordable, people are adequately warned of an approaching disaster, are equipped to survive the disaster with as much as possible of their assets intact, and are adequately supported in rebuilding their lives thereafter.

Over the last decade, disaster management has become recognised as both a necessary and legitimate element of overall water management. The Disaster Management Bureau (DMB) was created in June 1994 as a UNDP/UNICEF funded project under the administrative control of the Ministry of Disaster Management and Relief. DMB is headed by a Director-General and is supported by four functional Directors (i) Planning, (ii) Training, (iii) MIS and GIS, and (iv) Administration and Logistics. The Bureau carries out its responsibility through disaster management committees at Union, Upazila and District level. There is a co-ordination committee at Ministry level, and a Disaster Management Council at national level chaired by the Prime Minister. The Bureau provides services such as awareness raising, collecting, preserving and disseminating management and geographical information - including mapping and damage assessment. It is also responsible for all stages (ie pre, during and post) of managing disasters whether caused by flood, cyclone, drought, earthquake etc.

In the context of the NWMP, DMB has a key role to play as an interface between the forecasting agencies (principally BWDB and Department of Meteorology) in terms of disseminating information on water-related disasters and assisting those afflicted by such disasters, including ensuring they are fully prepared when disasters strike.

The purpose of this programme is to provide the necessary support to DMB to enable the agency to be fully responsive to water-related disasters.

## Programme Outline

The programme represents a continuation of earlier work to establish and build up the capacity of the DMB. This entails primarily supporting the outreach of DMB to District, Thana, Union and village levels, and strengthening at each level. In principle, most of these structures are in place, and the issue is one of “making things work”.

The Comprehensive Disaster Management Programme under preparation by the Ministry of Disaster Management Bureau with UNDP support (BGD/92/02), lists the potential areas for further support as follows:

Physical Support		Non-Structural Support	
• Multi-purpose shelters	DM 001	• Public awareness campaigns	EE 010
• Embankments/dykes	AW 007	• DP education	ID 008
• Access roads	DM 004	• Training	ID 008
• River bank protection	MR 010	• Community mobilisation	ID 008
• Urban mitigation	TR 007	• Risk/hazard mapping	EE 004
• Communication equipment	ID 008	• Vulnerability profiles	EE 004
• Wind and flood resistant buildings	DM 002	• Environmental threats	EA 010
• Safe water supplies	TR 003-4	• Community focus and NGOs	ID 008
• Sanitation facilities	TR 005-6	• Standing Orders and Coordination	ID 008
• Heavy lifting equipment	ID 008	• Enhancement of EOC	ID 008
• Fire fighting appliances	ID 008	• MIS and GIS	ID 008
• Ambulances	ID 008	• Warning systems	ID 009
• Telecommunications support	ID 008	• Cross border co-operation	ID 009, 010
		• Pollution monitoring	EA 003
		• Arsenic detection and mitigation	TR 002

Most of these support measures are already covered in one form or another under different NWMP programmes, leaving the following to be covered under this programme:

1. Communication equipment
2. Heavy lifting equipment
3. Fire fighting appliances
4. Ambulances
5. Telecommunications support
6. DP education
7. Training
8. Community mobilisation
9. Community focus and NGOs
10. Standing Orders and Coordination
11. Enhancement of EOC
12. MIS and GIS



It is assumed that this programme will require a further 10 years to complete, and will be guided by the ongoing preparatory work.

## Financing Arrangements

No reliable estimate is available for the cost of the above programme components. Given the prevalence of natural water-related disasters in Bangladesh, and the time that it will take to mitigate the risks through other programmes, significant expenditure on disaster preparedness and relief appears well justified. Provisionally a sum of Tk2200M is set aside for this. Together with programmes listed above, this would represent very approximately one-third of the total plan investments. The programme is suitable for Government funding with the potential for donor support.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Disaster Management Bureau capacity building programme agreed by the DMB and WARPO	I1	• Signed Project Document	2004
• Disaster Management Bureau capacity building programme completed	K	• Ex-post evaluation • Programme completion report	2014
• Capacities of Bangladesh's restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) independent training reviews	2026

## Institutional Arrangements

The programme will be implemented by DMB. Close co-operation will be needed with many water sector agencies with direct and indirect stake in disaster management. These include Municipalities, Zila parishads, BWDB, Department of Meteorology, LGED, DPHE, community organisations and NGOs.

## Existing Documentation

The topic of disaster management is discussed extensively in DSR, Main Report,. Cyclone Protection is covered in Cyclone Shelter Preparatory Study, June 1998, for European Commission with LGED. The Comprehensive Disaster Management Programme is being prepared for Ministry of Disaster Management Relief with UNDP support under programme ref. BGD/92/002.

## Linkages

Linkages are described in the table above.

## Risks and Assumptions

The main challenge for this programme will be to sustain the benefits of increased capacity in the form described above. Whilst this necessitates a commitment from Government to a significant level of recurrent expenditure, much is to be gained from mobilising community support for disaster management. It is assumed that the programme design will reflect this.

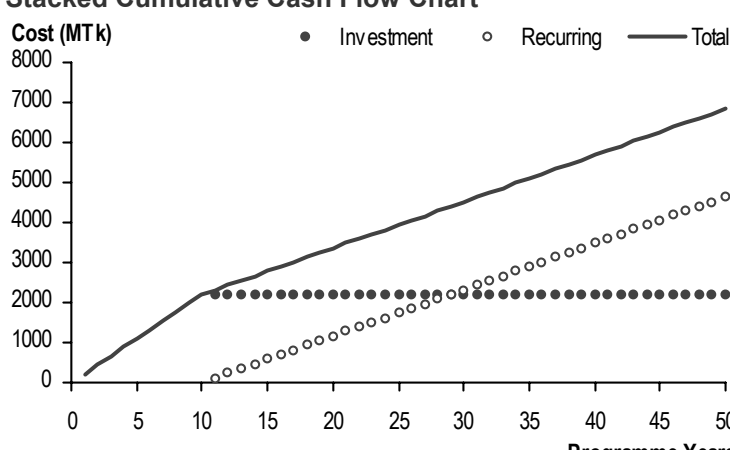
**Disaster Management Bureau Capacity Building**

Ref :

**ID 008**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Disaster Management Bureau</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>10 year(s)</b>
		Agency(s) Responsible :	<b>DMB</b> (Lead) <b>None</b> (Supporting)
Short Description :	This programme will provide the resources necessary to continue ongoing capacity building activities throughout the short and medium terms in order that the DMB can address its mandate in an increasingly effective fashion.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 008 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 008 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme		Year	
	Total Capital <sup>3</sup>		2,200.00 MTk	0%	100%	0%		10	
	Ultimate Recurring		116.00 MTk/yr	n/a	100%	0%		11	
	Date of Data :		31 07 01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment ○ Recurring — Total				
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Disaster Management Bureau capacity building programme agreed by the DMB and WARPO	• Signed Project Document	NYD
• Disaster Management Bureau capacity building programme completed	• Ex-post evaluation • Programme complete report	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 008
Title	Disaster Management Bureau Capacity Building

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	10.0	years	

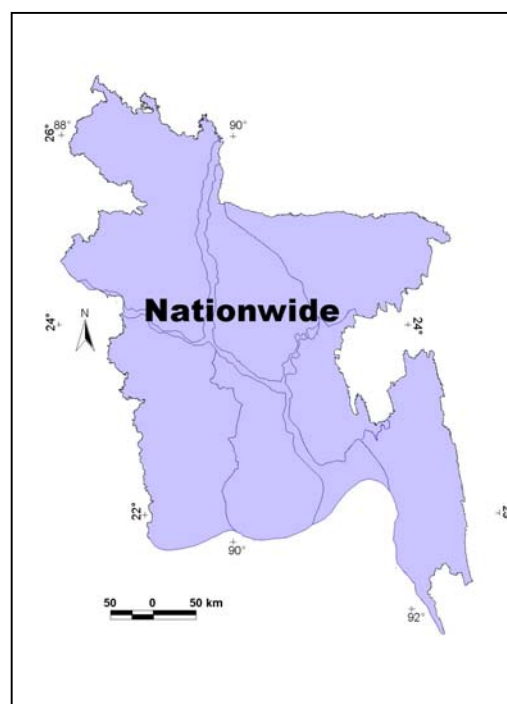
Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
<i>Programme preparation is ongoing with UNDP support</i>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Communications and related equipment					300.0	20.0%	60.0
2. Disaster relief equipment					500.0	10.0%	50.0
3. Education and training					1,100.0	0.0%	-
4. Central services					300.0	2.0%	6.0
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					2,200.0		116.0
<b>Overall Programme Costs</b>							
					2,200.0		116.0

**Capacity Building for Other Organisations**

Ref: ID 009

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide Significance****Relevance to NWPo**

The preamble to §4.2 of the NWPo recognises that “...the process of planning and managing water resources requires a comprehensive and integrated analysis of relevant hydrological....factors across all related water-using sectors.”. Clause o) of the same section calls for “..early warning systems to manage natural disasters like flood and drought.” §4.13 notes that “water bodies like haors, baors and beels are precious assets” and should be “preserved for maintaining the aquatic environment and facilitating drainage”.

**Purpose of Programme**

It is important to realise that in Bangladesh floods can have at least three primary causes: i) cyclones, which affect largely the coastal belt; ii) excessive local seasonal rainfall and iii) excessive in-stream flows, the last two of which are often greatly exacerbated by secondary problems such as impeded drainage or accretion in the case of natural channels.

As far as cyclones are concerned, Bangladesh's existing forecasting system is limited to the use of satellite imagery to monitor the formation of cyclones. Although it is constantly being upgraded, no technology is as yet available whereby cyclone intensity, speed and direction can be predicted with any degree of reliability. Current methods are predominantly empirical and subjective, thus there is a pressing need for the introduction of numerical methods. Furthermore, tropical cyclones frequently change course and intensity and the resulting uncertainties reduce public confidence in the warning, and response to warnings when they are issued. To increase confidence to levels where the need for prompt action is rarely questioned, it will be important to distinguish between the **possibility** of a cyclone striking Bangladesh and the **probability** of landfall, where and when.

Despite the high rainfall and great rivers that typify Bangladesh, every year brings months without rainfall that bring hardship to people living in areas with poor access to surface and groundwater resources. Low monsoon rainfall can seriously damage the aman crop while droughts in April and May has the same effect on the aus. Furthermore, the depressed groundwater tables that result often render ineffective village hand pumps in the area, driving women to seek water from contaminated surface sources. Adequate notice of drought conditions would be helpful to those responsible for arranging food imports or releases from Government godowns. And of particular usefulness would be a system that forecasts droughts for the period April to October. Advance warning of potentially disastrous flood and drought events would not only preserve live and livelihoods; it could also pre-empt knock on food security and other economic shocks.

Inland floods affect much of Bangladesh every year, and agriculture and human settlements have adapted to normal floods caused by rainfall or lateral flow from rivers. However, severe monsoon floods, like those of 1998, cause significant damage to crops and property. Floods can also be associated with major changes in river planform and sedimentation, the sources of erosion, accretion and disruption of navigation in the lean season. Understanding the behaviour of rivers is crucial in a country like Bangladesh.

The area of naturally-occurring water bodies has declined as a result of the increasing pressure on land and man's interventions. The eco-systems that depend on these water bodies are changing as a consequence, leading to loss of suitable habitats for a wide variety of aquatic vegetation and other natural resources, which are themselves important for the poor in particular. The Government is committed to preserving the natural environment and has given special, but by no means exclusive, emphasis to the wetlands found in the NE of the country.

This programme provides for capacity building in three important organisations who must respond to these policy directives: (i) the Department of Meteorology, (ii) the River Research Institute and (iii) the Bangladesh Haor and Wetland Development Board.

## Programme Outline

### (i) Bangladesh Meteorological Department (BMD)

Essentially, the whole point of improving the Bangladesh Meteorological Department's ability to forecast and quantify extreme climatic events, be they coastal floods, inland floods or droughts, is to provide time for adequate responses or preparations to be made as appropriate:

Event	Rapid Response needed	Advance Warning needed
Cyclones	<ul style="list-style-type: none"> <li>Evacuation of people and livestock to shelters, killas, embankments and high ground</li> <li>Securing of ships and boats</li> </ul>	<ul style="list-style-type: none"> <li>Safe havens provided</li> </ul>
Inland Floods	<ul style="list-style-type: none"> <li>Evacuation of people and livestock to embankments and high ground</li> </ul>	<ul style="list-style-type: none"> <li>Stock piling of food, blankets and medicines</li> </ul>
Droughts	<ul style="list-style-type: none"> <li>Not applicable</li> </ul>	<ul style="list-style-type: none"> <li>Macro food security measures</li> </ul>

Thus the programme, which is scheduled for the short term, provides for the establishment in Bangladesh of digital equipment with which to make more accurate forecasts not only of cyclone intensity, but also time and location of landfall. Equally, multi-parameter warning systems, ideally based on regional rather than local monitoring, will be introduced for the purpose of forecasting extreme hydrological events and lines already being considered, at least conceptually, by USAID. Finally, the programme will ensure that all relevant staff are adequately trained in the use of the new facilities.

### (ii) River Research Institute (RRI)

Under the Ministry of Water Resources, the River Research Institute is mandated to undertake studies of river behaviour. Currently established in Faridpur, RRI conducts physical modelling of rivers as well as undertaking engineering soil testing, mainly in support of BWDB activities. A part of its income is derived from contracting out these services to other agencies and projects. Whilst increasing use is made of mathematical models, it is considered by many important to retain and improve domestic capacity for physical modelling. Given the significance of sediment transport in Bangladesh and the greater focus on integrated river system management in the

NWMP, it is anticipated that there will be an increase in demand upon RRI's services and a consequent need to upgrade their skills and capacity in modelling sediment transport.

### (iii) Bangladesh Haor and Wetland Development Board (BHWDB)

The newly formed Bangladesh Haor and Wetland Development Board is faced with the demanding task of preserving the declining wetlands of Bangladesh, especially those in the Northeast. Whilst many of necessary the skills for river engineering have been imported with staff deputed from BWDB, there is a dearth of environmental knowledge. To address this will require a proper skills inventory, with a downstream capacity building programme involving both training and recruitment. This programme will support these activities.

## **Financing Arrangements**

The programme is suitable for GoB funding, possibly with donor or development bank assistance and is expected to cost some Tk300M, all of which will be required in the first five years of the NWMP.

## **Objectives and Indicators**

<b>Objective</b>	<b>Suffix</b>	<b>Indicators/Mean of Verification</b>	<b>Due</b>
• Capacity building programmes agreed for BMD, RRI and BHWDB	I1	• Signed Project Documents	2005
• State of the art climate forecasting facilities available to the BMD	I2	• Equipment inventory	2010
• Reliable predictions of extreme climatic events (both short and long term), and morphological changes; and effective wetland management procedures	K	• Annual performance reviews	2012
• Capacities of Bangladesh's restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) independent training reviews	2027

## **Institutional Arrangements**

It is intended that the programme by the concerned organisations with some international technical assistance. Close association with the Disaster Management Bureau, co-operation with BWDB's Flood Forecasting and Warning Centre, the Field Service Wing of DAE and the Integrated Coastal Management Programme will be desirable for the DoM programme, and with DoE for the BHWDB programme.

## **Existing Documentation**

A useful, fairly detailed description of the cyclone warning challenge can be found in "Flood Forecasting in Coastal Areas" Danish Hydraulics Research Institute, May 2000; but no existing documentation relative to the forecasting of long term hydrological extremes, or for RRI and BHWDB strengthening, has so far been located.

## **Linkages**

There are obvious links with NWMP Programmes DM 001 (Cyclone Shelters and Killas), DM 002 (Bari-level Cyclone Shelters), ID 008 (Disaster Management Bureau Capacity Building), ID 010 (BWDB Capacity Building), MR 001 (Main River Studies and Research) and MR 006 (Regional River Management and Improvement).

## **Risks and Assumptions**

Two classic risks are associated with early warning systems of this kind. First is the risk that people will feel over-confident to the extent that they will wait for the warnings from the official system, which may have failed even as the event approaches. Secondly, communities can become complacent or cynical in the wake of false alarms. It is assumed that both risks can be obviated by appropriate levels of community involvement especially as regards the selection of community contact individuals and emergency task groups. People will be more likely to trust community members that they themselves have given responsibility to. There is also a risk that recurring costs will not be met by official sources; but it may be possible to establish the early warning system on a revenue basis whereby users of the information are required to pay a small sum for the privilege of doing so.

For RRI, as primarily a service agency, the risk is of course is that there is insufficient demand for the services provided. Whilst in principle the demand will exist and indeed increase as a result of other NWMP programmes, the strength of demand will depend upon the quality and cost-effectiveness of the services provided by RRI. Building the skills and capacity of RRI should therefore be seen as a holistic exercise embracing all employees who contribute to the service, not just for a limited number of specialists.

As a relatively young organisation, BHWDB faces many challenges ahead in resolving the intricate problems of wetland management. The risk for BHWDB, given its roots, is that it becomes an implementing agency for engineering works, alienated from both the environmental and local communities, without whose support the BHWDB will not prosper. The programme seeks to avert this by broadening the skill base, and it is assumed that the top management will fully support a pro-active stance towards environmental issues.

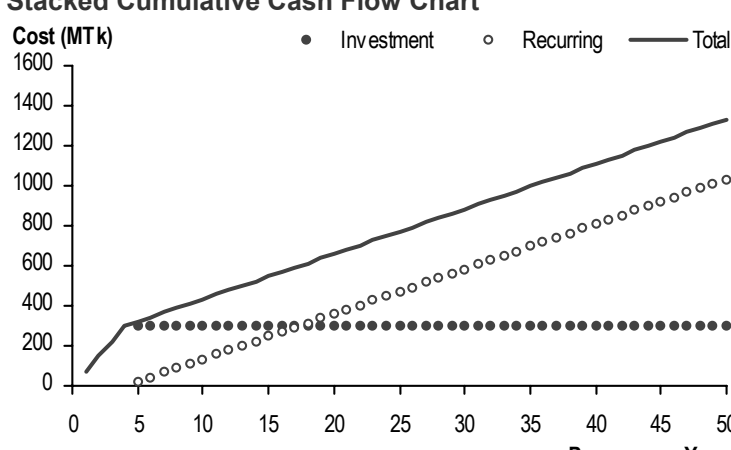
**Capacity Building for Other Organisations**

Ref :

**ID 009**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Other Agencies</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>4 year(s)</b>
		Agency(s) Responsible :	<b>BMD, RRI, (Lead) BHWDB (Supporting) None</b>
Short Description :	The NWPo §4.02(o) requires the GoB or its responsible agencies to undertake comprehensive and integrated analysis of relevant hydrological factors across all related water-using sectors for the purpose of managing the river systems and providing early warning systems of natural disasters like flood and drought. NWPo §4.13 also requires water bodies like haors, baors and beels are preserved for maintaining the aquatic environment and facilitating drainage. This programme provides for capacity building of three key agencies involved in these activities, namely: Bangladesh Meteorological Department, River Research Institute and Bangladesh Haor and Wetland Development Board.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 009 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 009 PgP.doc

Finance						
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear	
Total Capital <sup>3</sup>	300.00 MTk	0%	100%	0%	4	
Ultimate Recurring	22.50 MTk/yr	n/a	100%	0%	5	
Date of Data :	31 07 01 (dd) (mm) (yy)	Stacked Cumulative Cash Flow Chart				
Status :	Identified	Cost (MTk)				
Financial Base Year:	mid-2000	<div>● Investment ○ Recurring — Total</div> 				
Planned Expenditure (to date) :	0 MTk					
Actual Expenditure <sup>4</sup> (to date) :	0 MTk					

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Capacity building programmes agreed for DoM, RRI and BHWDB	• Signed Project Documents	NYD
• State of the art climate forecasting facilities available to the BMD	• Equipment inventory	NYD
• Reliable predictions of extreme climatic events (both short and long term), and morphological changes; and effective wetland management procedures	• Annual performance reviews	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design ,supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done



**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	<b>ID 009</b>
Title	<b>Capacity Building for Other Organisations</b>

*Assumptions:*

Taka/US\$	51.000	TA duration	4.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	84.0	20,000		85.7		
Senior National consultants (all-in rate)	p-m	104.0		150	15.6	0.0%	-
Mid-level National consultants (all-in rate)	p-m	208.0		90	18.7	0.0%	-
Sub-totals					120.0		-
Other general TA programme costs		25%			30.0		-
Specific other TA programme costs	Equipment and training				150.0	15.0%	22.5
<b>Total TA Costs</b>					<b>300.0</b>		<b>22.5</b>

**Other Programme Costs**

1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-

<b>Overall Programme Costs</b>					<b>300.0</b>		<b>22.5</b>
--------------------------------	--	--	--	--	--------------	--	-------------

**Break up**

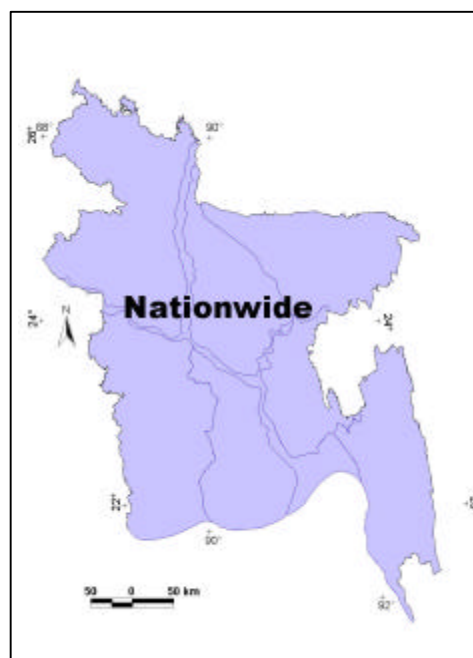
Technical Assistance	Expat	National 1	National 2	TA Total (TkM)	Equipment and Training (TkM)	Total (TkM)
1. BMD Capacity Building	40.0	60.0	120.0	75.8	37.50	113.3
1. RRI Capacity Building	30.0	30.0	60.0	50.6	75.00	125.6
1. BHWDB Capacity Building	14.0	14.0	28.0	23.6	37.50	61.1

**BWDB Capacity Building**

Ref: ID 010

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide Significance****Relevance to NWPo**

§3 of the NWPo confirms that all agencies working in the water sector are subject to the policy which is intended to result in sustainable public and private water delivery systems (§3.c); institutional changes that will help decentralize water resources management (§3.d) and a legal and regulatory environment that helps the process of decentralization. The preamble to §5 states that Government will restructure and strengthen...the existing institutions to ensure that the agenda for reform ...is implemented efficiently. §5.a confirms that the Government will formulate a framework for institutional reforms to guide all water sector activities and review the mandates of all water sector institutions. Finally and where appropriate, Government will restructure its present institutions (§4.1) and to this end, public water schemes are designed with specific provision for future disinvestments if and when feasible.

**Purpose of Programme**

Under the BWDB Act 2000, BWDB is repositioned to place a central role in water resource development and management, with a mandate fully consistent with the Policy. Many of BWDB's earlier functions are retained and it is assumed that in-service training, supported by project assistance as needed, will continue. However, in a number of key areas, new functions are included and existing ones are to be undertaken in modified ways. BWDB needs to respond to these challenges in a number of ways. This programme, together with ID 003: FCD and FCD/I Management Rationalisation and ID 004: BWDB Regional and Sub-Regional Management, is designed to provide support for BWDB to bring about the necessary internal changes and restructured skill mix envisaged under NWPo. It will be incumbent upon BWDB to review its staffing mix, and to recruit a significant proportion of non-engineering professionals to complement the efforts to re-train staff included within this programme. Efforts will also be needed for institutional development and HRD of the RRI and BHWDB.

**Programme Outline**

The programme aims to strengthen BWDB in four specific areas, to provide induction and in-service training within a broader framework of promoting a truly integrated and participatory approach to water resource management, and to upgrade BWDB's office accommodation consistent with its revised role. The important elements of the programme are as follows, which would be preceded by a preparatory technical assistance to assist in programme design and planning:

- Support for flood forecasting and warning dissemination
- Strengthening surface and groundwater monitoring and dissemination
- Support for erosion and accretion forecasting
- Support for Planning, design and O&M activities
- Support for drought forecasting
- Re-orientation programmes
- Management Information System (MIS) for BWDB
- Human Resource Development (HRD) for different departments of BWDB
- New central office
- Upgrading regional centres

It is envisaged that the programme would take 10 years to complete.

### **Financing Arrangements**

The total cost of the programme over 10 years is estimated to be Tk1316M, of which Tk50M is for preparation and Tk300M is for new office and upgrades. The re-orientation programmes are targeted at 3000 BWDB staff and are estimated to cost Tk302M, with remaining four specific programmes costing Tk190M, Tk163M, Tk222M and Tk89M respectively. Financing is appropriately from Government with the potential for donor support.

### **Objectives and Indicators**

<b>Objective</b>	<b>Suffix</b>	<b>Indicators/Mean of Verification</b>	<b>Due</b>
• BWDB long term needs assessed	I1	• Needs Assessment Report	2003
• Future roles and responsibilities of BWDB agreed	I2	• Acceptance of the Needs Assessment Report	2003
• BWDB capacity building programme agreed	I3	• Signed Project Document	2003
• BWDB capacity building programme completed	K	• Ex-post evaluation	2013
		• Programme completion report	
• Capacities of Bangladesh's restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) independent training reviews	2025

### **Institutional Arrangements**

BWDB will take a lead and pro-active role in developing its own organisation under the guidance of its management board. Co-operation will be needed with Disaster Management Bureau, Department of Meteorology, Department of Environment, Local Government and with data collecting agencies for the different programme components.

### **Existing Documentation**

Various reports are available with BWDB on flood forecasting. EGIS are working on erosion forecasting. USAID are supporting long range weather forecasting. DSR Chapter 4 describes new directions for BWDB. Copies of relevant legislation are held by WARPO on NWRD.

### **Linkages**

The programme has direct linkages with ID 003: FCD and FCD/I Management Rationalisation and ID 004: BWDB Regional and Sub-Regional Management. It also has bearing on EE 007: NWRD Improved Data Collection and Processing Facilities, MR 006: Regional River Management and Improvement, MR 010: Main Rivers Erosion Control at Selected Locations,

DM 006: Supplementary Irrigation and Drought Proofing of Rural Water Supplies, and EA 003: National Water Quality Monitoring.

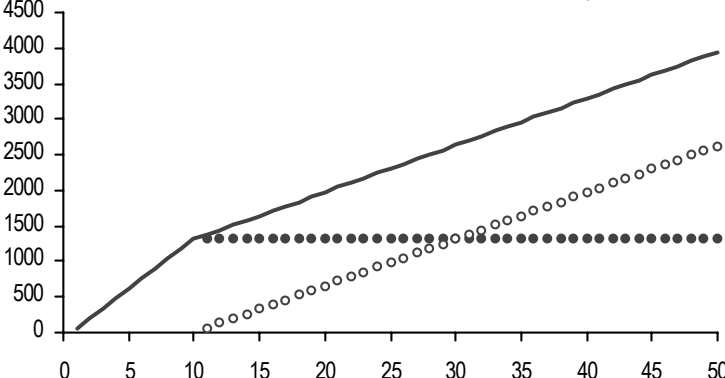
### **Risks and Assumptions**

The principle risk for the programme is a lack of commitment from within BWDB to embrace the changes ordained by NWPo and the BWDB Act 2000. The impetus for change must come from the Board of Directors, but it is up to the Director General and his staff to stimulate the organisation as a whole to willingly cooperate. This will require rapid establishment of a common vision for what BWDB will be like in 10 years time along and thereafter a sustained effort to achieve it. Frequent changes in top management, as happens now, are not conducive to carrying through change programmes, and it is assumed that BWDB will introduce new arrangements to ensure more continuity.

**BWDB Capacity Building**Ref : **ID 010**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Bangladesh Water Development Board</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>10 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>None</b> (Supporting)
Short Description :	This programme is intended to strengthen BWDB in several ways: improved flood forecasting and warning; strengthened surface and groundwater monitoring and dissemination; support for erosion and accretion forecasting; support for drought forecasting; re-orientation programmes especially with regard to the social and environmental dimensions of water resources management, MIS, HRD and other related fields of BWDB; a new central office and upgraded regional centres.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 010 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 010 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme		Year	
	Total Capital <sup>3</sup>		1,316.00 MTk	0%	100%	0%	10		
	Ultimate Recurring		65.70 MTk/yr	n/a	100%	0%	11		
	Date of Data :		31 07 01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring	— Total		
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• BWDB long term needs assessed	• Needs Assessment Report	NYD
• Future roles and responsibilities of BWDB agreed	• Acceptance of the Needs Assessment Report	NYD
• BWDB capacity building programme agreed	• Signed Project Document	NYD
• BWDB capacity building programme completed	• Ex-post evaluation • Programme complete report	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 010
Title	BWDB Capacity Building

### Assumptions:

Taka/US\$	51.000	TA duration	1.0	years	All prices in mid-2000 values
		Investment duration	9.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
Technical Assistance	Programme design						
Expatriate consultants (all-in rate)	p-m	28.0	20,000		28.6		
Senior National consultants (all-in rate)	p-m	48.0		150	7.2	0.0%	-
Mid-level National consultants (all-in rate)	p-m	47.0		90	4.2	0.0%	-
Sub-totals					40.0		-
Other general TA programme costs		25%			10.0		-
Specific other TA programme costs					-	0.0%	-
Total TA Costs					50.0		-
Other Programme Costs							
1. Support for Flood Forecasting and Warning Dissemination				PS	190.0	4.0%	7.6
2. Strengthening surface and groundwater monitoring and dissemination				PS	163.0	5.0%	8.2
3. Support for erosion and accretion forecasting				PS	222.0	1.0%	2.2
4. Support for drought forecasting				PS	89.0	3.0%	2.7
5. Re-orientation programmes				PS	302.0	5.0%	15.1
6. New central office				PS	100.0	10.0%	10.0
7. Upgrading 8 regional centres				PS	200.0	10.0%	20.0
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
Total Other Programme Costs					1,266.0		65.7
Overall Programme Costs					1,316.0		65.7

### Break up

<b>Technical Assistance</b>	Expat	National 1	National 2	Total (TkM)		
1. Flood Forecasting and Warning	80	80	160	135.0		
2. Water monitoring	80	80	160	108.0		
3. Erosion and accretion forecasting	120	120	240	162.0		
4. Drought forecasting	40	40	80	54.0		
5. Re-orientation programmes	120	120	240	162.0		
<b>Capacity Building</b>	Trainees	Unit rate	Total (TkM)	Equipment	Total (TkM)	O&M
1. Flood Forecasting and Warning	600	50,000	30.0	25.0	55.0	4.0%
2. Water monitoring	600	50,000	30.0	25.0	55.0	5.0%
3. Erosion and accretion forecasting	100	500,000	50.0	10.0	60.0	1.0%
4. Drought forecasting	50	500,000	25.0	10.0	35.0	3.0%
5. Re-orientation programmes	3,000	30,000	90.0	50.0	140.0	5.0%

# **Institutional Development**



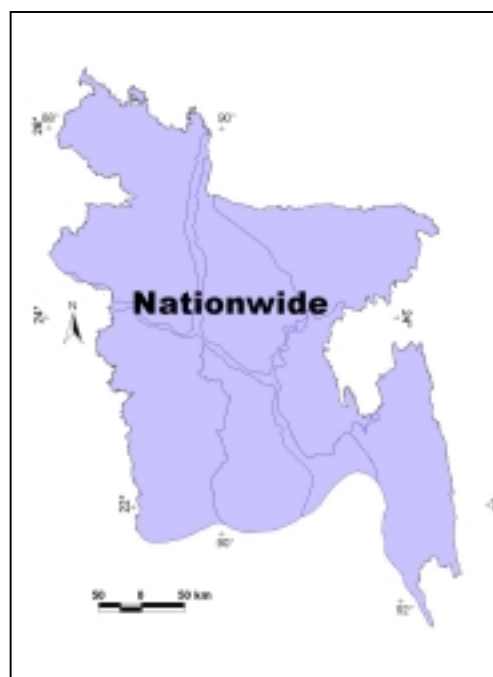


**Local Government Needs Assessment for Water Management**

Ref: ID 001

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide Significance****Relevance to NWPo**

The NWPo introduces significant new roles and responsibilities for Local Government Institutions. In particular §4.2 Article e requires LGI's to implement FCD/I projects having a command area less than or equal to 1000ha, while Article f calls upon LGI's to be the principle agencies for coordinating stakeholder participation at all stages of water sector project cycles. Equally §4.3 Article e allows the central Government to decentralize water allocation rights to the LGI's. The preamble to §4.4 establishes the principle that LGI's have a role to play in the community level resource management. §4.4b Article e provides for the possibility of LGI involvement in the joint management of non-municipal water schemes over 5000ha, while Article f requires the ownership of FCD and FCD/I projects with command areas less than or equal to 1000 ha to be transferred to LGI's.

**Purpose of Programme**

As a result of the NWPo, LGI's will become progressively responsible (with community groups) for the management of all FCD schemes up to 5000ha, and for the raising of operation and maintenance tariffs through local resources. They may also play an important role in supporting the management of larger schemes by autonomous bodies. In addition, LGI's will be responsible for development of community cyclone protection and will work with NGO's in support of bari-level cyclone and flood proofing programmes. They will also have essential roles to play as regards the development of improved water supply and sanitation facilities in the rural areas. Equally, in the urban sector, paurashava and city corporations will become increasingly autonomous and responsible (directly or through WASA's) for the provision of all water-related services. Such new responsibilities clearly represent a challenge for the LGI's which have little or no historic experience of water sector development and are in any case generally weak or non-existent (the DSR reports that three out of four levels of Parishad have yet to be established). The DSR also concludes that considerable efforts will be needed to strengthen local planning and management capacity if it is to evolve in a manner that adequately reflects local issues while remaining, or indeed becoming compatible with national plans as well as with those of the line agencies. To this end the programme has two objectives and they are linked. The first objective is to identify management structures, procedures and human resources needed by the LGI's if they are to take on the management of local water resources and channel systems; water supply and sanitation development; urban and peri-urban services as well as cyclone protection facilities. An expected feature of the resulting management structure is likely to be a central training support unit based within the Ministry of Local Government and Rural Development. The

second objective is to identify the steps necessary to achieve these ends and the human resource training needs.

## Programme Outline

In acknowledgement of the need to make solid progress in the water sector decentralization process, the programme will take place in the short term while the outstanding LGI's are still being established. In fact, by identifying suitable institutional arrangements and their associated capacity building implications and during or before LGI establishment will increase the chances of the institutions becoming effective as early as possible. Management and training needs assessments will therefore be carried out as follows. A study of potential LGI water sector operations will identify appropriate measures to allow LGIs control over development funding in their areas of responsibility in the water sector and will cover Paurashavas and each level of Parishad. Inter-alia, the study will cover accountability; loan modalities; alternative means of generating funds; tariffs; oversight and audit; institutional, legal and management requirements and human resource development. At the same time, a parallel study at Zila level will identify and develop appropriate planning mechanisms at Zila level and below. Each will take around 18 months and cover a few contiguous Districts and should explore the modalities of implementing the new policy. Together the studies will inform the preparation of realistic development, capacity building and training plans reflecting the results of broad consultation with all parties and including details of costs, benefits, financing plans, cost recovery, and long term management. Such plans should seek to integrate private sector activities wherever possible, including the employment of Bangladeshi consulting firms while including plans for disposition of FCD projects within the jurisdictional area

Once the two studies are concluded, they will be used to design a responsive training and capacity building programme.

## Financing Arrangements

On the assumption that the studies take place in say, eight locations across the country (each representing one or more Districts with differing development constraints), the costs are expected to total some Tk40M and Tk130M for the LGI and Zila level studies respectively and will be appropriate for Government funding.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"> <li>Outline management structure, procedures and human resource requirements for local water sector development and management by LGI's agreed by all stakeholders</li> </ul>	K	<ul style="list-style-type: none"> <li>Formal agreement of stakeholder agencies</li> </ul>	2004
<ul style="list-style-type: none"> <li>Bangladesh's institutional framework for the water sector regulated, decentralised and devolved according to subsidiarity principles</li> </ul>	D	<ul style="list-style-type: none"> <li>Ratified legal framework</li> </ul>	2019

## Institutional Arrangements

By their very nature, the studies will have to cross ministry boundaries, but should preferably be led by the LGD in collaboration with WARPO and with the support of consultants. The study team themselves should be lead by a senior official in Local Government Division and include

representatives of existing LGIs and CBOs with units from DPHE, LGED and BWDB. WARPO should also participate in an advisory role, both to ensure consistency with NWMP and to help develop linkages between the National Water Resources Database and the local level plans. Community organisations should take a prominent role in setting forth plans for their immediate areas.

### **Existing Documentation**

Background analyses leading to the identification of this programme can be found in Section 4 of the DSR, where specific details are provided in sub-sections 4-4 and 4-5. Other than that, no additional documentation has been identified.

### **Linkages**

There is a clear and direct link with Programme ID 005 (Local Government Capacity Building for Water Management) for which this programme essentially represents the preparatory phase. Less direct, but equally important links also exist with programmes ID 002 (Independent Regulatory Bodies for Water Supply and Sanitation Service Sector); ID 003 (FCD and FCD/I Management Rationalisation); and ID 004 (BWDB Regional and Sub-regional Management Strengthening).

### **Risks and Assumptions**

The main risk will be that continuing delays in LGI establishment will compromise the validity of the programme or delay its execution. It is assumed however, that the Government's clearly enunciated and repeated commitment to decentralization along with the advice and support of the donor community will be sufficient to overcome the remaining inertia.

**Local Government Needs Assessment for Water Management**Ref : **ID 001**

Cluster :	Institutional Development		Region(s) :	All	
Focus/Foci :	Local Government Institutions		Location :	Nationwide	
Start Year <sup>1</sup> :	2002	Duration <sup>2</sup> :	2 year(s)	Agency(s) Responsible :	LGD (Lead) None (Supporting)
Short Description :	The NWPo creates new roles for and places new responsibilities on Local Government Institutions. In particular §4.2.e requires LGI's to implement FCD/I projects having a command area less than or equal to 1000ha, while §4.2.f calls upon LGI's to coordinate stakeholder participation at all stages of water sector project cycles. Furthermore, as a result of §4.4.d LGI's will become progressively responsible for the management of all FCD schemes up to 5000ha, as well as for the raising of operation and maintenance tariffs through local resources. This programme assesses the implications of these challenges in terms of the institutional framework and human resource requirements and presents them in the form of a institutional capacity building and human resource development programme document.				

<b>MIS Links</b>	Cost Calculation :	ID Programme costing.xls	Map :	ID 001 Map.jpg
	Disb't Schedule :	ID Programme costing.xls	Description :	ID 001 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private		GoB	Beneficiaries	Programme	Year	
	Total Capital <sup>3</sup>		170.00 MTk		0%	100%	0%	2	
	Ultimate Recurring		0.00 MTk/yr		n/a	n/a	n/a	n/a	
	Date of Data :		31	07	01	Stacked Cumulative Cash Flow Chart			
	(dd)	(mm)	(yy)	Cost (MTk)		● Investment	○ Recurring	— Total	
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Outline management structure, procedures and human resource requirements for local water sector development and management by LGI's agreed by all stakeholders	• Formal agreement of stakeholder agencies	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 001
Title	Local Government Needs Assessment for Water Management

### Assumptions:

Taka/US\$	51.000	TA duration	2.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	84.0	20,000		85.7	0.0%	-
Senior National consultants (all-in rate)	p-m	124.0		150	18.6	0.0%	-
Mid-level National consultants (all-in rate)	p-m	312.0		90	28.1	0.0%	-
Sub-totals					132.4		-
Other general TA programme costs		25%			33.1		-
Specific other TA programme costs	Study tour	2	45000		4.6	0.0%	-
<b>Total TA Costs</b>					<b>170.0</b>		-
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-
<b>Overall Programme Costs</b>					<b>170.0</b>		-

### Notes

	Expat	National-1	National-2	Total	
Potential LGI water sector operations	24.0	24.0	40.0	88.0	p-m
Planning mechanisms at Zila level	60.0	100.0	272.0	432.0	p-m
Totals	84.0	124.0	312.0	520.0	p-m

## Independent Regulatory Body for Water Supply and Sanitation Service Sector

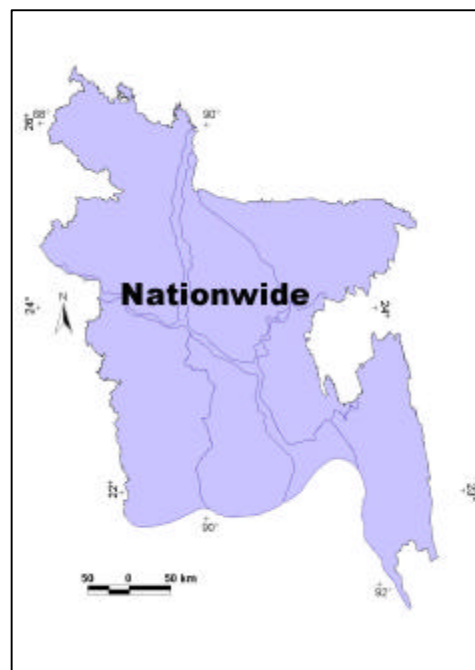
Ref: ID 002

### Basic Data

NWMP Sub-sector      **Institutional Development**Region(s)              **National Significance**

### Relevance to NWPo

NWPo and the National Policy for Safe Water Supply and Sanitation (NPSWSS) both clearly state that private sector participation (PSP) in the water supply and sanitation sector will be promoted in order to access the capital resources, management expertise and performance efficiency of private enterprise. However, for such a partnership to operate satisfactorily in the long term interests of both the consumer and the private investor, there is a clear need for an independent regulatory framework to supervise and monitor the contractual relationship, performance and pricing in a fair and even-handed manner. The NWPo supports this initiative in several key phrases. For example, policy highlights the need “To develop a legal and regulatory environment that will help the process of decentralisation, sound environmental management, and improve the investment climate for the private sector in water development and management”, and that “...there should be a separation of policy, planning and regulatory functions from implementation and operational functions at each level of government”, and “...each institution must be held accountable for financial and operational performance.” The NWMP suggests that independent regulation of the private sector can or will control monopolistic tendencies, improve economic efficiency by encouraging natural monopolies to perform at a socially optimal level, and maintain balance between the potentially competing interests of government, regulated utilities and consumers.



### Purpose of Programme

The main purpose of the programme is to establish an independent regulatory body which will provide a fair and pragmatic framework for the supervision, control and monitoring of private (and possibly public) sector contracts, investment, management and operations in the water supply and sanitation sector. The major challenge will be to establish a regulatory framework which is independent and fair to all parties in setting standards, guidelines and pricing parameters which encourage private investment and give confidence to the consumer that services will improve at an affordable price.

The international trend has been to promote a framework of national principles and guidelines, coupled with regional or local instruments to resolve specific issues and potential conflicts. Lessons for Bangladesh from these experiences are:

- (a) A realistic assessment is needed of actual institutions and government effectiveness. In establishing an effective regulatory framework, institutional restructuring, strengthening and technical training will be key factors;

- (b) The quality and structure of incentives and instruments to be used in the regulatory process are important factors in the creation of a fair balance between the consumer and private sector companies;
- (c) Creation of a regulatory framework does not guarantee effective regulation. Implementation of the regulatory controls needs to be monitored carefully;
- (d) Administrative and financial independence is a central requirement if a regulatory agency is to function effectively. Regulatory and operational functions must be clearly separated;
- (e) GoB needs to develop an innovative regulatory framework with incentives to attract private investment to small cities and towns. Local private companies, with relevant expertise, should be encouraged to participate in order to increase competition; and
- (f) Fully “independent” regulation is difficult to achieve without strong safeguards and a willingness to limit political interference. In this context, the Government needs to guarantee, formalise and institutionalise its commitments to consumers and investors.

In theory, the scope of an independent regulatory framework could also be broadened to cover public sector operators (e.g. DWASA, CWASA and municipal operations) and community-based schemes in the water supply and sanitation sector. This may present considerable difficulties in the short to medium term given the poor performance of most public sector operators in the sector. However, the proposed study will examine the implications of this alternative.

The Government will also complement this initiative with parallel and supporting programmes under the NWMP (see “Linkages”). It should be stated also that the proposed regulatory body will not have any direct responsibility for environmental regulation (e.g. polluting wastewater discharges to surface water and groundwater). This is the responsibility of the Department of Environment, and is currently being strengthened with external assistance from UNDP and Canada.

## **Programme Outline**

The study and manual for an Independent Regulatory Body for the Water Supply and Sanitation Sector will be commissioned within the next two years. It is expected that the project programme will cover the following major topics, among others:

- (a) Review of international experience with regulatory bodies in the water supply and sanitation sector;
- (b) Review of relevant institutional, financial and legal issues in Bangladesh;
- (c) Analysis of alternative independent regulatory structure appropriate for Bangladesh;
- (d) Results of wide-ranging stakeholder consultation process;
- (e) Institutional and legal requirements for an Independent Regulatory Body;
- (f) Financing and training requirements for an Independent Regulatory Body;
- (g) Detailed regulatory framework and manual; and
- (h) Recommendations for a time-bound Action Plan to establish the Independent Regulatory Body.

Within the analysis of alternative independent regulatory structures (see: item (c) above), it is expected that the presentation will include, among other options: (i) private sector involvement only; (ii) public and private sector operations (i.e. including DWASA, CWASA, municipal operations, and community-based schemes); (iii) central or regional IRBs; (iv) water supply and sewerage only, excluding sanitation; (v) urban and/or rural water services; and (vi) other combinations.

The first few years of the implementation programme will demonstrate GoB's serious intent to push forward with the process of private sector participation (PSP) and the establishment of an Independent Regulatory Body for the Water Supply and Sanitation Sector.

## Financing Arrangements

The proposed programme (study, manual and action plan) for establishing an Independent Regulatory Body (IRB) for the Water Supply and Sanitation Sector is suitable for GoB funding with the support of the international donor community. The initial funding requirement for Technical Assistance is estimated at Tk75M at mid-2000 prices.

One of the principal outputs of the study will be the Action Plan for the establishment of the IRB. The implementation plan will be costed in detail to cover the first 5 years of operation. The NWMP provides a provisional estimate of Tk1,200M.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Regulatory Framework agreed by Government Stakeholders	I1	• The framework	2006
• Regulatory manual completed and agreed	I2	• The manual • The agreement	2007
• Independent regulatory bodies for water supply and sanitation services established and fully functional	K	• Operational charters of the regulatory bodies • Legal status of the regulatory bodies	2011
• Bangladesh's institutional framework for the water sector regulated, decentralised and devolved according to subsidiarity principles	D	• Ratified legal framework	2019

## Institutional Arrangements

The Local Government Division, in co-ordination with the Ministry of Finance, will be responsible for commissioning the study for Regulatory and Economic Instruments. LGD will be the executing agency, and be responsible for preparing the Terms of Reference and other background documentation.

Institutional arrangements for the implementation of the action plan on an Independent Regulatory Body for the Water and Sanitation Sector will depend on the detailed recommendations of the proposed study.

## References and Documentation

- (a) Strategy Study to Mobilise Finance and Increase Efficiency in the Dhaka Water Supply and Sewerage Sector, Halcrow Management Services Limited, August 1998
- (b) The Water Supply and Sewerage Authority Act (1996) and other legislation

## Linkages

The programme for an Independent Regulatory Body for the Water Supply and Sanitation Sector should be closely linked and co-ordinated with other NWMP programmes, namely: (a) Local Government Needs Assessment for Water Management (ID 001); (b) Local Government Capacity Building for Water Management (ID 005); (c) Field Testing of Participatory Management Models (EE 002); (d) Project Preparation Procedures - Guidelines and Manuals (EE 007); (e) Regulatory and Economic Instruments (EE 005); (f) Raising Public Awareness in the Wise Use and Management of Water (EE 010); (g) Private Sector Participation in Water



Management (EE 011); (h) Water and Environment Funds (EE 012); (i) Alternative Financing Methods for Water Management (EE 013); and (j) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

Preparation and development of the Independent Regulatory Body for Water Supply and Sanitation should also be co-ordinated with Ministry of Water Resources (MoWR), WARPO, Ministry of Industry (MoI), Ministry of Agriculture (MoA), Ministry of Environment and Forests (MoEF), Bangladesh Water Development Board (BWDB), Department of Public Health Engineering (DPHE), Local Government Engineering Department (LGED), Department of Environment (DoE), DWASA, CWASA, Local Government authorities, NGOs, the private sector and other stakeholders.

### **Risks and Assumptions**

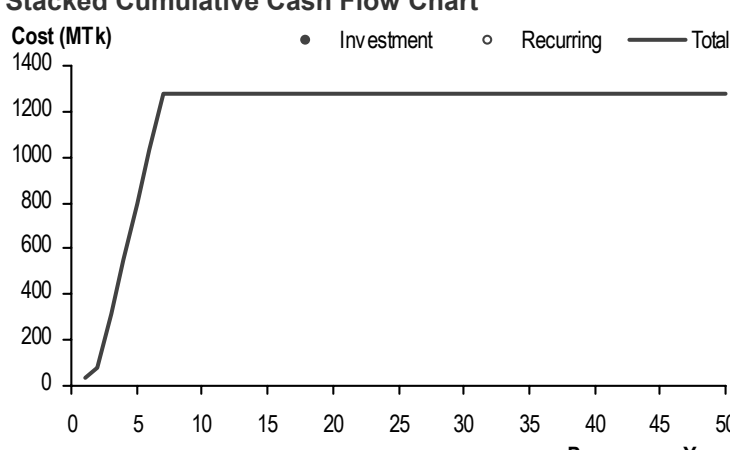
The risks associated with the commissioning and execution of the proposed IRB Study and Manual are minimal, providing well qualified international consultants are engaged to carry out the work. The main risks will arise after the study and manual have been completed. They will fall into two categories: institutional and financial. The institutional risks are twofold: firstly, whether there is sufficient political will and commitment to carry out the IRB programme; and secondly, whether government line agencies and enterprises will provide effective support and co-operation to implement the proposals. The NWPo and NPSWSS give clear statements that private sector participation is an integral part of water sector policy; therefore, GoB must give sustained support if the additional financial resources and management expertise are to be forthcoming from the private sector. In this context, parallel co-ordination and implementation of the EE Programmes will be crucial. The main financial risk is that if the IRB programme is not effectively implemented then the private sector may not have the necessary confidence that the Government will regulate the sector in a fair and acceptable manner. This will result in less domestic private sector investment and will delay indefinitely the possibility of foreign private investment. It may also discourage some international donor support for the water sector.

## Independent Regulatory Bodies for Water Supply and Sanitation Service Sector

Ref : **ID 002**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>New Regulatory Bodies</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>7 year(s)</b>
		Agency(s) Responsible :	<b>LGD</b> (Lead) <b>MoFinance,</b> (Supporting) <b>New agencies</b>
Short Description :	Initially, this programme will begin by studying options for the establishment of a regulatory framework for water supply and sanitation as well as the institutional demands thereof. This preliminary stage will be followed by the establishment and mandating of the institutions themselves. It is anticipated that existing institutions will be able to accept some of the responsibility; even so a clear need for new, specialist agencies is foreseen.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 002 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 002 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme	Year		
	Total Capital <sup>3</sup>		1,275.00 MTk	0%	100%	0%	7		
	Ultimate Recurring		0.00 MTk/yr	n/a	n/a	n/a	n/a		
	Date of Data :		31 07 01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment ○ Recurring — Total				
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

## Monitoring

Objective	Indicator	Present Status <sup>5</sup>
• Regulatory Framework agreed by Government Stakeholders	• The framework	NYD
• Regulatory manual completed and agreed	• The manual • The agreement	NYD
• Independent regulatory bodies for water supply and sanitation services established and fully functional	• Operational charters of the regulatory bodies • Legal status of the regulatory bodies	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 002
Title	Independent Regulatory Bodies for Water Supply and Sanitation Service Sector

### Assumptions:

Taka/US\$	51.000	TA duration	2.0	years	All prices in mid-2000 values
		Investment duration	5.0	years	

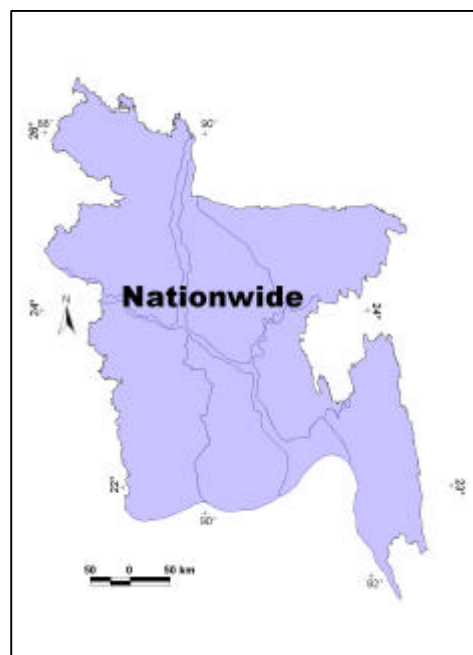
Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	48.0	20,000		49.0		
Senior National consultants (all-in rate)	p-m	36.0		150	5.4		
Mid-level National consultants (all-in rate)	p-m	63.0		90	5.7		
Sub-totals					60.0		
Other general TA programme costs		25%			15.0		
Specific other TA programme costs					-		
<b>Total TA Costs</b>					<b>75.0</b>		
<b>Other Programme Costs</b>							
1. Provsion for setting up body(ies)	LS	1			1,200.0	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>1,200.0</b>		-
<b>Overall Programme Costs</b>							
					<b>1,275.0</b>		-

**FCD and FCD/I Management Rationalisation**

Ref: ID 003

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **National Significance****Relevance to NWPo**

Realising that the ultimate success of public water resources management projects depends on the peoples acceptance and ownership of each project, it is the policy of the Government that: *'The management of public water schemes, barring municipal schemes, with a command area up to 5000ha will be gradually made over to local and community organisations and their O&M will be financed through local resources.'* (Clause 4.04d) and; *'Ownership of FCD and FCDI projects with command area of 1000ha or less will gradually be transferred to the local governments, beginning with the ones that are being satisfactorily managed and operated by the beneficiary/ community organisations.'* (Clause 4.04f)

**Purpose of Programme**

In adhering to the principles outlined by policy, a future institutional framework is expected to include measures to enable: a) Existing FCD infrastructure (up to 5000ha), currently operated by BWDB/LGED, will be handed over to local government and/or community groups as soon as sustainable mechanisms to effect the transfer are established. And; b) Existing and new FCD(I) projects over 5000ha will be progressively transferred to autonomous operating authorities, constituted in a manner determined through trial and testing. The purpose of this programme therefore, is to carry out pilot studies of alternative institutional models to effect the management transfer of FCD(I) schemes to local Government, community organisations, or new autonomous bodies in accordance with policy.

**Programme Outline**

Year 1 of the programme would be spent preparing detailed plans for the pilot phase testing. Some six to eight schemes would be carefully selected for the testing. Four possible modes have been suggested:

- i) Hand-over to Local Government
- ii) Hand-over to beneficiaries
- iii) Joint management by BWDB and beneficiaries
- iv) Establishment of a joint non-profit making management company owned by BWDB and Local Government Institutions.

Other models may be considered providing they comply with Government Policy and efforts would be made at an early stage to identify these through intensive local consultation.

These models would be tested during years 2 to 6, concurrently with environmental audit (in accordance with NEMAP requirements) and requisite civil works arising from the outcome of participatory planning involving all stakeholders.

In parallel to the above a full inventory would be made of BWDB schemes including an assessment of the physical condition of the works. A programme of environmental audit would also be launched.

The results of the pilot testing, the asset survey and the audits conducted would be compiled in years 4 to 6 and a plan of action would be drawn up for the remaining BWDB schemes. Up to a further ten years may be required to implement this proposed management plan for the existing BWDB schemes (which would be implemented under Programmes AW 002 and AW 007).

## Financing Arrangements

This programme is suitable for GoB funding (possibly with donor assistance) and is expected to cost approximately 1,300 TkM.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Reduction in the number of schemes directly managed by BWDB	I1	• Nationwide FCD(/I) statistics	2019
• Increase in funds for O&M after turnover of scheme	I2	• Scheme accounts	N/A
• 75% of decentralised FCD/I schemes considered sustainable within 10 years of transfer	K	• National FCD/I scheme statistics	2019
• Bangladesh's institutional framework for the water sector regulated, decentralised and devolved according to subsidiarity principles	D	• Ratified legal framework	2019

## Institutional Arrangements

Preparation of the management plan would be the responsibility of BWDB. In view of the wide range of skills required, Technical Assistance (TA) would be required. Implementation arrangements will be determined on the basis of the management plan but are expected to involve LGIs, CBOs, and WUGs as well as further TA.

## Existing Documentation

A start was made on a scheme-by-scheme assessment during the Water Sector Improvement Project preparatory studies, but handover was not considered in detail. Documentation on the CARE flood proofing project and the LGED Small Scale Water Resources Development Project may also provide useful information regarding previous management transfer attempts in the Bangladesh water sector.

## Linkages

There will be an obvious linkage with AW 007 'Rationalisation of Existing FCD Infrastructure' as well as possible links with AW 008 'Coastal Protection and Aforestation' and MR 006 'Regional River Management and Improvement'.

## **Risks and Assumptions**

Transfer of management responsibilities may meet with considerable resistance, particularly when financial responsibilities are included as well. However a suitably tactful and consultative process at all stages of the programme should minimise these problems. Other risks include inadequate or subjective evaluation of pilot schemes that would result in further unsustainability at scheme level.

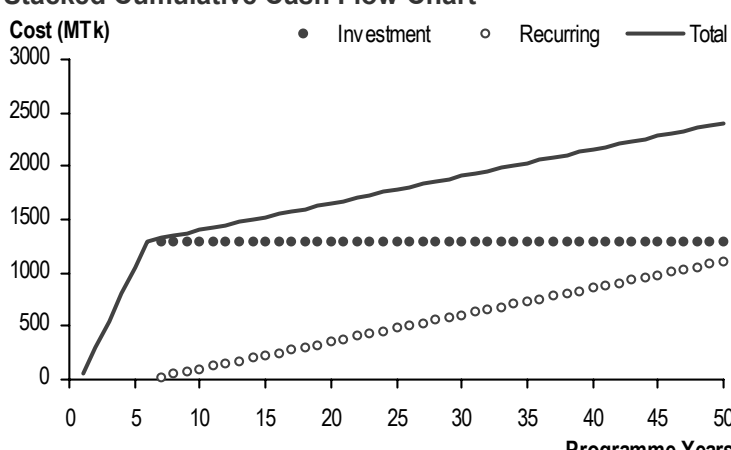
**FCD and FCD/I Management Rationalisation**

Ref :

**ID 003**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Bangladesh Water Development Board</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>6 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>None</b> (Supporting)
Short Description :	This programme is intended to facilitate the transfer of FCD/I scheme management as per policy. Three steps will be involved. In the short term BWDB will receive capacity building with respect to environmental and social issues, while in consultation with the stakeholders a range of transfer options will be identified and prepared. Finally these options will be pilot tested at selected locations during the short and medium term.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 003 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 003 PgP.doc

<b>Finance</b>	Costs	Private	Funding (%)	Expected by	
			GoB	Beneficiaries	ProgrammeYear
Total Capital <sup>3</sup>	<b>1,300.00</b> MTk	<b>0%</b>	<b>85%</b>	<b>15%</b>	<b>6</b>
Ultimate Recurring	<b>25.20</b> MTk/yr	<b>n/a</b>	<b>50%</b>	<b>50%</b>	<b>7</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	MTk				
Actual Expenditure <sup>4</sup> (to date) :	MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Reduction in the number of schemes directly managed by BWDB	• Nationwide FCD(I) statistics	NYD
• Increase in funds for O&M after turnover of scheme	• Scheme accounts	NYD
• 75% of decentralised FCD/I schemes considered sustainable within 10 years of transfer	• National FCD/I scheme statistics	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 003
Title	FCD and FCD/I Management Rationalisation

### Assumptions:

Taka/US\$	51.000	TA duration	1.0	years	All prices in mid-2000 values
		Investment duration	5.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	28.0	20,000		28.6		
Senior National consultants (all-in rate)	p-m	28.0		150	4.2	0.0%	-
Mid-level National consultants (all-in rate)	p-m	80.0		90	7.2	0.0%	-
Sub-totals					40.0		-
Other general TA programme costs		25%			10.0		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					<b>50.0</b>		<b>-</b>
<b>Other Programme Costs</b>							
1. Pilot scheme investment (rehabilitation)	ha	45,000		20	900.0	2.8%	25.2
2. TA support for environmental audit	year	5		50,000	250.0	0.0%	-
3. TA support for evaluation of pilot schemes	year	1		50,000	50.0	0.0%	-
4. TA support for long-term management plan	year	1		50,000	50.0	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>1,250.0</b>		<b>25.2</b>
<b>Overall Programme Costs</b>					<b>1,300.0</b>		<b>25.2</b>

### Notes:

Rehabilitation rate is based on NWMPP estimates derived from actual BWDB costs



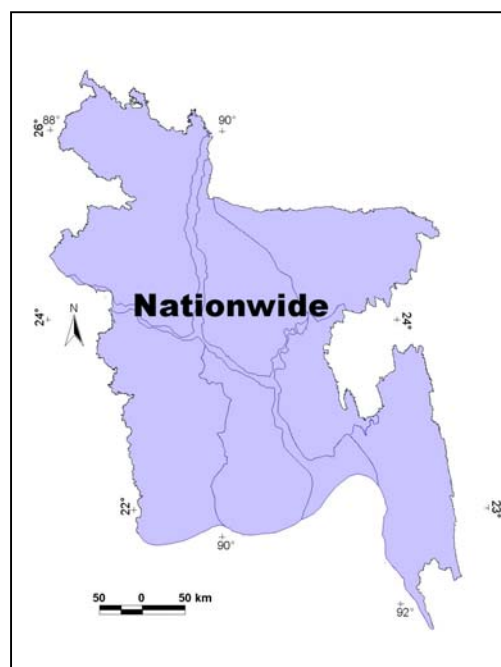
**BWDB Regional and Sub-regional Management Strengthening**

Ref: ID 004

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide Significance****Relevance to NWPo**

The Introduction to the NWPo acknowledges that the most critical issues for water resources management include alternating flood and water scarcity, meeting ever-expanding water needs and massive river sedimentation and bank erosion. Provision of total water quality management and maintenance of the eco-system are also major concerns of Policy. In §3, Policy objectives include harnessing and development of all forms of surface water and ground water in an efficient and equitable manner and bringing about institutional changes to help decentralise the management of water resources.

In §4.2, NWPo directs that, within the macro framework of the NWMP, and (d) sector agencies and local bodies will prepare and implement sub-regional and local water-management plans, (f) ensuring the participation of all project affected persons. Furthermore, agencies will (j) undertake comprehensive development and management of the main rivers (k) for multipurpose use, (l) de-silt watercourses to maintain navigation channels and proper drainage, (n) protect water quality, (p) designate and provide desired levels of flood protection, and (q) develop and implement master plans for river training and erosion control works and for (q) reclamation of land from rivers.

**Purpose of Programme**

Under its Act (2000), BWDB is responsible for controlling the flow of water in all rivers and channels and aquifers. Local Government institutions are already vested with authority to manage local water resources. Recognising this, the Government's strategy is that river improvement programmes will be prepared in an integrated manner giving due importance to all users and environmental and fish migration requirements. The plans will identify dredging and erosion control measures, taking account of new flood protection requirements for areas of high economic importance as defined by Policy. Potential and actual sources of pollution will be identified along with areas of encroachment. In formulating programmes, actions will be prioritised taking account of social, environmental and economic criteria. Activities on regional river systems will be coordinated with improvements to local channel systems in a manner that leads to cost-effective and sustainable improvement of the surface water resource system by all concerned. The purpose of this programme is to provide the necessary support to BWDB to enable the agency to prepare river improvement plans at regional and sub-regional level consistent with the above strategy.

## Programme Outline

The programme will address four main issues to fulfil the objectives above. Firstly support will be provided to establish an inventory of river systems, cataloguing inter alia the condition and general requirements on each river and, whilst doing so, demarcating in principle a mutually acceptable division of responsibilities between BWDB and Local Government. Secondly, support will be provided to BWDB to allocate responsibilities within the organisation for each river and to determine the management structures most suited to ensure effective implementation. Thirdly, within this framework, at least one river will be selected in each of eight hydrological regions, and support provided for BWDB to prepare improvement programmes for each. Lastly, on the basis of the above, support will be provided to BWDB to determine an overall procedure for river improvement programmes, identify and overcome skill and resource gaps and introduce a system for monitoring performance and impacts of the programmes.

## Financing Arrangements

The programme is expected to take 3 years to reach the stage of an agreed approach to river improvement, with a further 3 years to provide training and capacity building necessary for the approach to be made sustainable. The first phase is expected to cost Tk179M and the second Tk71M. Both are suitable for Government funding with the potential for donor support.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Establishment of river inventory with demarcation of BWDB responsibility	I1	• Reports issues and approved by GoB	2004
• BWDB internal organisation structured to plan, develop and manage river improvement programmes with established capacity	K	• Reports issues and approved by GoB and implemented by BWDB • River improvement plans produced at an acceptable quality	2006
• Bangladesh's institutional framework for the water sector regulated, decentralized and devolved according to subsidiarity principles	D	• Ratified legal framework	2019

## Institutional Arrangements

The programme will be implemented by BWDB. Close co-operation will be needed with many water sector agencies with direct and indirect stake in river management. These include WARPO, DoE, BIWTA, Municipalities, Zila parishads, WASAs, LGED, community organisations, irrigation project authorities, private sector (power companies, industry, boat-owners, irrigators, land owners and developers) etc. A critical factor will be achieving consensus between these different groups on planning procedures, dispute resolution and legal enforcement where required. Thus from the outset, BWDB will need to establish a consultative approach with an appropriate forum for debate.

## Existing Documentation

There are many previous studies of existing rivers and river systems available in both WARPO and BWDB archives. The BWDB Act 2000 defines the responsibilities and mandate of the organisation. The various Parishad Acts set out Local Government responsibilities. EGIS has been working on river erosion forecasting, and BWDB and BIWTA have records of sedimentation and dredging. DoE has identified pollution hot-spots and WARPO is working on

fish migration and habitat preservation requirements. SWMC have provided WARPO with hydrodynamic 1-D models of the main rivers of each hydrological region.

### **Linkages**

As stated, this programme will be complemented by other institutional capacity building programmes. It will also have some bearing on several of the Enabling Environment programmes, notably EE 001: Support to Preparation of New legislation, EE 004: Project Preparation Procedures – Guidelines and Manuals, and EE 008: Water Resources Management Research and Development Studies. It will have to fully integrate with all the Main River programmes, and specifically will provide the basis for investment under MR 006: Regional River Management and Improvement, and MR 011: River Dredging for Navigation. Plans for Flood Protection and Stormwater drainage under the MC and TR programmes will need to be taken account of, along with DM 003: Flood Proofing in the Charlands and Haor Basin. Similarly, inter-action with Agriculture and Water Management Programmes will be required, particularly AW 005 and AW 006 dealing with improvements to water management and at Local Government and Community levels. Finally, there is strong linkage with virtually all the Environment and Aquatic Resource programmes.

### **Risks and Assumptions**

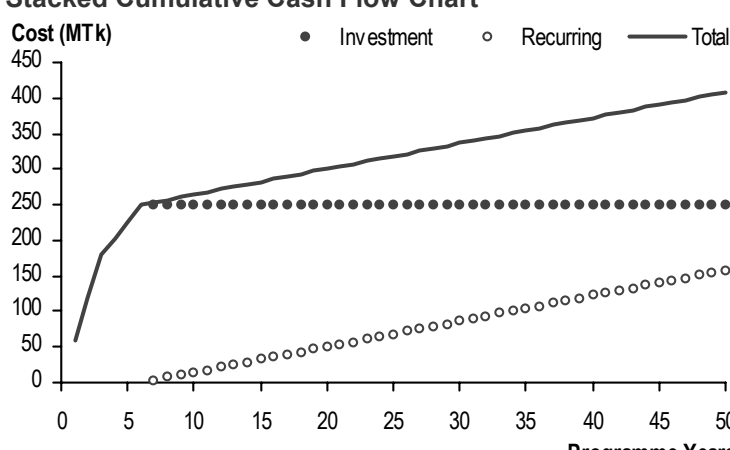
The main concern relates to the culture change needed within BWDB to move from a centrally driven project-orientated approach to that of long-term integrated management of the river systems in a manner responsive to different needs. The programme seeks to address this through supporting BWDB in finding suitable organisation arrangements and in providing capacity building to help build up the ability of the organisation to field the broad spectrum of skills needed. A second concern is to overcome the ad hoc approach to river management that has characterised many past projects, often driven by political expediency. The sooner BWDB has integrated plans, and the legal backing to enforce them, the quicker this can be overcome.

**BWDB Regional and Sub-regional Management Strengthening**Ref : **ID 004**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Bangladesh Water Development Board</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>6 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>None</b> (Supporting)
Short Description :	According to its Act, BWDB is responsible for controlling the flow of water in all rivers and aquifers. To this end it is the strategy of GoB to prepare integrated river improvement initiatives which give due importance to all stakeholders. This programme is intended to provide the necessary support to BWDB to enable it to prepare such initiatives at regional and sub-regional levels consistent with the GoB strategy.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 004 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 004 PgP.doc

Finance						
	Costs	Private	Funding (%)	Beneficiaries	Expected by	
			GoB		ProgrammeYear	
Total Capital <sup>3</sup>	250.00 MTk	0%	100%	0%	6	
Ultimate Recurring	3.60 MTk/yr	n/a	100%	0%	7	
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart		
	(dd)	(mm)	(yy)	Cost (MTk)		
Status :	Identified		● Investment ○ Recurring — Total			
Financial Base Year:	mid-2000					
Planned Expenditure (to date) :	0 MTk					
Actual Expenditure <sup>4</sup> (to date) :	0 MTk					



Programme Years	Investment (MTk)	Recurring (MTk)	Total (MTk)
0	0	0	0
5	250	0	250
10	250	10	260
20	250	40	290
30	250	80	330
40	250	120	370
50	250	150	400

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Establishment of river inventory with demarcation of BWDB responsibility	• Reports issued and approved by GoB	NYD
• BWDB internal organisation structured to plan, develop and manage river improvement programmes with established capacity	• Reports issued and approved by GoB and implemented by BWDB • River improvement plans produced at an acceptable quality	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 004
Title	BWDB Regional and Sub-regional Management Strengthening

### Assumptions:

Taka/US\$	51.000	TA duration	3.0	years	All prices in mid-2000 values
		Investment duration	3.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	84.0	20,000		85.7		
Senior National consultants (all-in rate)	p-m	130.0		150	19.5	0.0%	-
Mid-level National consultants (all-in rate)	p-m	136.0		90	12.2	0.0%	-
Sub-totals					117.4		-
Other general TA programme costs		25%			29.4		-
Specific other TA programme costs	River models	8		4,000	32.0	0.0%	-
<b>Total TA Costs</b>					<b>178.8</b>		-
<b>Other Programme Costs</b>					TkM		
1. Training/HRD for BWDB staff in integrated river planning		8		7.1	56.8	0.0%	-
2. Equipment for BWDB Offices		8		1.8	14.4	25.0%	3.6
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>71.2</b>		<b>3.6</b>
<b>Overall Programme Costs</b>					<b>250.0</b>		<b>3.6</b>

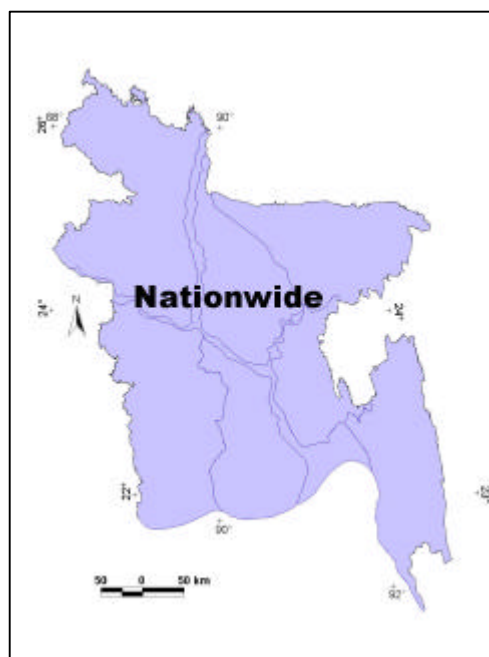
<b>Training Programmes</b>			<b>Regional Design Units</b>		<b>8 No.</b>
Trainees	25	per Regional Unit	Computer equipment	1,125,000	Tk/unit
80% Local	100,000	Tk/trainee	Communication support	200,000	Tk/unit
20% O/seas	20,000	\$/trainee	Miscellaneous other	500,000	Tk/unit
Total	<b>7.1</b>	TkM/unit	Total	<b>1.8</b>	TkM/unit

**Local Government Capacity Building for Water Management**

Ref: ID 005

**Basic Data**NWMP Sub-sector **Institutional Development**Region(s) **Nationwide Significance****Relevance to NWPo**

The NWPo introduces significant new roles and responsibilities for Local Government Institutions. In particular §4.2 Article e requires LG's to implement FCD/I projects having a command area less than or equal to 1000ha, while Article f calls upon LG's to be the principle agencies for coordinating stakeholder participation at all stages of water sector project cycles. Equally §4.3 Article e allows the central Government to decentralize water allocation rights to the LG's. The preamble to §4.4 establishes the principle that LG's have a role to play in the community level resource management. §4.4b Article e provides for the possibility of LG involvement in the joint management of non-municipal water schemes over 5000ha, while Article f requires the ownership of FCD and FCD/I projects with command areas less than or equal to 1000ha to be transferred to LG's.

**Purpose of Programme**

As a result of the NWPo, LGI's will become progressively responsible (with community groups) for the management of all FCD schemes up to 5000ha, and for the raising of operation and maintenance tariffs through local resources. They may also play an important role in supporting the management of larger schemes by autonomous bodies. In addition, LGI's will be responsible for development of community cyclone protection and will work with NGO's in support of barrier-level cyclone and flood proofing programmes. They will also have essential roles to play as regards the development of improved water supply and sanitation facilities in the rural areas. Equally, in the urban sector, paurashava and city corporations will become increasingly autonomous and responsible (directly or through WASA's) for the provision of all water-related services. Such new responsibilities clearly represent a challenge for the LGI's which have little or no historic experience of water sector development and are in any case generally weak or non-existent (the DSR reports that three out of four levels of Parishad have yet to be established). The DSR also concludes that considerable efforts will be needed to strengthen local planning and management capacity if it is to evolve in a manner that adequately reflects local issues while remaining, or indeed becoming compatible with national plans as well as with those of the line agencies. This programme is intended to deliver the necessary capacity building and human resource development in response to the needs assessments carried out under Programme ID 001 (Local Government Needs Assessment for Water Management). However, despite this programme's local focus, it will be necessary to include within its components to address the training needs of the LGED, especially in terms of the participatory implementation of small water projects/schemes and of the DPHE in terms of mobilising and working with the private sector.

## Programme Outline

The details of this programme will be defined by ID 001. It is anticipated nevertheless that this programme will begin with the establishment of the Central Training Unit and thereafter comprise a long and sustained effort beginning in the short term of the NWMP and continuing throughout the remainder of its 25 years. During that time it is intended to train a total of 737,900 LGI employees made up as follows:

Civil Administrative level	No of Institutional Entities	Estimated No of Trainees per Entities	Total No of Trainees
Paurashava	206	25	5,150
Zila Parishad	64	20	1,280
Upazila Parishad	464	15	6,960
Union Parishad	4,451	10	44,510
Gram Parishad	68,000	10	680,000
<b>Totals</b>	<b>73,815</b>		<b>737,900</b>

## Financing Arrangements

The programme is expected to cost some Tk12,100M inclusive of 2.5% monitoring and evaluation costs. It is suitable for Government funding.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Programme document for LGI capacity building for local water sector management and development by LGI's	I1	• Signed project document	2005
• Central Training Unit established at the Ministry of Local Government and Rural Development	I2	• Operational charter of the Central Training Unit	2006
• LGI water management operational capacity consistent with the needs of decentralised water management in Bangladesh	K	• Legal status of the Central Training Unit	2027
• Capacities of Bangladesh's restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) management reviews	2027
		• Regular (5 yearly) Independent training review	2027

## Institutional Arrangements

The proposed Central Training Unit (CTU) will be responsible for overall coordination of the programme and will begin by nominating and training District Level Human Resource Development Units (DLHRDUs), one for each District. With CTU assistance these will be responsible for developing their own long term capacity building strategies targeted at decentralised water management and reflecting closely the recommendations of ID 001. Such strategies will then be grant funded from the programme budget which will remain under the control of the CTU which will also provide training materials (as identified by ID 001) while monitoring and evaluating progress. Ideally, District training strategies will have measurable interim objectives which once reached would qualify the District in question for capital funding commensurate with the level of institutional reform and capacity reached as a direct or indirect result of the training and capacity building activities.

## Existing Documentation

Background analyses leading to the identification of this programme can be found in §4 of the DSR, where specific details are provided in sub-sections 4-4 and 4-5. Other than that, no additional documentation has been identified.

## **Linkages**

There is a clear and direct link with Programme ID 001 which represents the preparatory phase for this programme. Less direct, but equally important links also exist with programmes ID 002 (Independent Regulatory Bodies for Water Supply and Sanitation Service Sector); ID 003 (FCD and FCD/I Management Rationalisation); and ID 004 (BWDB Regional and Sub-regional Management Strengthening).

## **Risks and Assumptions**

The main risk will be that continuing delays in LGI establishment will compromise the validity of the programme or delay its execution. It is assumed however, that the Government's clearly enunciated and repeated commitment to decentralisation along with the advice and support of the donor community will be sufficient to overcome the remaining inertia.

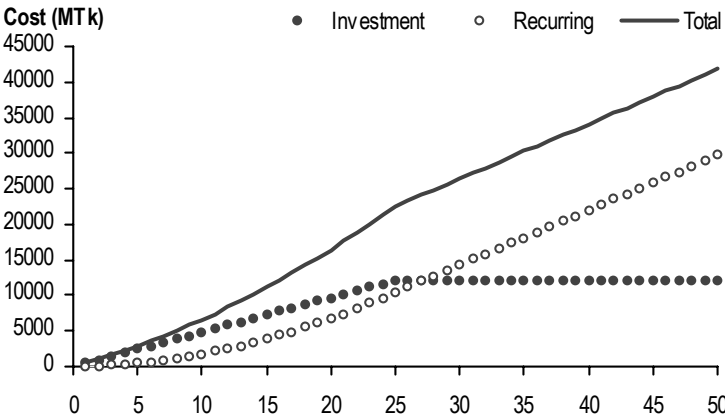


**Local Government Capacity Building for Water Management**Ref : **ID 005**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Local Government Institutions</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>25 year(s)</b>
		Agency(s) Responsible :	<b>LGIs</b> (Lead) <b>None</b> (Supporting)
Short Description :	The NWPo creates new roles for and places new responsibilities on Local Government Institutions. In particular §4.2.e requires LGI's to implement FCD/I projects having a command area less than or equal to 1000ha, while §4.2.f calls upon LGI's to coordinate stakeholder participation at all stages of water sector project cycles. Furthermore, as a result of §4.4.d LGI's will become progressively responsible for the management of all FCD schemes up to 5000ha, as well as for the raising of operation and maintenance tariffs through local resources. This programme is intended to deliver the necessary capacity building and human resource development in response to the needs assessments carried out under Programme ID 001 (Local Government Needs Assessment for Water Management). The programme will begin with the establishment of a Central Training Unit and thereafter comprise a long and sustained effort beginning in the short term of the NWMP and continuing throughout the remainder of its 25 years. The programme will include training for both LGED and DPHE to strengthen their		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 005 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 005 PgP.doc

**Finance**

	Costs			Private	Funding (%)	Beneficiaries	Expected by
					GoB		ProgrammeYear
Total Capital <sup>3</sup>	12,100.00	MTk		0%	100%	0%	25
Ultimate Recurring	771.90	MTk/yr		n/a	100%	0%	26
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart			
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring	— Total
Status :	Identified						
Financial Base Year:	mid-2000						
Planned Expenditure (to date) :	0 MTk						
Actual Expenditure <sup>4</sup> (to date) :	0 MTk						

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Programme document for LGI capacity building for local water sector management and development by LGI's	• Signed project document	NYD
• Central Training Unit established at the Ministry of Local Government and Rural Development	• Operational charter of the Central Training Unit • Legal status of the Central Training Unit	NYD
• LGI water management operational capacity consistent with the needs of decentralised water management in Bangladesh	• Regular (5 yearly) management reviews	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design ,supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

## National Water Management Plan

### Programme Costing Sheet

Programme Ref	ID 005
Title	Local Government Capacity Building for Water Management

#### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Local Government staff training					6,768.7	0.0%	-
2. Office equipment					3,859.3	20.0%	771.9
3. Monitoring and evaluation		2.5%			272.0	0.0%	-
4. Strengthening LGED support capacity					600.0	0.0%	-
5. Strengthening DPHE support capacity					600.0	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					12,100.0		771.9
<b>Overall Programme Costs</b>					<b>12,100.0</b>		<b>771.9</b>

#### Local Government Training Costs

Urban centres, consisting of four city corporations (Dhaka, Chittagong, Rajshahi and, added in 1990, Khulna) and 206 Paurashavas, are independent of the Bangladesh territorial administrative structure of six Divisions 64 Zilas, 464 Upazilas, 4451 Unions and 68,000 villages.

	No.	Trainees per entity	Cost per trainee	Total training cost (TkM)	Equipment per entity	Total equip. cost (TkM)	Total cost (TkM)
Paurashava	206	25	42,500	219	250,000	52	270
Zila parishads	64	20	42,500	54	250,000	16	70
Upazila Parishads	464	15	21,250	148	125,000	58	206
Union Parishads	4,451	10	12,750	568	75,000	334	901
Gram Parishads	68,000	10	8,500	5,780	50,000	3,400	9,180
<b>Totals</b>	<b>73,185</b>			<b>6,769</b>		<b>3,859</b>	<b>10,628</b>

**WARPO Capacity Building**

Ref: ID 006

**Basic Data**

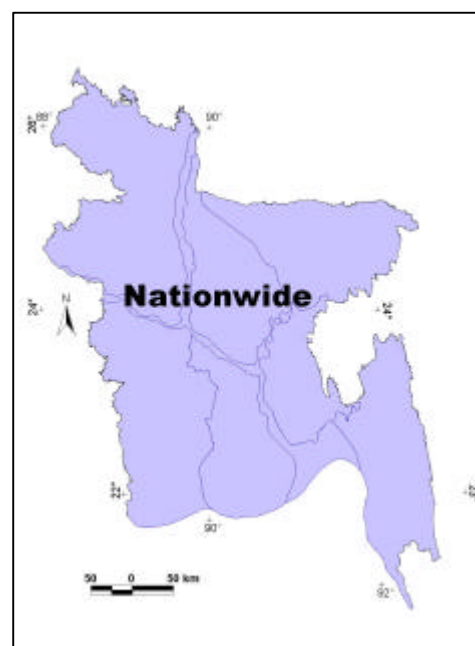
NWMP Sub-sector **Institutional Development**

Region(s) **Nationwide Significance**
**Relevance to NWPo**

§5.d of the NWPo establishes WARPO i) as the exclusive government institution for macro-level water resources planning and ii) as the Executive Secretariat of the ECNWRC.

**Purpose of Programme**

The various responsibilities assigned to WARPO by §5.d of the NWPo can be said to fall into two categories, namely: routine core services and periodic services. They are defined as follows:


**Routine Core Services**

- Maintenance, updating and dissemination of the NWRD
- Upkeep of water resource assessment
- Monitoring implementation of the NWMP and its impacts
- Functioning as a “clearing house” for all water sector projects
- Secretariat to the NWRC/ECNWRC
- Responding to NWRC/ECNWRC requests for information and advice

**Periodic Services**

- Updates of the National Water Management Plan
- Contributions to Five Year Plans
- Provision of ad hoc advice on policy, strategy, institutional and legal issues
- Execution of special studies, research, etc as required from time to time

Clearly if these tasks are to be fulfilled adequately, it will be necessary for WARPO to attract and retain a cadre of focused, permanent staff supported as and when required by reliable, high calibre contracted experts. Equally, in the interests of continuity, WARPO will have to become an attractive career option in terms of long term employment, while housing itself in a permanent functional and purpose built office. Unfortunately however WARPO and indeed its predecessors have suffered considerably from a lack of permanence, with adequate funding support provided only during national plan preparations and little in-between. These cycles of disinterest in WARPO have lead to loss of information and institutional memory. Career opportunities have been very limited, even for WARPO’s few permanent staff, and it is difficult for WARPO to attract and retain the calibre of staff suggested by its new responsibilities under Policy. This programme comprises a pragmatic approach to solving these pernicious problems.

**Programme Outline**

Four parallel strategies will be involved, all deliverable during the short term of the NWMP. The first involves revision of WARPO’s legal establishment, including necessary adjustments to its mandate to bring it fully into line both with NWPo requirements and the functional needs identified in the NWMP. Specific attention will be given in this to WARPO’s role as Secretariat

to the ECNWRC, precise definition of its “clearing house” role and relationships with other planning and monitoring agencies, reinforcing its position of neutrality amongst the many agencies involved in the water sector and reviewing the composition of the WARPO Board of Governors to provide strong and appropriate stewardship. Secondly, steps will be taken to revise WARPO’s staffing structure commensurate with its redefined functions, acknowledging the potential benefits of short term employment of specialists to support periodic activities. Thirdly, a permanent, purpose built high-tech office will be constructed for WARPO, potentially sharing this facility to mutual benefit with other organisations such as SWMC, EGIS and the JRC. Finally, value will be added to these investments by means of a series of capacity building initiatives delivered over a three to five year period with a focus on further strengthening of planning and monitoring capabilities as well the establishment of stronger links with the LGI’s and with line agencies.

## Financing Arrangements

The total cost, all of which will be incurred in the NWMP short-term, is estimated to be Tk660M. All of this is suitable for GoB financing, perhaps with donor assistance.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• WARPO mandate and establishment in line with NWPO and NWMP requirements	I1	• Gazetted Act and approved establishment	2003
• WARPO housed in a purpose built fully equipped high tech facility	I2	• Registered address of WARPO	2004
• WARPO capacity building training programme	I3	• Signed Project Document	2003
• WARPO established as a centre of excellence	K	• Donor confidence	2008
		• Investor confidence	
		• Correlation between plans and actualities in the water sector	
• Capacities of Bangladesh’s restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) independent training reviews	2025

## Institutional Arrangements

WARPO will be the main executor of this programme. Interim steps will be agreed with WARPO’s Board of Governors with further endorsement from the Ministry of Water Resources to whom WARPO at present is administratively attached.

## Existing Documentation

A five year work plan for WARPO is available. It provides a preliminary outline of WARPO capacity building requirements.

## Linkages

Operational linkages will be encouraged with the SWMC for resource modelling; EGIS for NWRD maintenance and broader environmental impact monitoring of water sector development activities, and BIDS for economic and regulatory issues. Administrative linkages will have to be strengthened with the Planning Commission and ideally, philosophical linkages should be established with other related bodies around the world for the purpose of information sharing and exposure to other sectoral solutions/paradigms.

## **Risks and Assumptions**

The first main risk concerns the ability of WARPO to attract and retain staff of appropriate calibre. This will be mitigated by placing the organisation in an influential position with an attractive and efficient operating environment, including good career and training prospects. Wider civil service reforms, including the prospects for enhanced performance related employment conditions would also be of direct relevance to WARPO. The second risk is simply that of inaction, leading to a further cyclical collapse of WARPO at a time when it is clearly needed to champion the NWPO as well as guiding and monitoring its implementation under the NWMP. It is reasonable to assume however, that current, strongly enunciated central commitment to institutional reform will be sufficient to overcome this.

**WARPO Capacity Building**Ref : **ID 006**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>WARPO</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2001</b>	Duration <sup>2</sup> :	<b>5 year(s)</b>
		Agency(s) Responsible :	<b>WARPO</b> (Lead) <b>None</b> (Supporting)
Short Description :	WARPO has suffered considerably in the past from a lack of permanence, with adequate funding support being provided only during national plan preparations and little in-between. Furthermore, prevailing employment conditions then, make the appointment and retention of suitable staff difficult. This programme intends to render WARPO sustainable while building its capacity such that it becomes a centre of excellence characterized by committed high calibre staff. This will be achieved by revision of WARPO's legal establishment, restructuring of WARPO staffing, relocation to a permanent suitable office and various capacity building programmes.		

<b>MIS Links</b>	Cost Calculation :	ID Programme costing.xls	Map :	ID 006 Map.jpg
	Disb't Schedule :	ID Programme costing.xls	Description :	ID 006 PgP.doc

<b>Finance</b>					Expected by Programme Year
	Costs	Private	Funding (%) GoB	Beneficiaries	
Total Capital <sup>3</sup>	<b>660.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>5</b>
Ultimate Recurring	<b>0.00</b> MTk/yr	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>	<p>Cost (MTk)</p> <p>Legend: ● Investment ○ Recurring — Total</p>			
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• WARPO mandate and establishment in line with NWPo and NWMP requirements	• Gazetted Act and approved establishment	NYD
• WARPO housed in a purpose built fully equipped high tech facility	• Registered address of WARPO	NYD
• WARPO capacity building training programme	• Signed Project Document	NYD
• WARPO established as a centre of excellence	• Donor confidence • Investor confidence • Correlation between plans and actualities in the water sector	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 006
Title	WARPO Capacity Building

### Assumptions:

Taka/US\$	51.000	TA duration	5.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	115.0	20,000		117.3		
Senior National consultants (all-in rate)	p-m	115.0		150	17.3	0.0%	-
Mid-level National consultants (all-in rate)	p-m	283.0		90	25.5	0.0%	-
Sub-totals					160.0		-
Other general TA programme costs		25%			40.0		-
Specific other TA programme costs	Training and Study tours				50.0	0.0%	-
<b>Total TA Costs</b>					<b>250.0</b>		-
<b>Other Programme Costs</b>							
1. Provision for R&D support	PS				310.0	0.0%	-
2. Permanent building	PS	Upkeep covered by R&D Support			100.0	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>410.0</b>		-
<b>Overall Programme Costs</b>							
<b>Overall Programme Costs</b>					<b>660.0</b>		-

**Department of Environment Capacity Building**

Ref: ID 007

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide****Relevance to NWPo**

Article 4.08 has three clauses with explicit operational implications for the Department of Environment (DoE): (b) requires that effluent disposal is monitored by relevant Government agencies; (c) instructs the DoE and (d) requires that industrial polluters pay for the clean-up of water bodies polluted by them. Equally, the Policy is characterised by numerous implicit references to environmental standards and objectives, most of which have implications for further DoE operations and capacity.

**Purpose of Programme**

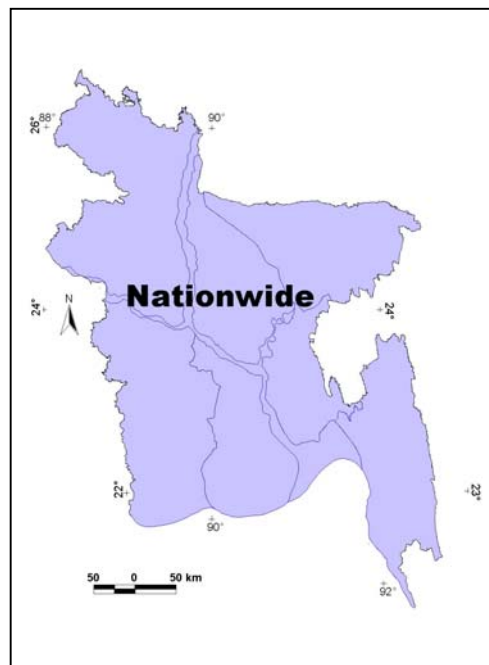
The purpose of the Programme is to strengthen DoE's ability to carry out its duties effectively.

**Programme Outline**

The DoE is the primary institution for environmental management and the setting and enforcement of the environmental regulations. Its key duties related to the water sector include:

- pollution control, including the monitoring of effluent sources and ensuring mitigation of environmental pollution;
- setting the Water Quality Standard (WQS) for particular uses of water and for discharges to water bodies;
- defining EIA procedures and issuing environmental clearance permits, the latter being legal requirements before proposed projects can proceed to implementation;
- providing advice or taking direct action to prevent degradation of the environment;
- declaring Environmentally Critical Areas (ECAs) where the ecosystem has been degraded to a critical state. ECA status confers protection on land and water resources through a series of environmental regulations.

However, the DoE has been consistently under-resourced and needs institutional strengthening. In 1999 the Sustainable Environmental Management Programme (SEMP) began this process, with UNDP and other donor support. SEMP includes a Policy and Institutions sub-programme within SEMP, which has a component on "Capacity Building for Environmental Legislation and Policy Analysis". Linked with this is the Bangladesh Environmental Management Project (BEMP), supported by the Canadian Government, which over a five-year period is strengthening the DoE.





BEMP forms the core of the DoE strengthening effort. Started in 1999, with a total budget of Tk391M, its emphasis is on human resource development, institutional planning, legal and policy matters, strategic planning, awareness raising and resource information systems, linked by practical demonstration projects. The “brown” rather than “green” environment is being given priority. Air pollution is the subject of the first demonstration project and the Buriganga River Pollution Prevention and Control Project is the second. BEMP’s approach is to work closely with industries. A serious constraint on BEMP impact so far has been DoE’s understaffing, which has resulted in low absorptive capacity to technical assistance. Increased staffing has been promised by GoB.

Despite this and other difficulties, BEMP has a vital contribution to make to the improvement of the water-related environment. An effective DoE, as the primary official body responsible, is essential. Due to its relative youth and lack of resources, the DoE will be unable to fulfil its role without a continuing strengthening programme, coupled with increased staffing and budget provisions from GoB. This is likely to be a long-term process.

It is therefore envisaged that the DoE strengthening programme will continue for a further five years after the end of the current phase in June 2004. Based on the cost data in the 2000/01 ADP, the budget remaining at the end of that fiscal year will be Tk218M. If this is fully utilised in the remaining three years, the average annual spend will be around Tk73M. The same level of spend has been assumed for the 5 year period after June 2004, the total cost of the new phase of the programme thus being Tk365M. Part of this continued strengthening programme will need to be put into establishment of DoE representation at Zila level to facilitate environmental oversight and regulation of local level activities as per law.

## Financing Arrangements

Financing will be by GoB, with a major donor contribution expected as at present.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"> <li>Department of Environment capacity building programme agreed by DoE and WARPO</li> </ul>	I1	<ul style="list-style-type: none"> <li>Signed Project Document</li> </ul>	2005
<ul style="list-style-type: none"> <li>Department of Environment capacity building programme completed</li> </ul>	K	<ul style="list-style-type: none"> <li>Ex-post evaluation</li> <li>Programme completion report</li> </ul>	2010
<ul style="list-style-type: none"> <li>Capacities of Bangladesh’s restructured water sector institutions strengthened in line with future demands on them</li> </ul>	D	<ul style="list-style-type: none"> <li>Regular (5 yearly) independent training reviews</li> </ul>	2026

## Institutional Arrangements

As at present, the host agency for the strengthening programme will be the DoE, as the institution being strengthened, and close liaison will be maintained with those SEMP components which are relevant to the Programme.

## Existing Documentation

Mainly BEMP, SEMP and donor agency reports.

**Linkages**

Links will be strong with Programme EA 010 Environmental Responsibility, Public Awareness Raising and Empowerment; and with other EA programmes. There will also be some linkage with other Institutional Development programmes.

**Risks and Assumptions**

The greatest risk is that GoB will fail to provide sufficient staff and funding to enable DoE to benefit fully from the technical assistance provided and thereafter to function effectively.

**Department of Environment Capacity Building**

Ref :

**ID 007**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>		
Focus/Foci :	<b>Department of Environment</b>	Location :	<b>Nationwide</b>		
Start Year <sup>1</sup> :	<b>2001</b>	Duration <sup>2</sup> :	<b>5 year(s)</b>	Agency(s) Responsible :	<b>DoE</b> (Lead) <b>None</b> (Supporting)
Short Description :	As far as aquatic resources are concerned, DoE is mandated to protect water quality and ensure efficiency of use and in particular to monitor (and establish standards of) effluent disposal to prevent water pollution. This programme allows for institutional capacity building of DoE including the establishment of representational offices down to District level.				

**MIS Links**

Cost Calculation :	ID Programme costing.xls	Map :	ID 007 Map.jpg
Disb't Schedule :	ID Programme costing.xls	Description :	ID 007 PgP.doc

**Finance**

	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>365.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>5</b>
Ultimate Recurring	<b>0.00</b> MTk/yr	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b> 			
Status :	<b>Preparation</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Department of Environment capacity building programme agreed by DoE and WARPO	• Signed Project Document	NYD
• Department of Environment capacity building programme completed	• Ex-post evaluation • Programme complete report	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 007
Title	Department of Environment Capacity Building

### Assumptions:

Taka/US\$	51.000	TA duration	5.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	168.0	20,000		171.4		
Senior National consultants (all-in rate)	p-m	300.0		150	45.0	0.0%	-
Mid-level National consultants (all-in rate)	p-m	300.0		90	27.0	0.0%	-
Sub-totals					243.4		-
Other general TA programme costs		25%			60.8		-
Specific other TA programme costs		25%			60.8	0.0%	-
<b>Total TA Costs</b>					<b>365.0</b>		-
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-
<b>Overall Programme Costs</b>					<b>365.0</b>		-

**Disaster Management Bureau Capacity Building**

Ref: ID 008

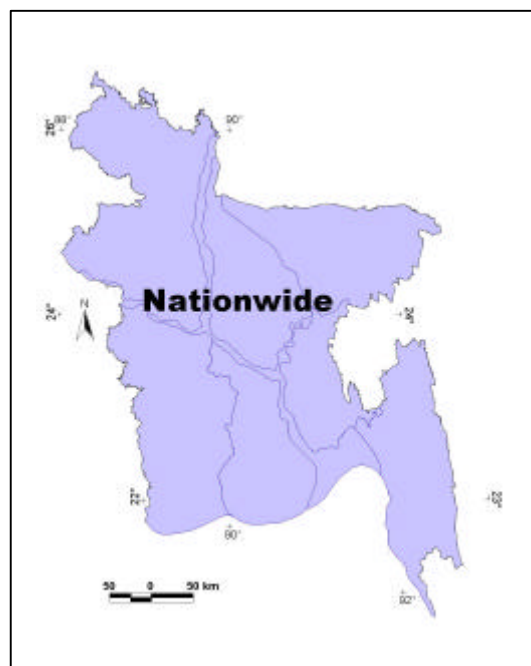
**Basic Data**

NWMP Sub-sector     **Institutional Development**

Region(s)                 **Nationwide Significance**

**Relevance to NWPo**

§4.2(c) of the NWPo requires that the NWMP and all related plans will be prepared in a comprehensive manner with regard to the interests of all water-related sectors. In Section (o) it stipulates that responsible agencies will develop early warning and flood-proofing systems to manage natural disasters. In §4.4, the NWPo makes clear that the Government's intervention will be directed towards ... addressing specific problems and protecting particular community interests. It further states that appropriate institutions will provide information to local community organisations for managing water resources efficiently.

**Purpose of Programme**

The Government's Development Strategy for the NWMP makes clear its intentions towards disaster management. Disaster management (including disaster preparedness) involves prevention and mitigation measures, preparedness plans and related warning systems, emergency response measures and post-disaster reconstruction and rehabilitation. Accordingly, in acknowledging that some people will always be at risk, the main aims for water-related disaster management are to provide the means by which, through a combination of structural and non-structural measures and to the extent feasible and affordable, people are adequately warned of an approaching disaster, are equipped to survive the disaster with as much as possible of their assets intact, and are adequately supported in rebuilding their lives thereafter.

Over the last decade, disaster management has become recognised as both a necessary and legitimate element of overall water management. The Disaster Management Bureau (DMB) was created in June 1994 as a UNDP/UNICEF funded project under the administrative control of the Ministry of Disaster Management and Relief. DMB is headed by a Director-General and is supported by four functional Directors (i) Planning, (ii) Training, (iii) MIS and GIS, and (iv) Administration and Logistics. The Bureau carries out its responsibility through disaster management committees at Union, Upazila and District level. There is a co-ordination committee at Ministry level, and a Disaster Management Council at national level chaired by the Prime Minister. The Bureau provides services such as awareness raising, collecting, preserving and disseminating management and geographical information - including mapping and damage assessment. It is also responsible for all stages (ie pre, during and post) of managing disasters whether caused by flood, cyclone, drought, earthquake etc.

In the context of the NWMP, DMB has a key role to play as an interface between the forecasting agencies (principally BWDB and Department of Meteorology) in terms of disseminating information on water-related disasters and assisting those afflicted by such disasters, including ensuring they are fully prepared when disasters strike.

The purpose of this programme is to provide the necessary support to DMB to enable the agency to be fully responsive to water-related disasters.

## Programme Outline

The programme represents a continuation of earlier work to establish and build up the capacity of the DMB. This entails primarily supporting the outreach of DMB to District, Thana, Union and village levels, and strengthening at each level. In principle, most of these structures are in place, and the issue is one of “making things work”.

The Comprehensive Disaster Management Programme under preparation by the Ministry of Disaster Management Bureau with UNDP support (BGD/92/02), lists the potential areas for further support as follows:

Physical Support		Non-Structural Support	
• Multi-purpose shelters	DM 001	• Public awareness campaigns	EE 010
• Embankments/dykes	AW 007	• DP education	ID 008
• Access roads	DM 004	• Training	<b>ID 008</b>
• River bank protection	MR 010	• Community mobilisation	<b>ID 008</b>
• Urban mitigation	TR 007	• Risk/hazard mapping	EE 004
• Communication equipment	ID 008	• Vulnerability profiles	EE 004
• Wind and flood resistant buildings	DM 002	• Environmental threats	EA 010
• Safe water supplies	TR 003-4	• Community focus and NGOs	ID 008
• Sanitation facilities	TR 005-6	• Standing Orders and Coordination	<b>ID 008</b>
• Heavy lifting equipment	ID 008	• Enhancement of EOC	<b>ID 008</b>
• Fire fighting appliances	<b>ID 008</b>	• MIS and GIS	<b>ID 008</b>
• Ambulances	<b>ID 008</b>	• Warning systems	ID 009
• Telecommunications support	<b>ID 008</b>	• Cross border co-operation	ID 009, 010
		• Pollution monitoring	EA 003
		• Arsenic detection and mitigation	TR 002

Most of these support measures are already covered in one form or another under different NWMP programmes, leaving the following to be covered under this programme:

1. Communication equipment
2. Heavy lifting equipment
3. Fire fighting appliances
4. Ambulances
5. Telecommunications support
6. DP education
7. Training
8. Community mobilisation
9. Community focus and NGOs
10. Standing Orders and Coordination
11. Enhancement of EOC
12. MIS and GIS

It is assumed that this programme will require a further 10 years to complete, and will be guided by the ongoing preparatory work.

## Financing Arrangements

No reliable estimate is available for the cost of the above programme components. Given the prevalence of natural water-related disasters in Bangladesh, and the time that it will take to mitigate the risks through other programmes, significant expenditure on disaster preparedness and relief appears well justified. Provisionally a sum of Tk2200M is set aside for this. Together with programmes listed above, this would represent very approximately one-third of the total plan investments. The programme is suitable for Government funding with the potential for donor support.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Disaster Management Bureau capacity building programme agreed by the DMB and WARPO	I1	• Signed Project Document	2004
• Disaster Management Bureau capacity building programme completed	K	• Ex-post evaluation • Programme completion report	2014
• Capacities of Bangladesh's restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) independent training reviews	2026

## Institutional Arrangements

The programme will be implemented by DMB. Close co-operation will be needed with many water sector agencies with direct and indirect stake in disaster management. These include Municipalities, Zila parishads, BWDB, Department of Meteorology, LGED, DPHE, community organisations and NGOs.

## Existing Documentation

The topic of disaster management is discussed extensively in DSR, Main Report,. Cyclone Protection is covered in Cyclone Shelter Preparatory Study, June 1998, for European Commission with LGED. The Comprehensive Disaster Management Programme is being prepared for Ministry of Disaster Management Relief with UNDP support under programme ref. BGD/92/002.

## Linkages

Linkages are described in the table above.

## Risks and Assumptions

The main challenge for this programme will be to sustain the benefits of increased capacity in the form described above. Whilst this necessitates a commitment from Government to a significant level of recurrent expenditure, much is to be gained from mobilising community support for disaster management. It is assumed that the programme design will reflect this.

**Disaster Management Bureau Capacity Building**

Ref :

**ID 008**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Disaster Management Bureau</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>10 year(s)</b>
		Agency(s) Responsible :	<b>DMB</b> (Lead) <b>None</b> (Supporting)
Short Description :	This programme will provide the resources necessary to continue ongoing capacity building activities throughout the short and medium terms in order that the DMB can address its mandate in an increasingly effective fashion.		

<b>MIS Links</b>	Cost Calculation :	ID Programme costing.xls	Map :	ID 008 Map.jpg
	Disb't Schedule :	ID Programme costing.xls	Description :	ID 008 PgP.doc

<b>Finance</b>	<b>Costs</b>		<b>Funding (%)</b>		<b>Expected by Programme Year</b>
		<b>Private</b>	<b>GoB</b>	<b>Beneficiaries</b>	
Total Capital <sup>3</sup>	<b>2,200.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>10</b>
Ultimate Recurring	<b>116.00</b> MTk/yr	<b>n/a</b>	<b>100%</b>	<b>0%</b>	<b>11</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Disaster Management Bureau capacity building programme agreed by the DMB and WARPO	• Signed Project Document	NYD
• Disaster Management Bureau capacity building programme completed	• Ex-post evaluation • Programme complete report	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done



# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 008
Title	Disaster Management Bureau Capacity Building

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	10.0	years	

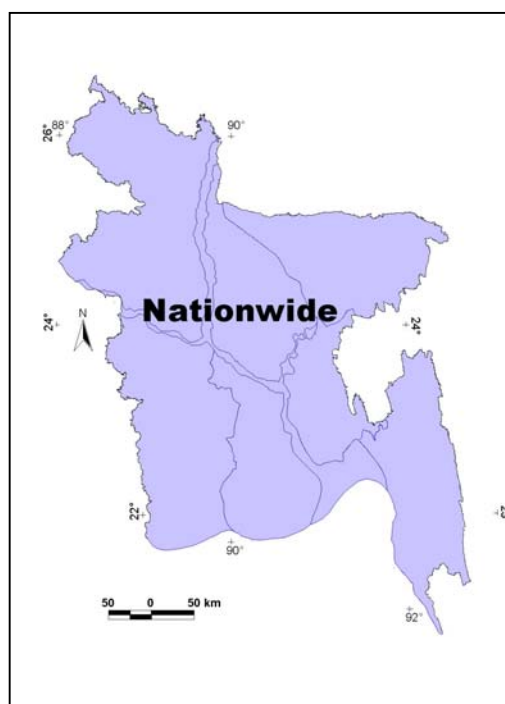
Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
<i>Programme preparation is ongoing with UNDP support</i>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Communications and related equipment					300.0	20.0%	60.0
2. Disaster relief equipment					500.0	10.0%	50.0
3. Education and training					1,100.0	0.0%	-
4. Central services					300.0	2.0%	6.0
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					2,200.0		116.0
<b>Overall Programme Costs</b>							
					2,200.0		116.0

**Capacity Building for Other Organisations**

Ref: ID 009

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide Significance****Relevance to NWPo**

The preamble to §4.2 of the NWPo recognises that “...the process of planning and managing water resources requires a comprehensive and integrated analysis of relevant hydrological....factors across all related water-using sectors.”. Clause o) of the same section calls for “..early warning systems to manage natural disasters like flood and drought.” §4.13 notes that “water bodies like haors, baors and beels are precious assets” and should be “preserved for maintaining the aquatic environment and facilitating drainage”.

**Purpose of Programme**

It is important to realise that in Bangladesh floods can have at least three primary causes: i) cyclones, which affect largely the coastal belt; ii) excessive local seasonal rainfall and iii) excessive in-stream flows, the last two of which are often greatly exacerbated by secondary problems such as impeded drainage or accretion in the case of natural channels.

As far as cyclones are concerned, Bangladesh’s existing forecasting system is limited to the use of satellite imagery to monitor the formation of cyclones. Although it is constantly being upgraded, no technology is as yet available whereby cyclone intensity, speed and direction can be predicted with any degree of reliability. Current methods are predominantly empirical and subjective, thus there is a pressing need for the introduction of numerical methods. Furthermore, tropical cyclones frequently change course and intensity and the resulting uncertainties reduce public confidence in the warning, and response to warnings when they are issued. To increase confidence to levels where the need for prompt action is rarely questioned, it will be important to distinguish between the **possibility** of a cyclone striking Bangladesh and the **probability** of landfall, where and when.

Despite the high rainfall and great rivers that typify Bangladesh, every year brings months without rainfall that bring hardship to people living in areas with poor access to surface and groundwater resources. Low monsoon rainfall can seriously damage the aman crop while droughts in April and May has the same effect on the aus. Furthermore, the depressed groundwater tables that result often render ineffective village hand pumps in the area, driving women to seek water from contaminated surface sources. Adequate notice of drought conditions would be helpful to those responsible for arranging food imports or releases from Government godowns. And of particular usefulness would be a system that forecasts droughts for the period April to October. Advance warning of potentially disastrous flood and drought events would not only preserve live and livelihoods; it could also pre-empt knock on food security and other economic shocks.

Inland floods affect much of Bangladesh every year, and agriculture and human settlements have adapted to normal floods caused by rainfall or lateral flow from rivers. However, severe monsoon floods, like those of 1998, cause significant damage to crops and property. Floods can also be associated with major changes in river planform and sedimentation, the sources of erosion, accretion and disruption of navigation in the lean season. Understanding the behaviour of rivers is crucial in a country like Bangladesh.

The area of naturally-occurring water bodies has declined as a result of the increasing pressure on land and man's interventions. The eco-systems that depend on these water bodies are changing as a consequence, leading to loss of suitable habitats for a wide variety of aquatic vegetation and other natural resources, which are themselves important for the poor in particular. The Government is committed to preserving the natural environment and has given special, but by no means exclusive, emphasis to the wetlands found in the NE of the country.

This programme provides for capacity building in three important organisations who must respond to these policy directives: (i) the Department of Meteorology, (ii) the River Research Institute and (iii) the Bangladesh Haor and Wetland Development Board.

## Programme Outline

### (i) Bangladesh Meteorological Department (BMD)

Essentially, the whole point of improving the Bangladesh Meteorological Department's ability to forecast and quantify extreme climatic events, be they coastal floods, inland floods or droughts, is to provide time for adequate responses or preparations to be made as appropriate:

Event	Rapid Response needed	Advance Warning needed
Cyclones	<ul style="list-style-type: none"> <li>Evacuation of people and livestock to shelters, killas, embankments and high ground</li> <li>Securing of ships and boats</li> </ul>	<ul style="list-style-type: none"> <li>Safe havens provided</li> </ul>
Inland Floods	<ul style="list-style-type: none"> <li>Evacuation of people and livestock to embankments and high ground</li> </ul>	<ul style="list-style-type: none"> <li>Stock piling of food, blankets and medicines</li> </ul>
Droughts	<ul style="list-style-type: none"> <li>Not applicable</li> </ul>	<ul style="list-style-type: none"> <li>Macro food security measures</li> </ul>

Thus the programme, which is scheduled for the short term, provides for the establishment in Bangladesh of digital equipment with which to make more accurate forecasts not only of cyclone intensity, but also time and location of landfall. Equally, multi-parameter warning systems, ideally based on regional rather than local monitoring, will be introduced for the purpose of forecasting extreme hydrological events and lines already being considered, at least conceptually, by USAID. Finally, the programme will ensure that all relevant staff are adequately trained in the use of the new facilities.

### (ii) River Research Institute (RRI)

Under the Ministry of Water Resources, the River Research Institute is mandated to undertake studies of river behaviour. Currently established in Faridpur, RRI conducts physical modelling of rivers as well as undertaking engineering soil testing, mainly in support of BWDB activities. A part of its income is derived from contracting out these services to other agencies and projects. Whilst increasing use is made of mathematical models, it is considered by many important to retain and improve domestic capacity for physical modelling. Given the significance of sediment transport in Bangladesh and the greater focus on integrated river system management in the

NWMP, it is anticipated that there will be an increase in demand upon RRI's services and a consequent need to upgrade their skills and capacity in modelling sediment transport.

### (iii) Bangladesh Haor and Wetland Development Board (BHWDB)

The newly formed Bangladesh Haor and Wetland Development Board is faced with the demanding task of preserving the declining wetlands of Bangladesh, especially those in the Northeast. Whilst many of necessary the skills for river engineering have been imported with staff deputed from BWDB, there is a dearth of environmental knowledge. To address this will require a proper skills inventory, with a downstream capacity building programme involving both training and recruitment. This programme will support these activities.

## **Financing Arrangements**

The programme is suitable for GoB funding, possibly with donor or development bank assistance and is expected to cost some Tk300M, all of which will be required in the first five years of the NWMP.

## **Objectives and Indicators**

<b>Objective</b>	<b>Suffix</b>	<b>Indicators/Mean of Verification</b>	<b>Due</b>
• Capacity building programmes agreed for BMD, RRI and BHWDB	I1	• Signed Project Documents	2005
• State of the art climate forecasting facilities available to the BMD	I2	• Equipment inventory	2010
• Reliable predictions of extreme climatic events (both short and long term), and morphological changes; and effective wetland management procedures	K	• Annual performance reviews	2012
• Capacities of Bangladesh's restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) independent training reviews	2027

## **Institutional Arrangements**

It is intended that the programme by the concerned organisations with some international technical assistance. Close association with the Disaster Management Bureau, co-operation with BWDB's Flood Forecasting and Warning Centre, the Field Service Wing of DAE and the Integrated Coastal Management Programme will be desirable for the DoM programme, and with DoE for the BHWDB programme.

## **Existing Documentation**

A useful, fairly detailed description of the cyclone warning challenge can be found in "Flood Forecasting in Coastal Areas" Danish Hydraulics Research Institute, May 2000; but no existing documentation relative to the forecasting of long term hydrological extremes, or for RRI and BHWDB strengthening, has so far been located.

## **Linkages**

There are obvious links with NWMP Programmes DM 001 (Cyclone Shelters and Killas), DM 002 (Bari-level Cyclone Shelters), ID 008 (Disaster Management Bureau Capacity Building), ID 010 (BWDB Capacity Building), MR 001 (Main River Studies and Research) and MR 006 (Regional River Management and Improvement).

## **Risks and Assumptions**

Two classic risks are associated with early warning systems of this kind. First is the risk that people will feel over-confident to the extent that they will wait for the warnings from the official system, which may have failed even as the event approaches. Secondly, communities can become complacent or cynical in the wake of false alarms. It is assumed that both risks can be obviated by appropriate levels of community involvement especially as regards the selection of community contact individuals and emergency task groups. People will be more likely to trust community members that they themselves have given responsibility to. There is also a risk that recurring costs will not be met by official sources; but it may be possible to establish the early warning system on a revenue basis whereby users of the information are required to pay a small sum for the privilege of doing so.

For RRI, as primarily a service agency, the risk is of course is that there is insufficient demand for the services provided. Whilst in principle the demand will exist and indeed increase as a result of other NWMP programmes, the strength of demand will depend upon the quality and cost-effectiveness of the services provided by RRI. Building the skills and capacity of RRI should therefore be seen as a holistic exercise embracing all employees who contribute to the service, not just for a limited number of specialists.

As a relatively young organisation, BHWDB faces many challenges ahead in resolving the intricate problems of wetland management. The risk for BHWDB, given its roots, is that it becomes an implementing agency for engineering works, alienated from both the environmental and local communities, without whose support the BHWDB will not prosper. The programme seeks to avert this by broadening the skill base, and it is assumed that the top management will fully support a pro-active stance towards environmental issues.

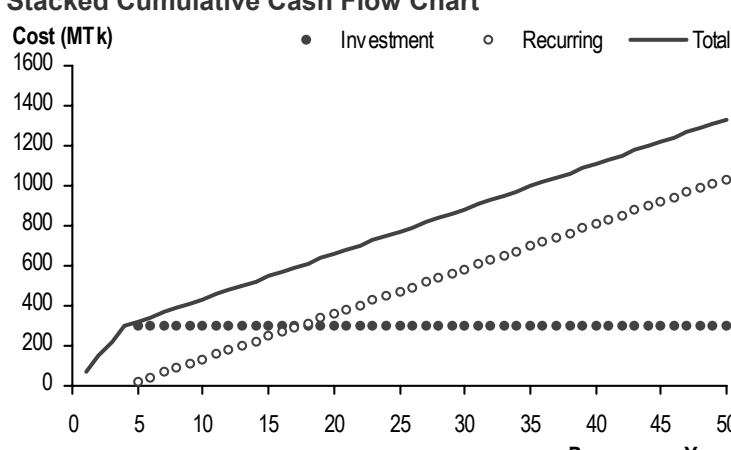
**Capacity Building for Other Organisations**

Ref :

**ID 009**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Other Agencies</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>4 year(s)</b>
		Agency(s) Responsible :	<b>BMD, RRI, (Lead) BHWDB (Supporting) None</b>
Short Description :	The NWPo §4.02(o) requires the GoB or its responsible agencies to undertake comprehensive and integrated analysis of relevant hydrological factors across all related water-using sectors for the purpose of managing the river systems and providing early warning systems of natural disasters like flood and drought. NWPo §4.13 also requires water bodies like haors, baors and beels are preserved for maintaining the aquatic environment and facilitating drainage. This programme provides for capacity building of three key agencies involved in these activities, namely: Bangladesh Meteorological Department, River Research Institute and Bangladesh Haor and Wetland Development Board.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 009 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 009 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme		Year	
	Total Capital <sup>3</sup>		300.00 MTk	0%	100%	0%		4	
	Ultimate Recurring		22.50 MTk/yr	n/a	100%	0%		5	
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment ○ Recurring — Total				
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Capacity building programmes agreed for DoM, RRI and BHWDB	• Signed Project Documents	NYD
• State of the art climate forecasting facilities available to the BMD	• Equipment inventory	NYD
• Reliable predictions of extreme climatic events (both short and long term), and morphological changes; and effective wetland management procedures	• Annual performance reviews	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design ,supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	<b>ID 009</b>
Title	<b>Capacity Building for Other Organisations</b>

*Assumptions:*

Taka/US\$	51.000	TA duration	4.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	84.0	20,000		85.7		
Senior National consultants (all-in rate)	p-m	104.0		150	15.6	0.0%	-
Mid-level National consultants (all-in rate)	p-m	208.0		90	18.7	0.0%	-
Sub-totals					120.0		-
Other general TA programme costs		25%			30.0		-
Specific other TA programme costs	Equipment and training				150.0	15.0%	22.5
<b>Total TA Costs</b>					<b>300.0</b>		<b>22.5</b>
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-
<b>Overall Programme Costs</b>					<b>300.0</b>		<b>22.5</b>

**Break up**

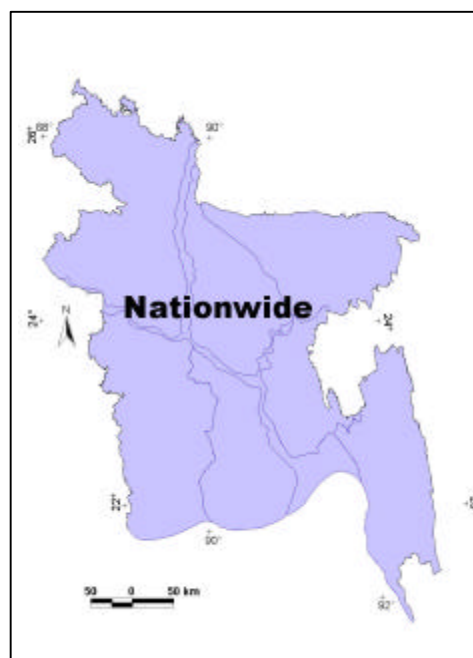
Technical Assistance	Expat	National 1	National 2	TA Total (TkM)	Equipment and Training (TkM)	Total (TkM)
1. BMD Capacity Building	40.0	60.0	120.0	75.8	37.50	113.3
1. RRI Capacity Building	30.0	30.0	60.0	50.6	75.00	125.6
1. BHWDB Capacity Building	14.0	14.0	28.0	23.6	37.50	61.1

**BWDB Capacity Building**

Ref: ID 010

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)                      **Nationwide Significance****Relevance to NWPo**

§3 of the NWPo confirms that all agencies working in the water sector are subject to the policy which is intended to result in sustainable public and private water delivery systems (§3.c); institutional changes that will help decentralize water resources management (§3.d) and a legal and regulatory environment that helps the process of decentralization. The preamble to §5 states that Government will restructure and strengthen...the existing institutions to ensure that the agenda for reform ...is implemented efficiently. §5.a confirms that the Government will formulate a framework for institutional reforms to guide all water sector activities and review the mandates of all water sector institutions. Finally and where appropriate, Government will restructure its present institutions (§4.1) and to this end, public water schemes are designed with specific provision for future disinvestments if and when feasible.

**Purpose of Programme**

Under the BWDB Act 2000, BWDB is repositioned to place a central role in water resource development and management, with a mandate fully consistent with the Policy. Many of BWDB's earlier functions are retained and it is assumed that in-service training, supported by project assistance as needed, will continue. However, in a number of key areas, new functions are included and existing ones are to be undertaken in modified ways. BWDB needs to respond to these challenges in a number of ways. This programme, together with ID 003: FCD and FCD/I Management Rationalisation and ID 004: BWDB Regional and Sub-Regional Management, is designed to provide support for BWDB to bring about the necessary internal changes and restructured skill mix envisaged under NWPo. It will be incumbent upon BWDB to review its staffing mix, and to recruit a significant proportion of non-engineering professionals to complement the efforts to re-train staff included within this programme. Efforts will also be needed for institutional development and HRD of the RRI and BHWDB.

**Programme Outline**

The programme aims to strengthen BWDB in four specific areas, to provide induction and in-service training within a broader framework of promoting a truly integrated and participatory approach to water resource management, and to upgrade BWDB's office accommodation consistent with its revised role. The important elements of the programme are as follows, which would be preceded by a preparatory technical assistance to assist in programme design and planning:



- Support for flood forecasting and warning dissemination
- Strengthening surface and groundwater monitoring and dissemination
- Support for erosion and accretion forecasting
- Support for Planning, design and O&M activities
- Support for drought forecasting
- Re-orientation programmes
- Management Information System (MIS) for BWDB
- Human Resource Development (HRD) for different departments of BWDB
- New central office
- Upgrading regional centres

It is envisaged that the programme would take 10 years to complete.

### **Financing Arrangements**

The total cost of the programme over 10 years is estimated to be Tk1316M, of which Tk50M is for preparation and Tk300M is for new office and upgrades. The re-orientation programmes are targeted at 3000 BWDB staff and are estimated to cost Tk302M, with remaining four specific programmes costing Tk190M, Tk163M, Tk222M and Tk89M respectively. Financing is appropriately from Government with the potential for donor support.

### **Objectives and Indicators**

<b>Objective</b>	<b>Suffix</b>	<b>Indicators/Mean of Verification</b>	<b>Due</b>
• BWDB long term needs assessed	I1	• Needs Assessment Report	2003
• Future roles and responsibilities of BWDB agreed	I2	• Acceptance of the Needs Assessment Report	2003
• BWDB capacity building programme agreed	I3	• Signed Project Document	2003
• BWDB capacity building programme completed	K	• Ex-post evaluation	2013
		• Programme completion report	
• Capacities of Bangladesh's restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) independent training reviews	2025

### **Institutional Arrangements**

BWDB will take a lead and pro-active role in developing its own organisation under the guidance of its management board. Co-operation will be needed with Disaster Management Bureau, Department of Meteorology, Department of Environment, Local Government and with data collecting agencies for the different programme components.

### **Existing Documentation**

Various reports are available with BWDB on flood forecasting. EGIS are working on erosion forecasting. USAID are supporting long range weather forecasting. DSR Chapter 4 describes new directions for BWDB. Copies of relevant legislation are held by WARPO on NWRD.

### **Linkages**

The programme has direct linkages with ID 003: FCD and FCD/I Management Rationalisation and ID 004: BWDB Regional and Sub-Regional Management. It also has bearing on EE 007: NWRD Improved Data Collection and Processing Facilities, MR 006: Regional River Management and Improvement, MR 010: Main Rivers Erosion Control at Selected Locations,

DM 006: Supplementary Irrigation and Drought Proofing of Rural Water Supplies, and EA 003: National Water Quality Monitoring.

### **Risks and Assumptions**

The principle risk for the programme is a lack of commitment from within BWDB to embrace the changes ordained by NWPo and the BWDB Act 2000. The impetus for change must come from the Board of Directors, but it is up to the Director General and his staff to stimulate the organisation as a whole to willingly cooperate. This will require rapid establishment of a common vision for what BWDB will be like in 10 years time along and thereafter a sustained effort to achieve it. Frequent changes in top management, as happens now, are not conducive to carrying through change programmes, and it is assumed that BWDB will introduce new arrangements to ensure more continuity.

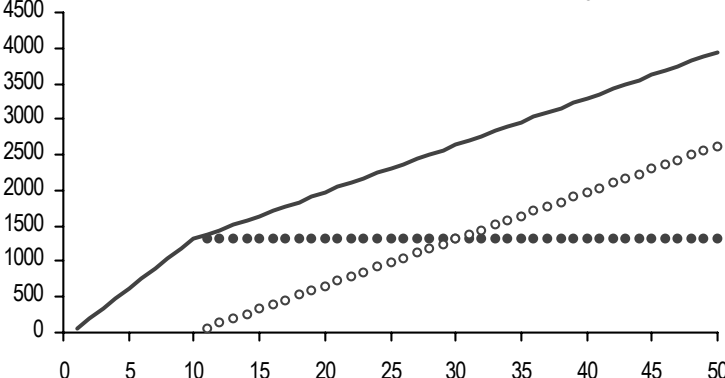
**BWDB Capacity Building**

Ref :

**ID 010**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Bangladesh Water Development Board</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>10 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>None</b> (Supporting)
Short Description :	This programme is intended to strengthen BWDB in several ways: improved flood forecasting and warning; strengthened surface and groundwater monitoring and dissemination; support for erosion and accretion forecasting; support for drought forecasting; re-orientation programmes especially with regard to the social and environmental dimensions of water resources management, MIS, HRD and other related fields of BWDB; a new central office and upgraded regional centres.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 010 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 010 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme		Year	
	Total Capital <sup>3</sup>		1,316.00 MTk	0%	100%	0%	10		
	Ultimate Recurring		65.70 MTk/yr	n/a	100%	0%	11		
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment ○ Recurring — Total				
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• BWDB long term needs assessed	• Needs Assessment Report	NYD
• Future roles and responsibilities of BWDB agreed	• Acceptance of the Needs Assessment Report	NYD
• BWDB capacity building programme agreed	• Signed Project Document	NYD
• BWDB capacity building programme completed	• Ex-post evaluation • Programme complete report	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 010
Title	BWDB Capacity Building

### Assumptions:

Taka/US\$	51.000	TA duration	1.0	years	All prices in mid-2000 values
		Investment duration	9.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b> <i>Programme design</i>							
Expatriate consultants (all-in rate)	p-m	28.0	20,000		28.6		
Senior National consultants (all-in rate)	p-m	48.0		150	7.2	0.0%	-
Mid-level National consultants (all-in rate)	p-m	47.0		90	4.2	0.0%	-
Sub-totals					40.0		-
Other general TA programme costs		25%			10.0		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					<b>50.0</b>		<b>-</b>
<b>Other Programme Costs</b>							
1. Support for Flood Forecasting and Warning Dissemination				PS	190.0	4.0%	7.6
2. Strengthening surface and groundwater monitoring and dissemination				PS	163.0	5.0%	8.2
3. Support for erosion and accretion forecasting				PS	222.0	1.0%	2.2
4. Support for drought forecasting				PS	89.0	3.0%	2.7
5. Re-orientation programmes				PS	302.0	5.0%	15.1
6. New central office				PS	100.0	10.0%	10.0
7. Upgrading 8 regional centres				PS	200.0	10.0%	20.0
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>1,266.0</b>		<b>65.7</b>
<b>Overall Programme Costs</b>					<b>1,316.0</b>		<b>65.7</b>

### Break up

<b>Technical Assistance</b>		Expat	National 1	National 2	Total (TkM)	
1. Flood Forecasting and Warning		80	80	160	135.0	
2. Water monitoring		80	80	160	108.0	
3. Erosion and accretion forecasting		120	120	240	162.0	
4. Drought forecasting		40	40	80	54.0	
5. Re-orientation programmes		120	120	240	162.0	
<b>Capacity Building</b>		Trainees	Unit rate	Total (TkM)	Equipment Total (TkM)	O&M
1. Flood Forecasting and Warning		600	50,000	30.0	25.0	55.0
2. Water monitoring		600	50,000	30.0	25.0	55.0
3. Erosion and accretion forecasting		100	500,000	50.0	10.0	60.0
4. Drought forecasting		50	500,000	25.0	10.0	35.0
5. Re-orientation programmes		3,000	30,000	90.0	50.0	140.0

# **Institutional Development**

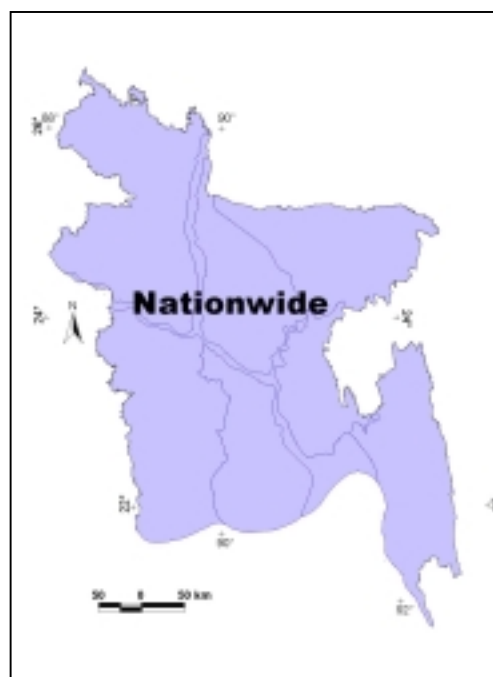


**Local Government Needs Assessment for Water Management**

Ref: ID 001

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide Significance****Relevance to NWPo**

The NWPo introduces significant new roles and responsibilities for Local Government Institutions. In particular §4.2 Article e requires LGI's to implement FCD/I projects having a command area less than or equal to 1000ha, while Article f calls upon LGI's to be the principle agencies for coordinating stakeholder participation at all stages of water sector project cycles. Equally §4.3 Article e allows the central Government to decentralize water allocation rights to the LGI's. The preamble to §4.4 establishes the principle that LGI's have a role to play in the community level resource management. §4.4b Article e provides for the possibility of LGI involvement in the joint management of non-municipal water schemes over 5000ha, while Article f requires the ownership of FCD and FCD/I projects with command areas less than or equal to 1000 ha to be transferred to LGI's.

**Purpose of Programme**

As a result of the NWPo, LGI's will become progressively responsible (with community groups) for the management of all FCD schemes up to 5000ha, and for the raising of operation and maintenance tariffs through local resources. They may also play an important role in supporting the management of larger schemes by autonomous bodies. In addition, LGI's will be responsible for development of community cyclone protection and will work with NGO's in support of bari-level cyclone and flood proofing programmes. They will also have essential roles to play as regards the development of improved water supply and sanitation facilities in the rural areas. Equally, in the urban sector, paurashava and city corporations will become increasingly autonomous and responsible (directly or through WASA's) for the provision of all water-related services. Such new responsibilities clearly represent a challenge for the LGI's which have little or no historic experience of water sector development and are in any case generally weak or non-existent (the DSR reports that three out of four levels of Parishad have yet to be established). The DSR also concludes that considerable efforts will be needed to strengthen local planning and management capacity if it is to evolve in a manner that adequately reflects local issues while remaining, or indeed becoming compatible with national plans as well as with those of the line agencies. To this end the programme has two objectives and they are linked. The first objective is to identify management structures, procedures and human resources needed by the LGI's if they are to take on the management of local water resources and channel systems; water supply and sanitation development; urban and peri-urban services as well as cyclone protection facilities. An expected feature of the resulting management structure is likely to be a central training support unit based within the Ministry of Local Government and Rural Development. The

second objective is to identify the steps necessary to achieve these ends and the human resource training needs.

## Programme Outline

In acknowledgement of the need to make solid progress in the water sector decentralization process, the programme will take place in the short term while the outstanding LGI's are still being established. In fact, by identifying suitable institutional arrangements and their associated capacity building implications and during or before LGI establishment will increase the chances of the institutions becoming effective as early as possible. Management and training needs assessments will therefore be carried out as follows. A study of potential LGI water sector operations will identify appropriate measures to allow LGIs control over development funding in their areas of responsibility in the water sector and will cover Paurashavas and each level of Parishad. Inter-alia, the study will cover accountability; loan modalities; alternative means of generating funds; tariffs; oversight and audit; institutional, legal and management requirements and human resource development. At the same time, a parallel study at Zila level will identify and develop appropriate planning mechanisms at Zila level and below. Each will take around 18 months and cover a few contiguous Districts and should explore the modalities of implementing the new policy. Together the studies will inform the preparation of realistic development, capacity building and training plans reflecting the results of broad consultation with all parties and including details of costs, benefits, financing plans, cost recovery, and long term management. Such plans should seek to integrate private sector activities wherever possible, including the employment of Bangladeshi consulting firms while including plans for disposition of FCD projects within the jurisdictional area

Once the two studies are concluded, they will be used to design a responsive training and capacity building programme.

## Financing Arrangements

On the assumption that the studies take place in say, eight locations across the country (each representing one or more Districts with differing development constraints), the costs are expected to total some Tk40M and Tk130M for the LGI and Zila level studies respectively and will be appropriate for Government funding.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"> <li>Outline management structure, procedures and human resource requirements for local water sector development and management by LGI's agreed by all stakeholders</li> </ul>	K	<ul style="list-style-type: none"> <li>Formal agreement of stakeholder agencies</li> </ul>	2004
<ul style="list-style-type: none"> <li>Bangladesh's institutional framework for the water sector regulated, decentralised and devolved according to subsidiarity principles</li> </ul>	D	<ul style="list-style-type: none"> <li>Ratified legal framework</li> </ul>	2019

## Institutional Arrangements

By their very nature, the studies will have to cross ministry boundaries, but should preferably be led by the LGD in collaboration with WARPO and with the support of consultants. The study team themselves should be lead by a senior official in Local Government Division and include



representatives of existing LGIs and CBOs with units from DPHE, LGED and BWDB. WARPO should also participate in an advisory role, both to ensure consistency with NWMP and to help develop linkages between the National Water Resources Database and the local level plans. Community organisations should take a prominent role in setting forth plans for their immediate areas.

### **Existing Documentation**

Background analyses leading to the identification of this programme can be found in Section 4 of the DSR, where specific details are provided in sub-sections 4-4 and 4-5. Other than that, no additional documentation has been identified.

### **Linkages**

There is a clear and direct link with Programme ID 005 (Local Government Capacity Building for Water Management) for which this programme essentially represents the preparatory phase. Less direct, but equally important links also exist with programmes ID 002 (Independent Regulatory Bodies for Water Supply and Sanitation Service Sector); ID 003 (FCD and FCD/I Management Rationalisation); and ID 004 (BWDB Regional and Sub-regional Management Strengthening).

### **Risks and Assumptions**

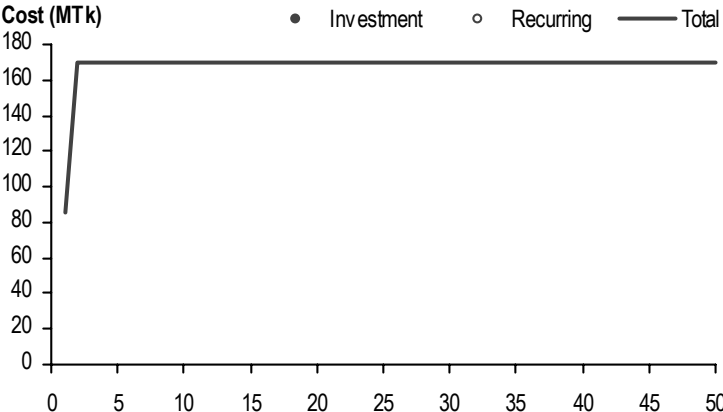
The main risk will be that continuing delays in LGI establishment will compromise the validity of the programme or delay its execution. It is assumed however, that the Government's clearly enunciated and repeated commitment to decentralization along with the advice and support of the donor community will be sufficient to overcome the remaining inertia.

**Local Government Needs Assessment for Water Management**Ref : **ID 001**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Local Government Institutions</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>2 year(s)</b>
		Agency(s) Responsible :	<b>LGD</b> (Lead) <b>None</b> (Supporting)
Short Description :	The NWPo creates new roles for and places new responsibilities on Local Government Institutions. In particular §4.2.e requires LGI's to implement FCD/I projects having a command area less than or equal to 1000ha, while §4.2.f calls upon LGI's to coordinate stakeholder participation at all stages of water sector project cycles. Furthermore, as a result of §4.4.d LGI's will become progressively responsible for the management of all FCD schemes up to 5000ha, as well as for the raising of operation and maintenance tariffs through local resources. This programme assesses the implications of these challenges in terms of the institutional framework and human resource requirements and presents them in the form of a institutional capacity building and human resource development programme document.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 001 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 001 PgP.doc

**Finance**

Finance		Costs		Private	Funding (%)		Beneficiaries	Expected by
					GoB			ProgrammeYear
Total Capital <sup>3</sup>		170.00 MTk		0%	100%		0%	2
Ultimate Recurring		0.00 MTk/yr		n/a	n/a		n/a	n/a
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart				
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment ○ Recurring — Total			
Status :	Identified							
Financial Base Year:	mid-2000							
Planned Expenditure (to date) :	0 MTk							
Actual Expenditure <sup>4</sup> (to date) :	0 MTk							

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Outline management structure, procedures and human resource requirements for local water sector development and management by LGI's agreed by all stakeholders	• Formal agreement of stakeholder agencies	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 001
Title	Local Government Needs Assessment for Water Management

### Assumptions:

Taka/US\$	51.000	TA duration	2.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	84.0	20,000		85.7	0.0%	-
Senior National consultants (all-in rate)	p-m	124.0		150	18.6	0.0%	-
Mid-level National consultants (all-in rate)	p-m	312.0		90	28.1	0.0%	-
Sub-totals					132.4		-
Other general TA programme costs		25%			33.1		-
Specific other TA programme costs	Study tour	2	45000		4.6	0.0%	-
<b>Total TA Costs</b>					<b>170.0</b>		-
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-
<b>Overall Programme Costs</b>							
					170.0		-

### Notes

	Expat	National-1	National-2	Total	
Potential LGI water sector operations	24.0	24.0	40.0	88.0	p-m
Planning mechanisms at Zila level	60.0	100.0	272.0	432.0	p-m
Totals	84.0	124.0	312.0	520.0	p-m

## Independent Regulatory Body for Water Supply and Sanitation Service Sector

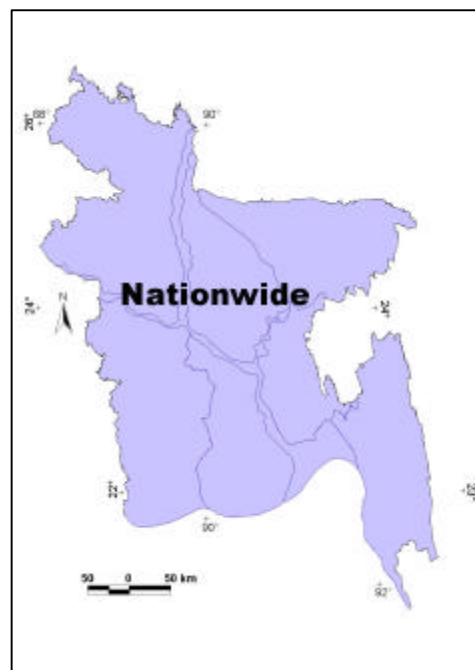
Ref: ID 002

### Basic Data

NWMP Sub-sector      **Institutional Development**Region(s)              **National Significance**

### Relevance to NWPo

NWPo and the National Policy for Safe Water Supply and Sanitation (NPSWSS) both clearly state that private sector participation (PSP) in the water supply and sanitation sector will be promoted in order to access the capital resources, management expertise and performance efficiency of private enterprise. However, for such a partnership to operate satisfactorily in the long term interests of both the consumer and the private investor, there is a clear need for an independent regulatory framework to supervise and monitor the contractual relationship, performance and pricing in a fair and even-handed manner. The NWPo supports this initiative in several key phrases. For example, policy highlights the need “To develop a legal and regulatory environment that will help the process of decentralisation, sound environmental management, and improve the investment climate for the private sector in water development and management”, and that “...there should be a separation of policy, planning and regulatory functions from implementation and operational functions at each level of government”, and “...each institution must be held accountable for financial and operational performance.” The NWMP suggests that independent regulation of the private sector can or will control monopolistic tendencies, improve economic efficiency by encouraging natural monopolies to perform at a socially optimal level, and maintain balance between the potentially competing interests of government, regulated utilities and consumers.



### Purpose of Programme

The main purpose of the programme is to establish an independent regulatory body which will provide a fair and pragmatic framework for the supervision, control and monitoring of private (and possibly public) sector contracts, investment, management and operations in the water supply and sanitation sector. The major challenge will be to establish a regulatory framework which is independent and fair to all parties in setting standards, guidelines and pricing parameters which encourage private investment and give confidence to the consumer that services will improve at an affordable price.

The international trend has been to promote a framework of national principles and guidelines, coupled with regional or local instruments to resolve specific issues and potential conflicts. Lessons for Bangladesh from these experiences are:

- (a) A realistic assessment is needed of actual institutions and government effectiveness. In establishing an effective regulatory framework, institutional restructuring, strengthening and technical training will be key factors;

- (b) The quality and structure of incentives and instruments to be used in the regulatory process are important factors in the creation of a fair balance between the consumer and private sector companies;
- (c) Creation of a regulatory framework does not guarantee effective regulation. Implementation of the regulatory controls needs to be monitored carefully;
- (d) Administrative and financial independence is a central requirement if a regulatory agency is to function effectively. Regulatory and operational functions must be clearly separated;
- (e) GoB needs to develop an innovative regulatory framework with incentives to attract private investment to small cities and towns. Local private companies, with relevant expertise, should be encouraged to participate in order to increase competition; and
- (f) Fully “independent” regulation is difficult to achieve without strong safeguards and a willingness to limit political interference. In this context, the Government needs to guarantee, formalise and institutionalise its commitments to consumers and investors.

In theory, the scope of an independent regulatory framework could also be broadened to cover public sector operators (e.g. DWASA, CWASA and municipal operations) and community-based schemes in the water supply and sanitation sector. This may present considerable difficulties in the short to medium term given the poor performance of most public sector operators in the sector. However, the proposed study will examine the implications of this alternative.

The Government will also complement this initiative with parallel and supporting programmes under the NWMP (see “Linkages”). It should be stated also that the proposed regulatory body will not have any direct responsibility for environmental regulation (e.g. polluting wastewater discharges to surface water and groundwater). This is the responsibility of the Department of Environment, and is currently being strengthened with external assistance from UNDP and Canada.

## **Programme Outline**

The study and manual for an Independent Regulatory Body for the Water Supply and Sanitation Sector will be commissioned within the next two years. It is expected that the project programme will cover the following major topics, among others:

- (a) Review of international experience with regulatory bodies in the water supply and sanitation sector;
- (b) Review of relevant institutional, financial and legal issues in Bangladesh;
- (c) Analysis of alternative independent regulatory structure appropriate for Bangladesh;
- (d) Results of wide-ranging stakeholder consultation process;
- (e) Institutional and legal requirements for an Independent Regulatory Body;
- (f) Financing and training requirements for an Independent Regulatory Body;
- (g) Detailed regulatory framework and manual; and
- (h) Recommendations for a time-bound Action Plan to establish the Independent Regulatory Body.

Within the analysis of alternative independent regulatory structures (see: item (c) above), it is expected that the presentation will include, among other options: (i) private sector involvement only; (ii) public and private sector operations (i.e. including DWASA, CWASA, municipal operations, and community-based schemes); (iii) central or regional IRBs; (iv) water supply and sewerage only, excluding sanitation; (v) urban and/or rural water services; and (vi) other combinations.

The first few years of the implementation programme will demonstrate GoB's serious intent to push forward with the process of private sector participation (PSP) and the establishment of an Independent Regulatory Body for the Water Supply and Sanitation Sector.

## Financing Arrangements

The proposed programme (study, manual and action plan) for establishing an Independent Regulatory Body (IRB) for the Water Supply and Sanitation Sector is suitable for GoB funding with the support of the international donor community. The initial funding requirement for Technical Assistance is estimated at Tk75M at mid-2000 prices.

One of the principal outputs of the study will be the Action Plan for the establishment of the IRB. The implementation plan will be costed in detail to cover the first 5 years of operation. The NWMP provides a provisional estimate of Tk1,200M.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Regulatory Framework agreed by Government Stakeholders	I1	• The framework	2006
• Regulatory manual completed and agreed	I2	• The manual • The agreement	2007
• Independent regulatory bodies for water supply and sanitation services established and fully functional	K	• Operational charters of the regulatory bodies • Legal status of the regulatory bodies	2011
• Bangladesh's institutional framework for the water sector regulated, decentralised and devolved according to subsidiarity principles	D	• Ratified legal framework	2019

## Institutional Arrangements

The Local Government Division, in co-ordination with the Ministry of Finance, will be responsible for commissioning the study for Regulatory and Economic Instruments. LGD will be the executing agency, and be responsible for preparing the Terms of Reference and other background documentation.

Institutional arrangements for the implementation of the action plan on an Independent Regulatory Body for the Water and Sanitation Sector will depend on the detailed recommendations of the proposed study.

## References and Documentation

- (a) Strategy Study to Mobilise Finance and Increase Efficiency in the Dhaka Water Supply and Sewerage Sector, Halcrow Management Services Limited, August 1998
- (b) The Water Supply and Sewerage Authority Act (1996) and other legislation

## Linkages

The programme for an Independent Regulatory Body for the Water Supply and Sanitation Sector should be closely linked and co-ordinated with other NWMP programmes, namely: (a) Local Government Needs Assessment for Water Management (ID 001); (b) Local Government Capacity Building for Water Management (ID 005); (c) Field Testing of Participatory Management Models (EE 002); (d) Project Preparation Procedures - Guidelines and Manuals (EE 007); (e) Regulatory and Economic Instruments (EE 005); (f) Raising Public Awareness in the Wise Use and Management of Water (EE 010); (g) Private Sector Participation in Water

Management (EE 011); (h) Water and Environment Funds (EE 012); (i) Alternative Financing Methods for Water Management (EE 013); and (j) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

Preparation and development of the Independent Regulatory Body for Water Supply and Sanitation should also be co-ordinated with Ministry of Water Resources (MoWR), WARPO, Ministry of Industry (MoI), Ministry of Agriculture (MoA), Ministry of Environment and Forests (MoEF), Bangladesh Water Development Board (BWDB), Department of Public Health Engineering (DPHE), Local Government Engineering Department (LGED), Department of Environment (DoE), DWASA, CWASA, Local Government authorities, NGOs, the private sector and other stakeholders.

### **Risks and Assumptions**

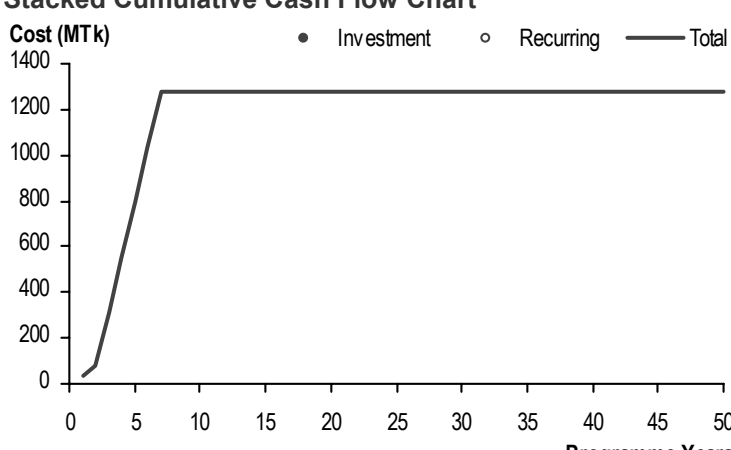
The risks associated with the commissioning and execution of the proposed IRB Study and Manual are minimal, providing well qualified international consultants are engaged to carry out the work. The main risks will arise after the study and manual have been completed. They will fall into two categories: institutional and financial. The institutional risks are twofold: firstly, whether there is sufficient political will and commitment to carry out the IRB programme; and secondly, whether government line agencies and enterprises will provide effective support and co-operation to implement the proposals. The NWPo and NPSWSS give clear statements that private sector participation is an integral part of water sector policy; therefore, GoB must give sustained support if the additional financial resources and management expertise are to be forthcoming from the private sector. In this context, parallel co-ordination and implementation of the EE Programmes will be crucial. The main financial risk is that if the IRB programme is not effectively implemented then the private sector may not have the necessary confidence that the Government will regulate the sector in a fair and acceptable manner. This will result in less domestic private sector investment and will delay indefinitely the possibility of foreign private investment. It may also discourage some international donor support for the water sector.

## Independent Regulatory Bodies for Water Supply and Sanitation Service Sector

Ref : **ID 002**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>New Regulatory Bodies</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>7 year(s)</b>
		Agency(s) Responsible :	<b>LGD</b> (Lead) <b>MoFinance,</b> (Supporting) <b>New agencies</b>
Short Description :	Initially, this programme will begin by studying options for the establishment of a regulatory framework for water supply and sanitation as well as the institutional demands thereof. This preliminary stage will be followed by the establishment and mandating of the institutions themselves. It is anticipated that existing institutions will be able to accept some of the responsibility; even so a clear need for new, specialist agencies is foreseen.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 002 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 002 PgP.doc

<b>Finance</b>					
	Costs	Private	Funding (%)	Expected by	
			GoB	Beneficiaries	ProgrammeYear
Total Capital <sup>3</sup>	<b>1,275.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>7</b>
Ultimate Recurring	<b>0.00</b> MTk/yr	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>
Date of Data :	<b>31 07 01</b>	<b>Stacked Cumulative Cash Flow Chart</b>			
	(dd) (mm) (yy)				
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

## Monitoring

Objective	Indicator	Present Status <sup>5</sup>
• Regulatory Framework agreed by Government Stakeholders	• The framework	NYD
• Regulatory manual completed and agreed	• The manual • The agreement	NYD
• Independent regulatory bodies for water supply and sanitation services established and fully functional	• Operational charters of the regulatory bodies • Legal status of the regulatory bodies	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done



**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	ID 002
Title	Independent Regulatory Bodies for Water Supply and Sanitation Service Sector

*Assumptions:*

Taka/US\$	51.000	TA duration	2.0	years	All prices in mid-2000 values
		Investment duration	5.0	years	

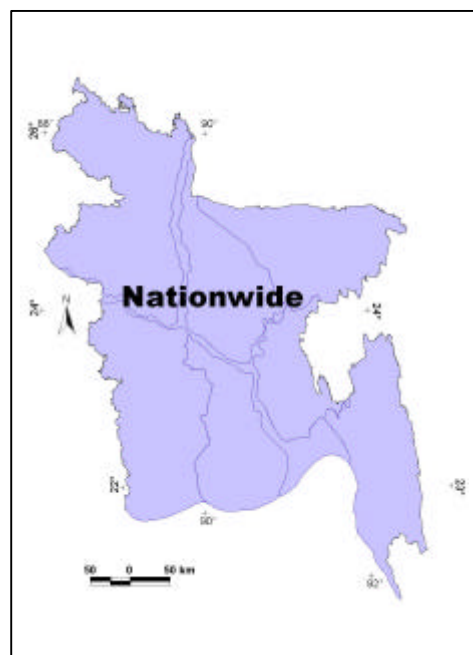
Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	48.0	20,000		49.0		
Senior National consultants (all-in rate)	p-m	36.0		150	5.4		
Mid-level National consultants (all-in rate)	p-m	63.0		90	5.7		
Sub-totals					60.0		
Other general TA programme costs		25%			15.0		
Specific other TA programme costs					-		
<b>Total TA Costs</b>					<b>75.0</b>		
<b>Other Programme Costs</b>							
1. Provision for setting up body(ies)	LS	1			1,200.0	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>1,200.0</b>		-
<b>Overall Programme Costs</b>							
					<b>1,275.0</b>		-

**FCD and FCD/I Management Rationalisation**

Ref: ID 003

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **National Significance****Relevance to NWPo**

Realising that the ultimate success of public water resources management projects depends on the peoples acceptance and ownership of each project, it is the policy of the Government that: *'The management of public water schemes, barring municipal schemes, with a command area up to 5000ha will be gradually made over to local and community organisations and their O&M will be financed through local resources.'* (Clause 4.04d) and; *'Ownership of FCD and FCDI projects with command area of 1000ha or less will gradually be transferred to the local governments, beginning with the ones that are being satisfactorily managed and operated by the beneficiary/ community organisations.'* (Clause 4.04f)

**Purpose of Programme**

In adhering to the principles outlined by policy, a future institutional framework is expected to include measures to enable: a) Existing FCD infrastructure (up to 5000ha), currently operated by BWDB/LGED, will be handed over to local government and/or community groups as soon as sustainable mechanisms to effect the transfer are established. And; b) Existing and new FCD(I) projects over 5000ha will be progressively transferred to autonomous operating authorities, constituted in a manner determined through trial and testing. The purpose of this programme therefore, is to carry out pilot studies of alternative institutional models to effect the management transfer of FCD(I) schemes to local Government, community organisations, or new autonomous bodies in accordance with policy.

**Programme Outline**

Year 1 of the programme would be spent preparing detailed plans for the pilot phase testing. Some six to eight schemes would be carefully selected for the testing. Four possible modes have been suggested:

- i) Hand-over to Local Government
- ii) Hand-over to beneficiaries
- iii) Joint management by BWDB and beneficiaries
- iv) Establishment of a joint non-profit making management company owned by BWDB and Local Government Institutions.

Other models may be considered providing they comply with Government Policy and efforts would be made at an early stage to identify these through intensive local consultation.

These models would be tested during years 2 to 6, concurrently with environmental audit (in accordance with NEMAP requirements) and requisite civil works arising from the outcome of participatory planning involving all stakeholders.

In parallel to the above a full inventory would be made of BWDB schemes including an assessment of the physical condition of the works. A programme of environmental audit would also be launched.

The results of the pilot testing, the asset survey and the audits conducted would be compiled in years 4 to 6 and a plan of action would be drawn up for the remaining BWDB schemes. Up to a further ten years may be required to implement this proposed management plan for the existing BWDB schemes (which would be implemented under Programmes AW 002 and AW 007).

## Financing Arrangements

This programme is suitable for GoB funding (possibly with donor assistance) and is expected to cost approximately 1,300 TkM.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Reduction in the number of schemes directly managed by BWDB	I1	• Nationwide FCD(/I) statistics	2019
• Increase in funds for O&M after turnover of scheme	I2	• Scheme accounts	N/A
• 75% of decentralised FCD/I schemes considered sustainable within 10 years of transfer	K	• National FCD/I scheme statistics	2019
• Bangladesh's institutional framework for the water sector regulated, decentralised and devolved according to subsidiarity principles	D	• Ratified legal framework	2019

## Institutional Arrangements

Preparation of the management plan would be the responsibility of BWDB. In view of the wide range of skills required, Technical Assistance (TA) would be required. Implementation arrangements will be determined on the basis of the management plan but are expected to involve LGIs, CBOs, and WUGs as well as further TA.

## Existing Documentation

A start was made on a scheme-by-scheme assessment during the Water Sector Improvement Project preparatory studies, but handover was not considered in detail. Documentation on the CARE flood proofing project and the LGED Small Scale Water Resources Development Project may also provide useful information regarding previous management transfer attempts in the Bangladesh water sector.

## Linkages

There will be an obvious linkage with AW 007 'Rationalisation of Existing FCD Infrastructure' as well as possible links with AW 008 'Coastal Protection and Aforestation' and MR 006 'Regional River Management and Improvement'.

## **Risks and Assumptions**

Transfer of management responsibilities may meet with considerable resistance, particularly when financial responsibilities are included as well. However a suitably tactful and consultative process at all stages of the programme should minimise these problems. Other risks include inadequate or subjective evaluation of pilot schemes that would result in further unsustainability at scheme level.

**FCD and FCD/I Management Rationalisation**

Ref :

**ID 003**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Bangladesh Water Development Board</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>6 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>None</b> (Supporting)
Short Description :	This programme is intended to facilitate the transfer of FCD/I scheme management as per policy. Three steps will be involved. In the short term BWDB will receive capacity building with respect to environmental and social issues, while in consultation with the stakeholders a range of transfer options will be identified and prepared. Finally these options will be pilot tested at selected locations during the short and medium term.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 003 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 003 PgP.doc

<b>Finance</b>	Costs	Private	Funding (%)	Expected by	
			GoB	Beneficiaries	ProgrammeYear
Total Capital <sup>3</sup>	<b>1,300.00</b> MTk	<b>0%</b>	<b>85%</b>	<b>15%</b>	<b>6</b>
Ultimate Recurring	<b>25.20</b> MTk/yr	<b>n/a</b>	<b>50%</b>	<b>50%</b>	<b>7</b>
Date of Data :	<b>31 07 01</b>	<b>Stacked Cumulative Cash Flow Chart</b>			
	(dd) (mm) (yy)				
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	MTk				
Actual Expenditure <sup>4</sup> (to date) :	MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Reduction in the number of schemes directly managed by BWDB	• Nationwide FCD(I) statistics	NYD
• Increase in funds for O&M after turnover of scheme	• Scheme accounts	NYD
• 75% of decentralised FCD/I schemes considered sustainable within 10 years of transfer	• National FCD/I scheme statistics	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	<b>ID 003</b>
Title	<b>FCD and FCD/I Management Rationalisation</b>

*Assumptions:*

Taka/US\$	51.000	TA duration	1.0	years	All prices in mid-2000 values
		Investment duration	5.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	28.0	20,000		28.6		
Senior National consultants (all-in rate)	p-m	28.0		150	4.2	0.0%	-
Mid-level National consultants (all-in rate)	p-m	80.0		90	7.2	0.0%	-
Sub-totals					40.0		-
Other general TA programme costs		25%			10.0		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					<b>50.0</b>		-
<b>Other Programme Costs</b>							
1. Pilot scheme investment (rehabilitation)	ha	45,000		20	900.0	2.8%	25.2
2. TA support for environmental audit	year	5		50,000	250.0	0.0%	-
3. TA support for evaluation of pilot schemes	year	1		50,000	50.0	0.0%	-
4. TA support for long-term management plan	year	1		50,000	50.0	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>1,250.0</b>		<b>25.2</b>
<b>Overall Programme Costs</b>					<b>1,300.0</b>		<b>25.2</b>

Notes:

Rehabilitation rate is based on NWMPP estimates derived from actual BWDB costs

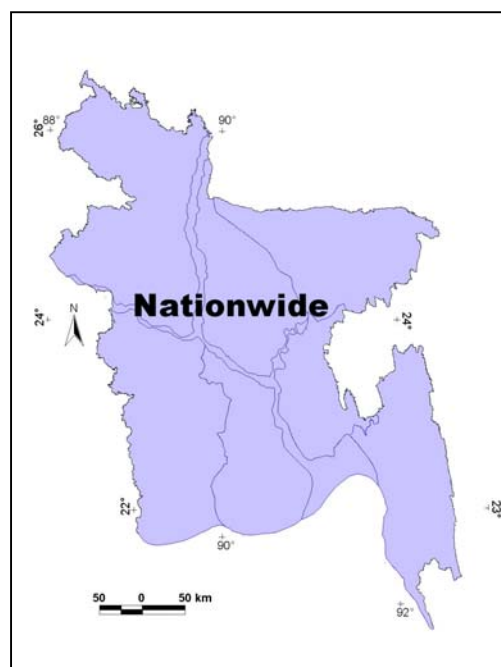
**BWDB Regional and Sub-regional Management Strengthening**

Ref: ID 004

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide Significance****Relevance to NWPo**

The Introduction to the NWPo acknowledges that the most critical issues for water resources management include alternating flood and water scarcity, meeting ever-expanding water needs and massive river sedimentation and bank erosion. Provision of total water quality management and maintenance of the eco-system are also major concerns of Policy. In §3, Policy objectives include harnessing and development of all forms of surface water and ground water in an efficient and equitable manner and bringing about institutional changes to help decentralise the management of water resources.

In §4.2, NWPo directs that, within the macro framework of the NWMP, and (d) sector agencies and local bodies will prepare and implement sub-regional and local water-management plans, (f) ensuring the participation of all project affected persons. Furthermore, agencies will (j) undertake comprehensive development and management of the main rivers (k) for multipurpose use, (l) de-silt watercourses to maintain navigation channels and proper drainage, (n) protect water quality, (p) designate and provide desired levels of flood protection, and (q) develop and implement master plans for river training and erosion control works and for (q) reclamation of land from rivers.

**Purpose of Programme**

Under its Act (2000), BWDB is responsible for controlling the flow of water in all rivers and channels and aquifers. Local Government institutions are already vested with authority to manage local water resources. Recognising this, the Government's strategy is that river improvement programmes will be prepared in an integrated manner giving due importance to all users and environmental and fish migration requirements. The plans will identify dredging and erosion control measures, taking account of new flood protection requirements for areas of high economic importance as defined by Policy. Potential and actual sources of pollution will be identified along with areas of encroachment. In formulating programmes, actions will be prioritised taking account of social, environmental and economic criteria. Activities on regional river systems will be coordinated with improvements to local channel systems in a manner that leads to cost-effective and sustainable improvement of the surface water resource system by all concerned. The purpose of this programme is to provide the necessary support to BWDB to enable the agency to prepare river improvement plans at regional and sub-regional level consistent with the above strategy.

## Programme Outline

The programme will address four main issues to fulfil the objectives above. Firstly support will be provided to establish an inventory of river systems, cataloguing inter alia the condition and general requirements on each river and, whilst doing so, demarcating in principle a mutually acceptable division of responsibilities between BWDB and Local Government. Secondly, support will be provided to BWDB to allocate responsibilities within the organisation for each river and to determine the management structures most suited to ensure effective implementation. Thirdly, within this framework, at least one river will be selected in each of eight hydrological regions, and support provided for BWDB to prepare improvement programmes for each. Lastly, on the basis of the above, support will be provided to BWDB to determine an overall procedure for river improvement programmes, identify and overcome skill and resource gaps and introduce a system for monitoring performance and impacts of the programmes.

## Financing Arrangements

The programme is expected to take 3 years to reach the stage of an agreed approach to river improvement, with a further 3 years to provide training and capacity building necessary for the approach to be made sustainable. The first phase is expected to cost Tk179M and the second Tk71M. Both are suitable for Government funding with the potential for donor support.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Establishment of river inventory with demarcation of BWDB responsibility	I1	• Reports issues and approved by GoB	2004
• BWDB internal organisation structured to plan, develop and manage river improvement programmes with established capacity	K	• Reports issues and approved by GoB and implemented by BWDB • River improvement plans produced at an acceptable quality	2006
• Bangladesh's institutional framework for the water sector regulated, decentralized and devolved according to subsidiarity principles	D	• Ratified legal framework	2019

## Institutional Arrangements

The programme will be implemented by BWDB. Close co-operation will be needed with many water sector agencies with direct and indirect stake in river management. These include WARPO, DoE, BIWTA, Municipalities, Zila parishads, WASAs, LGED, community organisations, irrigation project authorities, private sector (power companies, industry, boat-owners, irrigators, land owners and developers) etc. A critical factor will be achieving consensus between these different groups on planning procedures, dispute resolution and legal enforcement where required. Thus from the outset, BWDB will need to establish a consultative approach with an appropriate forum for debate.

## Existing Documentation

There are many previous studies of existing rivers and river systems available in both WARPO and BWDB archives. The BWDB Act 2000 defines the responsibilities and mandate of the organisation. The various Parishad Acts set out Local Government responsibilities. EGIS has been working on river erosion forecasting, and BWDB and BIWTA have records of sedimentation and dredging. DoE has identified pollution hot-spots and WARPO is working on



fish migration and habitat preservation requirements. SWMC have provided WARPO with hydrodynamic 1-D models of the main rivers of each hydrological region.

### **Linkages**

As stated, this programme will be complemented by other institutional capacity building programmes. It will also have some bearing on several of the Enabling Environment programmes, notably EE 001: Support to Preparation of New legislation, EE 004: Project Preparation Procedures – Guidelines and Manuals, and EE 008: Water Resources Management Research and Development Studies. It will have to fully integrate with all the Main River programmes, and specifically will provide the basis for investment under MR 006: Regional River Management and Improvement, and MR 011: River Dredging for Navigation. Plans for Flood Protection and Stormwater drainage under the MC and TR programmes will need to be taken account of, along with DM 003: Flood Proofing in the Charlands and Haor Basin. Similarly, inter-action with Agriculture and Water Management Programmes will be required, particularly AW 005 and AW 006 dealing with improvements to water management and at Local Government and Community levels. Finally, there is strong linkage with virtually all the Environment and Aquatic Resource programmes.

### **Risks and Assumptions**

The main concern relates to the culture change needed within BWDB to move from a centrally driven project-orientated approach to that of long-term integrated management of the river systems in a manner responsive to different needs. The programme seeks to address this through supporting BWDB in finding suitable organisation arrangements and in providing capacity building to help build up the ability of the organisation to field the broad spectrum of skills needed. A second concern is to overcome the ad hoc approach to river management that has characterised many past projects, often driven by political expediency. The sooner BWDB has integrated plans, and the legal backing to enforce them, the quicker this can be overcome.

**BWDB Regional and Sub-regional Management Strengthening**Ref : **ID 004**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Bangladesh Water Development Board</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>6 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>None</b> (Supporting)
Short Description :	According to its Act, BWDB is responsible for controlling the flow of water in all rivers and aquifers. To this end it is the strategy of GoB to prepare integrated river improvement initiatives which give due importance to all stakeholders. This programme is intended to provide the necessary support to BWDB to enable it to prepare such initiatives at regional and sub-regional levels consistent with the GoB strategy.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 004 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 004 PgP.doc

<b>Finance</b>	Costs	Private	Funding (%)	Expected by	
			GoB	Beneficiaries	ProgrammeYear
Total Capital <sup>3</sup>	<b>250.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>6</b>
Ultimate Recurring	<b>3.60</b> MTk/yr	<b>n/a</b>	<b>100%</b>	<b>0%</b>	<b>7</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Establishment of river inventory with demarcation of BWDB responsibility	• Reports issued and approved by GoB	NYD
• BWDB internal organisation structured to plan, develop and manage river improvement programmes with established capacity	• Reports issued and approved by GoB and implemented by BWDB • River improvement plans produced at an acceptable quality	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 004
Title	BWDB Regional and Sub-regional Management Strengthening

### Assumptions:

Taka/US\$	51.000	TA duration	3.0	years	All prices in mid-2000 values
		Investment duration	3.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	84.0	20,000		85.7		
Senior National consultants (all-in rate)	p-m	130.0		150	19.5	0.0%	-
Mid-level National consultants (all-in rate)	p-m	136.0		90	12.2	0.0%	-
Sub-totals					117.4		-
Other general TA programme costs		25%			29.4		-
Specific other TA programme costs	River models	8		4,000	32.0	0.0%	-
<b>Total TA Costs</b>					<b>178.8</b>		-
<b>Other Programme Costs</b>					TkM		
1. Training/HRD for BWDB staff in integrated river planning		8		7.1	56.8	0.0%	-
2. Equipment for BWDB Offices		8		1.8	14.4	25.0%	3.6
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					71.2		3.6
<b>Overall Programme Costs</b>					250.0		3.6

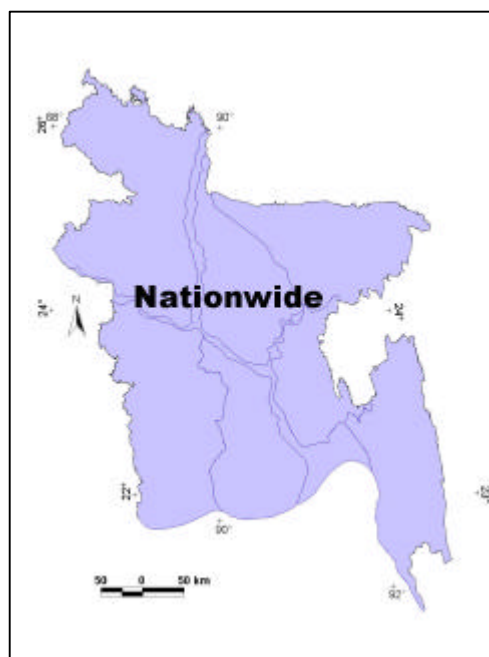
<b>Training Programmes</b>			<b>Regional Design Units</b>		<b>8 No.</b>
Trainees	25	per Regional Unit	Computer equipment	1,125,000	Tk/unit
80% Local	100,000	Tk/trainee	Communication support	200,000	Tk/unit
20% O/seas	20,000	\$/trainee	Miscellaneous other	500,000	Tk/unit
Total	<b>7.1</b>	TkM/unit	Total	<b>1.8</b>	TkM/unit

**Local Government Capacity Building for Water Management**

Ref: ID 005

**Basic Data**NWMP Sub-sector **Institutional Development**Region(s) **Nationwide Significance****Relevance to NWPo**

The NWPo introduces significant new roles and responsibilities for Local Government Institutions. In particular §4.2 Article e requires LG's to implement FCD/I projects having a command area less than or equal to 1000ha, while Article f calls upon LG's to be the principle agencies for coordinating stakeholder participation at all stages of water sector project cycles. Equally §4.3 Article e allows the central Government to decentralize water allocation rights to the LG's. The preamble to §4.4 establishes the principle that LG's have a role to play in the community level resource management. §4.4b Article e provides for the possibility of LG involvement in the joint management of non-municipal water schemes over 5000ha, while Article f requires the ownership of FCD and FCD/I projects with command areas less than or equal to 1000ha to be transferred to LG's.

**Purpose of Programme**

As a result of the NWPo, LGI's will become progressively responsible (with community groups) for the management of all FCD schemes up to 5000ha, and for the raising of operation and maintenance tariffs through local resources. They may also play an important role in supporting the management of larger schemes by autonomous bodies. In addition, LGI's will be responsible for development of community cyclone protection and will work with NGO's in support of barrier-level cyclone and flood proofing programmes. They will also have essential roles to play as regards the development of improved water supply and sanitation facilities in the rural areas. Equally, in the urban sector, paurashava and city corporations will become increasingly autonomous and responsible (directly or through WASA's) for the provision of all water-related services. Such new responsibilities clearly represent a challenge for the LGI's which have little or no historic experience of water sector development and are in any case generally weak or non-existent (the DSR reports that three out of four levels of Parishad have yet to be established). The DSR also concludes that considerable efforts will be needed to strengthen local planning and management capacity if it is to evolve in a manner that adequately reflects local issues while remaining, or indeed becoming compatible with national plans as well as with those of the line agencies. This programme is intended to deliver the necessary capacity building and human resource development in response to the needs assessments carried out under Programme ID 001 (Local Government Needs Assessment for Water Management). However, despite this programme's local focus, it will be necessary to include within its components to address the training needs of the LGED, especially in terms of the participatory implementation of small water projects/schemes and of the DPHE in terms of mobilising and working with the private sector.

## Programme Outline

The details of this programme will be defined by ID 001. It is anticipated nevertheless that this programme will begin with the establishment of the Central Training Unit and thereafter comprise a long and sustained effort beginning in the short term of the NWMP and continuing throughout the remainder of its 25 years. During that time it is intended to train a total of 737,900 LGI employees made up as follows:

Civil Administrative level	No of Institutional Entities	Estimated No of Trainees per Entities	Total No of Trainees
Paurashava	206	25	5,150
Zila Parishad	64	20	1,280
Upazila Parishad	464	15	6,960
Union Parishad	4,451	10	44,510
Gram Parishad	68,000	10	680,000
<b>Totals</b>	<b>73,815</b>		<b>737,900</b>

## Financing Arrangements

The programme is expected to cost some Tk12,100M inclusive of 2.5% monitoring and evaluation costs. It is suitable for Government funding.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Programme document for LGI capacity building for local water sector management and development by LGI's	I1	• Signed project document	2005
• Central Training Unit established at the Ministry of Local Government and Rural Development	I2	• Operational charter of the Central Training Unit	2006
• LGI water management operational capacity consistent with the needs of decentralised water management in Bangladesh	K	• Legal status of the Central Training Unit	2027
• Capacities of Bangladesh's restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) management reviews	2027
		• Regular (5 yearly) Independent training review	2027

## Institutional Arrangements

The proposed Central Training Unit (CTU) will be responsible for overall coordination of the programme and will begin by nominating and training District Level Human Resource Development Units (DLHRDUs), one for each District. With CTU assistance these will be responsible for developing their own long term capacity building strategies targeted at decentralised water management and reflecting closely the recommendations of ID 001. Such strategies will then be grant funded from the programme budget which will remain under the control of the CTU which will also provide training materials (as identified by ID 001) while monitoring and evaluating progress. Ideally, District training strategies will have measurable interim objectives which once reached would qualify the District in question for capital funding commensurate with the level of institutional reform and capacity reached as a direct or indirect result of the training and capacity building activities.

## Existing Documentation

Background analyses leading to the identification of this programme can be found in §4 of the DSR, where specific details are provided in sub-sections 4-4 and 4-5. Other than that, no additional documentation has been identified.

## **Linkages**

There is a clear and direct link with Programme ID 001 which represents the preparatory phase for this programme. Less direct, but equally important links also exist with programmes ID 002 (Independent Regulatory Bodies for Water Supply and Sanitation Service Sector); ID 003 (FCD and FCD/I Management Rationalisation); and ID 004 (BWDB Regional and Sub-regional Management Strengthening).

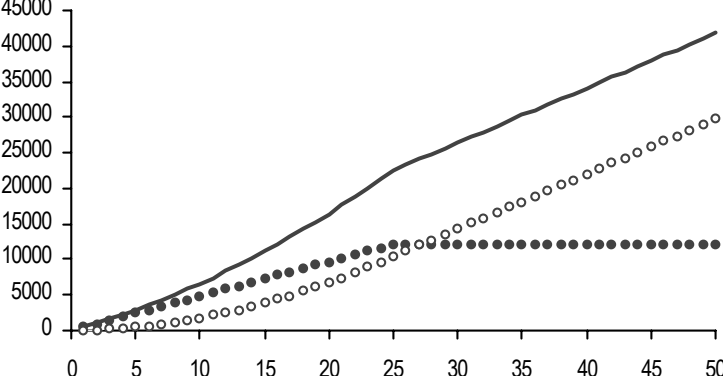
## **Risks and Assumptions**

The main risk will be that continuing delays in LGI establishment will compromise the validity of the programme or delay its execution. It is assumed however, that the Government's clearly enunciated and repeated commitment to decentralisation along with the advice and support of the donor community will be sufficient to overcome the remaining inertia.

**Local Government Capacity Building for Water Management**Ref : **ID 005**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Local Government Institutions</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>25 year(s)</b>
		Agency(s) Responsible :	<b>LGIs</b> (Lead) <b>None</b> (Supporting)
Short Description :	The NWPo creates new roles for and places new responsibilities on Local Government Institutions. In particular §4.2.e requires LGI's to implement FCD/I projects having a command area less than or equal to 1000ha, while §4.2.f calls upon LGI's to coordinate stakeholder participation at all stages of water sector project cycles. Furthermore, as a result of §4.4.d LGI's will become progressively responsible for the management of all FCD schemes up to 5000ha, as well as for the raising of operation and maintenance tariffs through local resources. This programme is intended to deliver the necessary capacity building and human resource development in response to the needs assessments carried out under Programme ID 001 (Local Government Needs Assessment for Water Management). The programme will begin with the establishment of a Central Training Unit and thereafter comprise a long and sustained effort beginning in the short term of the NWMP and continuing throughout the remainder of its 25 years. The programme will include training for both LGED and DPHE to strengthen their		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 005 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 005 PgP.doc

Finance						
	Costs	Private	Funding (%)	Beneficiaries	Expected by	
			GoB		ProgrammeYear	
Total Capital <sup>3</sup>	12,100.00 MTk	0%	100%	0%	25	
Ultimate Recurring	771.90 MTk/yr	n/a	100%	0%	26	
Date of Data :	31 07 01	Stacked Cumulative Cash Flow Chart				
	(dd) (mm) (yy)	Cost (MTk)				
Status :	Identified	● Investment ○ Recurring — Total				
Financial Base Year:	mid-2000					
Planned Expenditure (to date) :	0 MTk					
Actual Expenditure <sup>4</sup> (to date) :	0 MTk					

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Programme document for LGI capacity building for local water sector management and development by LGI's	• Signed project document	NYD
• Central Training Unit established at the Ministry of Local Government and Rural Development	• Operational charter of the Central Training Unit • Legal status of the Central Training Unit	NYD
• LGI water management operational capacity consistent with the needs of decentralised water management in Bangladesh	• Regular (5 yearly) management reviews	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design ,supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

## National Water Management Plan

### Programme Costing Sheet

Programme Ref	ID 005
Title	Local Government Capacity Building for Water Management

#### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Local Government staff training					6,768.7	0.0%	-
2. Office equipment					3,859.3	20.0%	771.9
3. Monitoring and evaluation		2.5%			272.0	0.0%	-
4. Strengthening LGED support capacity					600.0	0.0%	-
5. Strengthening DPHE support capacity					600.0	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					12,100.0		771.9
<b>Overall Programme Costs</b>					<b>12,100.0</b>		<b>771.9</b>

#### Local Government Training Costs

Urban centres, consisting of four city corporations (Dhaka, Chittagong, Rajshahi and, added in 1990, Khulna) and 206 Paurashavas, are independent of the Bangladesh territorial administrative structure of six Divisions 64 Zilas, 464 Upazilas, 4451 Unions and 68,000 villages.

	No.	Trainees per entity	Cost per trainee	Total training cost (TkM)	Equipment per entity	Total equip. cost (TkM)	Total cost (TkM)
Paurashava	206	25	42,500	219	250,000	52	270
Zila parishads	64	20	42,500	54	250,000	16	70
Upazila Parishads	464	15	21,250	148	125,000	58	206
Union Parishads	4,451	10	12,750	568	75,000	334	901
Gram Parishads	68,000	10	8,500	5,780	50,000	3,400	9,180
<b>Totals</b>	<b>73,185</b>			<b>6,769</b>		<b>3,859</b>	<b>10,628</b>



**WARPO Capacity Building**

Ref: ID 006

**Basic Data**

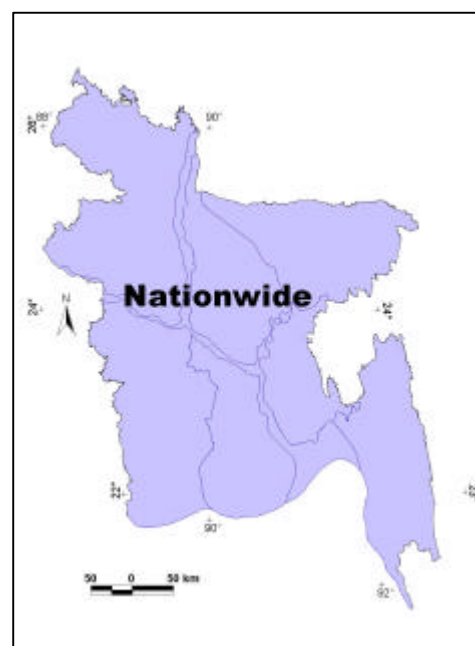
NWMP Sub-sector **Institutional Development**

Region(s) **Nationwide Significance**
**Relevance to NWPo**

§5.d of the NWPo establishes WARPO i) as the exclusive government institution for macro-level water resources planning and ii) as the Executive Secretariat of the ECNWRC.

**Purpose of Programme**

The various responsibilities assigned to WARPO by §5.d of the NWPo can be said to fall into two categories, namely: routine core services and periodic services. They are defined as follows:


**Routine Core Services**

- Maintenance, updating and dissemination of the NWRD
- Upkeep of water resource assessment
- Monitoring implementation of the NWMP and its impacts
- Functioning as a “clearing house” for all water sector projects
- Secretariat to the NWRC/ECNWRC
- Responding to NWRC/ECNWRC requests for information and advice

**Periodic Services**

- Updates of the National Water Management Plan
- Contributions to Five Year Plans
- Provision of ad hoc advice on policy, strategy, institutional and legal issues
- Execution of special studies, research, etc as required from time to time

Clearly if these tasks are to be fulfilled adequately, it will be necessary for WARPO to attract and retain a cadre of focused, permanent staff supported as and when required by reliable, high calibre contracted experts. Equally, in the interests of continuity, WARPO will have to become an attractive career option in terms of long term employment, while housing itself in a permanent functional and purpose built office. Unfortunately however WARPO and indeed its predecessors have suffered considerably from a lack of permanence, with adequate funding support provided only during national plan preparations and little in-between. These cycles of disinterest in WARPO have lead to loss of information and institutional memory. Career opportunities have been very limited, even for WARPO’s few permanent staff, and it is difficult for WARPO to attract and retain the calibre of staff suggested by its new responsibilities under Policy. This programme comprises a pragmatic approach to solving these pernicious problems.

**Programme Outline**

Four parallel strategies will be involved, all deliverable during the short term of the NWMP. The first involves revision of WARPO’s legal establishment, including necessary adjustments to its mandate to bring it fully into line both with NWPo requirements and the functional needs identified in the NWMP. Specific attention will be given in this to WARPO’s role as Secretariat

to the ECNWRC, precise definition of its “clearing house” role and relationships with other planning and monitoring agencies, reinforcing its position of neutrality amongst the many agencies involved in the water sector and reviewing the composition of the WARPO Board of Governors to provide strong and appropriate stewardship. Secondly, steps will be taken to revise WARPO’s staffing structure commensurate with its redefined functions, acknowledging the potential benefits of short term employment of specialists to support periodic activities. Thirdly, a permanent, purpose built high-tech office will be constructed for WARPO, potentially sharing this facility to mutual benefit with other organisations such as SWMC, EGIS and the JRC. Finally, value will be added to these investments by means of a series of capacity building initiatives delivered over a three to five year period with a focus on further strengthening of planning and monitoring capabilities as well the establishment of stronger links with the LGI’s and with line agencies.

## Financing Arrangements

The total cost, all of which will be incurred in the NWMP short-term, is estimated to be Tk660M. All of this is suitable for GoB financing, perhaps with donor assistance.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• WARPO mandate and establishment in line with NWPO and NWMP requirements	I1	• Gazetted Act and approved establishment	2003
• WARPO housed in a purpose built fully equipped high tech facility	I2	• Registered address of WARPO	2004
• WARPO capacity building training programme	I3	• Signed Project Document	2003
• WARPO established as a centre of excellence	K	• Donor confidence • Investor confidence • Correlation between plans and actualities in the water sector	2008
• Capacities of Bangladesh’s restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) independent training reviews	2025

## Institutional Arrangements

WARPO will be the main executor of this programme. Interim steps will be agreed with WARPO’s Board of Governors with further endorsement from the Ministry of Water Resources to whom WARPO at present is administratively attached.

## Existing Documentation

A five year work plan for WARPO is available. It provides a preliminary outline of WARPO capacity building requirements.

## Linkages

Operational linkages will be encouraged with the SWMC for resource modelling; EGIS for NWRD maintenance and broader environmental impact monitoring of water sector development activities, and BIDS for economic and regulatory issues. Administrative linkages will have to be strengthened with the Planning Commission and ideally, philosophical linkages should be established with other related bodies around the world for the purpose of information sharing and exposure to other sectoral solutions/paradigms.

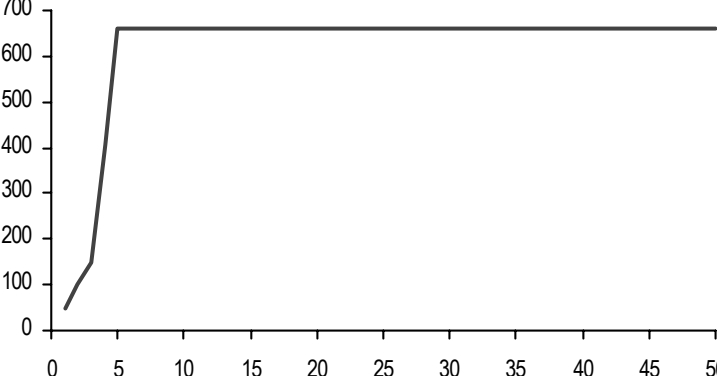
## **Risks and Assumptions**

The first main risk concerns the ability of WARPO to attract and retain staff of appropriate calibre. This will be mitigated by placing the organisation in an influential position with an attractive and efficient operating environment, including good career and training prospects. Wider civil service reforms, including the prospects for enhanced performance related employment conditions would also be of direct relevance to WARPO. The second risk is simply that of inaction, leading to a further cyclical collapse of WARPO at a time when it is clearly needed to champion the NWPo as well as guiding and monitoring its implementation under the NWMP. It is reasonable to assume however, that current, strongly enunciated central commitment to institutional reform will be sufficient to overcome this.

**WARPO Capacity Building**Ref : **ID 006**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>WARPO</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2001</b>	Duration <sup>2</sup> :	<b>5 year(s)</b>
		Agency(s) Responsible :	<b>WARPO</b> (Lead) <b>None</b> (Supporting)
Short Description :	WARPO has suffered considerably in the past from a lack of permanence, with adequate funding support being provided only during national plan preparations and little in-between. Furthermore, prevailing employment conditions then, make the appointment and retention of suitable staff difficult. This programme intends to render WARPO sustainable while building its capacity such that it becomes a centre of excellence characterized by committed high calibre staff. This will be achieved by revision of WARPO's legal establishment, restructuring of WARPO staffing, relocation to a permanent suitable office and various capacity building programmes.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 006 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 006 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme	Year		
	Total Capital <sup>3</sup>		660.00 MTk	0%	100%	0%		5	
	Ultimate Recurring		0.00 MTk/yr	n/a	n/a	n/a		n/a	
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MT k)	● Investment    ○ Recurring    — Total				
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• WARPO mandate and establishment in line with NWPo and NWMP requirements	• Gazetted Act and approved establishment	NYD
• WARPO housed in a purpose built fully equipped high tech facility	• Registered address of WARPO	NYD
• WARPO capacity building training programme	• Signed Project Document	NYD
• WARPO established as a centre of excellence	• Donor confidence • Investor confidence • Correlation between plans and actualities in the water sector	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	ID 006
Title	WARPO Capacity Building

*Assumptions:*

Taka/US\$	51.000	TA duration	5.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	115.0	20,000		117.3		
Senior National consultants (all-in rate)	p-m	115.0		150	17.3	0.0%	-
Mid-level National consultants (all-in rate)	p-m	283.0		90	25.5	0.0%	-
Sub-totals					160.0		-
Other general TA programme costs		25%			40.0		-
Specific other TA programme costs	Training and Study tours				50.0	0.0%	-
<b>Total TA Costs</b>					<b>250.0</b>		-
<b>Other Programme Costs</b>							
1. Provision for R&D support	PS				310.0	0.0%	-
2. Permanent building	PS	Upkeep covered by R&D Support			100.0	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>410.0</b>		-
<b>Overall Programme Costs</b>					<b>660.0</b>		-

**Department of Environment Capacity Building**

Ref: ID 007

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide****Relevance to NWPo**

Article 4.08 has three clauses with explicit operational implications for the Department of Environment (DoE): (b) requires that effluent disposal is monitored by relevant Government agencies; (c) instructs the DoE and (d) requires that industrial polluters pay for the clean-up of water bodies polluted by them. Equally, the Policy is characterised by numerous implicit references to environmental standards and objectives, most of which have implications for further DoE operations and capacity.

**Purpose of Programme**

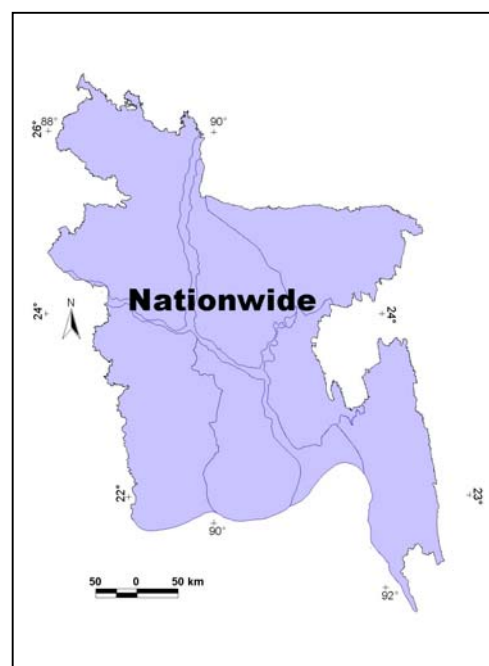
The purpose of the Programme is to strengthen DoE's ability to carry out its duties effectively.

**Programme Outline**

The DoE is the primary institution for environmental management and the setting and enforcement of the environmental regulations. Its key duties related to the water sector include:

- pollution control, including the monitoring of effluent sources and ensuring mitigation of environmental pollution;
- setting the Water Quality Standard (WQS) for particular uses of water and for discharges to water bodies;
- defining EIA procedures and issuing environmental clearance permits, the latter being legal requirements before proposed projects can proceed to implementation;
- providing advice or taking direct action to prevent degradation of the environment;
- declaring Environmentally Critical Areas (ECAs) where the ecosystem has been degraded to a critical state. ECA status confers protection on land and water resources through a series of environmental regulations.

However, the DoE has been consistently under-resourced and needs institutional strengthening. In 1999 the Sustainable Environmental Management Programme (SEMP) began this process, with UNDP and other donor support. SEMP includes a Policy and Institutions sub-programme within SEMP, which has a component on "Capacity Building for Environmental Legislation and Policy Analysis". Linked with this is the Bangladesh Environmental Management Project (BEMP), supported by the Canadian Government, which over a five-year period is strengthening the DoE.



BEMP forms the core of the DoE strengthening effort. Started in 1999, with a total budget of Tk391M, its emphasis is on human resource development, institutional planning, legal and policy matters, strategic planning, awareness raising and resource information systems, linked by practical demonstration projects. The “brown” rather than “green” environment is being given priority. Air pollution is the subject of the first demonstration project and the Buriganga River Pollution Prevention and Control Project is the second. BEMP’s approach is to work closely with industries. A serious constraint on BEMP impact so far has been DoE’s understaffing, which has resulted in low absorptive capacity to technical assistance. Increased staffing has been promised by GoB.

Despite this and other difficulties, BEMP has a vital contribution to make to the improvement of the water-related environment. An effective DoE, as the primary official body responsible, is essential. Due to its relative youth and lack of resources, the DoE will be unable to fulfil its role without a continuing strengthening programme, coupled with increased staffing and budget provisions from GoB. This is likely to be a long-term process.

It is therefore envisaged that the DoE strengthening programme will continue for a further five years after the end of the current phase in June 2004. Based on the cost data in the 2000/01 ADP, the budget remaining at the end of that fiscal year will be Tk218M. If this is fully utilised in the remaining three years, the average annual spend will be around Tk73M. The same level of spend has been assumed for the 5 year period after June 2004, the total cost of the new phase of the programme thus being Tk365M. Part of this continued strengthening programme will need to be put into establishment of DoE representation at Zila level to facilitate environmental oversight and regulation of local level activities as per law.

## Financing Arrangements

Financing will be by GoB, with a major donor contribution expected as at present.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"> <li>Department of Environment capacity building programme agreed by DoE and WARPO</li> </ul>	I1	<ul style="list-style-type: none"> <li>Signed Project Document</li> </ul>	2005
<ul style="list-style-type: none"> <li>Department of Environment capacity building programme completed</li> </ul>	K	<ul style="list-style-type: none"> <li>Ex-post evaluation</li> <li>Programme completion report</li> </ul>	2010
<ul style="list-style-type: none"> <li>Capacities of Bangladesh’s restructured water sector institutions strengthened in line with future demands on them</li> </ul>	D	<ul style="list-style-type: none"> <li>Regular (5 yearly) independent training reviews</li> </ul>	2026

## Institutional Arrangements

As at present, the host agency for the strengthening programme will be the DoE, as the institution being strengthened, and close liaison will be maintained with those SEMP components which are relevant to the Programme.

## Existing Documentation

Mainly BEMP, SEMP and donor agency reports.

**Linkages**

Links will be strong with Programme EA 010 Environmental Responsibility, Public Awareness Raising and Empowerment; and with other EA programmes. There will also be some linkage with other Institutional Development programmes.

**Risks and Assumptions**

The greatest risk is that GoB will fail to provide sufficient staff and funding to enable DoE to benefit fully from the technical assistance provided and thereafter to function effectively.



**Department of Environment Capacity Building**

Ref :

**ID 007**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Department of Environment</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2001</b>	Duration <sup>2</sup> :	<b>5 year(s)</b>
		Agency(s) Responsible :	<b>DoE</b> (Lead) <b>None</b> (Supporting)
Short Description :	As far as aquatic resources are concerned, DoE is mandated to protect water quality and ensure efficiency of use and in particular to monitor (and establish standards of) effluent disposal to prevent water pollution. This programme allows for institutional capacity building of DoE including the establishment of representational offices down to District level.		

**MIS Links**

Cost Calculation :	ID Programme costing.xls	Map :	ID 007 Map.jpg
Disb't Schedule :	ID Programme costing.xls	Description :	ID 007 PgP.doc

**Finance**

	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>365.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>5</b>
Ultimate Recurring	<b>0.00</b> MTk/yr	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b> 			
Status :	<b>Preparation</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Department of Environment capacity building programme agreed by DoE and WARPO	• Signed Project Document	NYD
• Department of Environment capacity building programme completed	• Ex-post evaluation • Programme complete report	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 007
Title	Department of Environment Capacity Building

### Assumptions:

Taka/US\$	51.000	TA duration	5.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	168.0	20,000		171.4		
Senior National consultants (all-in rate)	p-m	300.0		150	45.0	0.0%	-
Mid-level National consultants (all-in rate)	p-m	300.0		90	27.0	0.0%	-
Sub-totals					243.4		-
Other general TA programme costs		25%			60.8		-
Specific other TA programme costs		25%			60.8	0.0%	-
<b>Total TA Costs</b>					<b>365.0</b>		-
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-
<b>Overall Programme Costs</b>					<b>365.0</b>		-

**Disaster Management Bureau Capacity Building**

Ref: ID 008

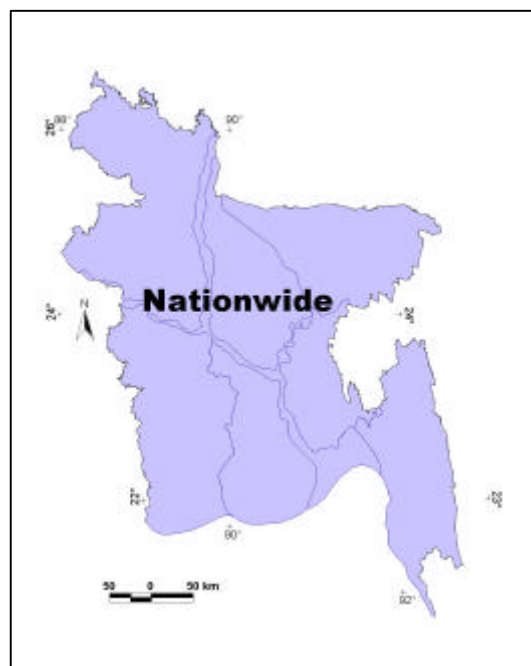
**Basic Data**

NWMP Sub-sector     **Institutional Development**

Region(s)                **Nationwide Significance**

**Relevance to NWPo**

§4.2(c) of the NWPo requires that the NWMP and all related plans will be prepared in a comprehensive manner with regard to the interests of all water-related sectors. In Section (o) it stipulates that responsible agencies will develop early warning and flood-proofing systems to manage natural disasters. In §4.4, the NWPo makes clear that the Government's intervention will be directed towards ... addressing specific problems and protecting particular community interests. It further states that appropriate institutions will provide information to local community organisations for managing water resources efficiently.

**Purpose of Programme**

The Government's Development Strategy for the NWMP makes clear its intentions towards disaster management. Disaster management (including disaster preparedness) involves prevention and mitigation measures, preparedness plans and related warning systems, emergency response measures and post-disaster reconstruction and rehabilitation. Accordingly, in acknowledging that some people will always be at risk, the main aims for water-related disaster management are to provide the means by which, through a combination of structural and non-structural measures and to the extent feasible and affordable, people are adequately warned of an approaching disaster, are equipped to survive the disaster with as much as possible of their assets intact, and are adequately supported in rebuilding their lives thereafter.

Over the last decade, disaster management has become recognised as both a necessary and legitimate element of overall water management. The Disaster Management Bureau (DMB) was created in June 1994 as a UNDP/UNICEF funded project under the administrative control of the Ministry of Disaster Management and Relief. DMB is headed by a Director-General and is supported by four functional Directors (i) Planning, (ii) Training, (iii) MIS and GIS, and (iv) Administration and Logistics. The Bureau carries out its responsibility through disaster management committees at Union, Upazila and District level. There is a co-ordination committee at Ministry level, and a Disaster Management Council at national level chaired by the Prime Minister. The Bureau provides services such as awareness raising, collecting, preserving and disseminating management and geographical information - including mapping and damage assessment. It is also responsible for all stages (ie pre, during and post) of managing disasters whether caused by flood, cyclone, drought, earthquake etc.

In the context of the NWMP, DMB has a key role to play as an interface between the forecasting agencies (principally BWDB and Department of Meteorology) in terms of disseminating information on water-related disasters and assisting those afflicted by such disasters, including ensuring they are fully prepared when disasters strike.

The purpose of this programme is to provide the necessary support to DMB to enable the agency to be fully responsive to water-related disasters.

## Programme Outline

The programme represents a continuation of earlier work to establish and build up the capacity of the DMB. This entails primarily supporting the outreach of DMB to District, Thana, Union and village levels, and strengthening at each level. In principle, most of these structures are in place, and the issue is one of “making things work”.

The Comprehensive Disaster Management Programme under preparation by the Ministry of Disaster Management Bureau with UNDP support (BGD/92/02), lists the potential areas for further support as follows:

Physical Support		Non-Structural Support	
• Multi-purpose shelters	DM 001	• Public awareness campaigns	EE 010
• Embankments/dykes	AW 007	• DP education	ID 008
• Access roads	DM 004	• Training	<b>ID 008</b>
• River bank protection	MR 010	• Community mobilisation	<b>ID 008</b>
• Urban mitigation	TR 007	• Risk/hazard mapping	EE 004
• Communication equipment	ID 008	• Vulnerability profiles	EE 004
• Wind and flood resistant buildings	DM 002	• Environmental threats	EA 010
• Safe water supplies	TR 003-4	• Community focus and NGOs	ID 008
• Sanitation facilities	TR 005-6	• Standing Orders and Coordination	<b>ID 008</b>
• Heavy lifting equipment	ID 008	• Enhancement of EOC	<b>ID 008</b>
• Fire fighting appliances	<b>ID 008</b>	• MIS and GIS	<b>ID 008</b>
• Ambulances	<b>ID 008</b>	• Warning systems	ID 009
• Telecommunications support	<b>ID 008</b>	• Cross border co-operation	ID 009, 010
		• Pollution monitoring	EA 003
		• Arsenic detection and mitigation	TR 002

Most of these support measures are already covered in one form or another under different NWMP programmes, leaving the following to be covered under this programme:

1. Communication equipment
2. Heavy lifting equipment
3. Fire fighting appliances
4. Ambulances
5. Telecommunications support
6. DP education
7. Training
8. Community mobilisation
9. Community focus and NGOs
10. Standing Orders and Coordination
11. Enhancement of EOC
12. MIS and GIS

It is assumed that this programme will require a further 10 years to complete, and will be guided by the ongoing preparatory work.

## Financing Arrangements

No reliable estimate is available for the cost of the above programme components. Given the prevalence of natural water-related disasters in Bangladesh, and the time that it will take to mitigate the risks through other programmes, significant expenditure on disaster preparedness and relief appears well justified. Provisionally a sum of Tk2200M is set aside for this. Together with programmes listed above, this would represent very approximately one-third of the total plan investments. The programme is suitable for Government funding with the potential for donor support.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Disaster Management Bureau capacity building programme agreed by the DMB and WARPO	I1	• Signed Project Document	2004
• Disaster Management Bureau capacity building programme completed	K	• Ex-post evaluation • Programme completion report	2014
• Capacities of Bangladesh's restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) independent training reviews	2026

## Institutional Arrangements

The programme will be implemented by DMB. Close co-operation will be needed with many water sector agencies with direct and indirect stake in disaster management. These include Municipalities, Zila parishads, BWDB, Department of Meteorology, LGED, DPHE, community organisations and NGOs.

## Existing Documentation

The topic of disaster management is discussed extensively in DSR, Main Report. Cyclone Protection is covered in Cyclone Shelter Preparatory Study, June 1998, for European Commission with LGED. The Comprehensive Disaster Management Programme is being prepared for Ministry of Disaster Management Relief with UNDP support under programme ref. BGD/92/002.

## Linkages

Linkages are described in the table above.

## Risks and Assumptions

The main challenge for this programme will be to sustain the benefits of increased capacity in the form described above. Whilst this necessitates a commitment from Government to a significant level of recurrent expenditure, much is to be gained from mobilising community support for disaster management. It is assumed that the programme design will reflect this.

**Disaster Management Bureau Capacity Building**

Ref :

**ID 008**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Disaster Management Bureau</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>10 year(s)</b>
		Agency(s) Responsible :	<b>DMB</b> (Lead) <b>None</b> (Supporting)
Short Description :	This programme will provide the resources necessary to continue ongoing capacity building activities throughout the short and medium terms in order that the DMB can address its mandate in an increasingly effective fashion.		

<b>MIS Links</b>	Cost Calculation :	ID Programme costing.xls	Map :	ID 008 Map.jpg
	Disb't Schedule :	ID Programme costing.xls	Description :	ID 008 PgP.doc

<b>Finance</b>	<b>Costs</b>		<b>Funding (%)</b>		<b>Expected by ProgrammeYear</b>
		<b>Private</b>	<b>GoB</b>	<b>Beneficiaries</b>	
Total Capital <sup>3</sup>	<b>2,200.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>10</b>
Ultimate Recurring	<b>116.00</b> MTk/yr	<b>n/a</b>	<b>100%</b>	<b>0%</b>	<b>11</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Disaster Management Bureau capacity building programme agreed by the DMB and WARPO	• Signed Project Document	NYD
• Disaster Management Bureau capacity building programme completed	• Ex-post evaluation • Programme complete report	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 008
Title	Disaster Management Bureau Capacity Building

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	10.0	years	

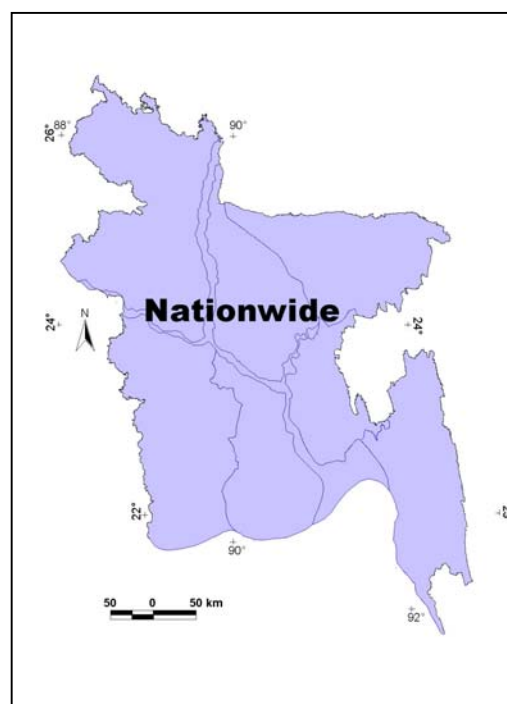
Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Programme preparation is ongoing with UNDP support							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Communications and related equipment					300.0	20.0%	60.0
2. Disaster relief equipment					500.0	10.0%	50.0
3. Education and training					1,100.0	0.0%	-
4. Central services					300.0	2.0%	6.0
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					2,200.0		116.0
<b>Overall Programme Costs</b>					2,200.0		116.0

**Capacity Building for Other Organisations**

Ref: ID 009

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide Significance****Relevance to NWPo**

The preamble to §4.2 of the NWPo recognises that “...the process of planning and managing water resources requires a comprehensive and integrated analysis of relevant hydrological....factors across all related water-using sectors.”. Clause o) of the same section calls for “..early warning systems to manage natural disasters like flood and drought.” §4.13 notes that “water bodies like haors, baors and beels are precious assets” and should be “preserved for maintaining the aquatic environment and facilitating drainage”.

**Purpose of Programme**

It is important to realise that in Bangladesh floods can have at least three primary causes: i) cyclones, which affect largely the coastal belt; ii) excessive local seasonal rainfall and iii) excessive in-stream flows, the last two of which are often greatly exacerbated by secondary problems such as impeded drainage or accretion in the case of natural channels.

As far as cyclones are concerned, Bangladesh’s existing forecasting system is limited to the use of satellite imagery to monitor the formation of cyclones. Although it is constantly being upgraded, no technology is as yet available whereby cyclone intensity, speed and direction can be predicted with any degree of reliability. Current methods are predominantly empirical and subjective, thus there is a pressing need for the introduction of numerical methods. Furthermore, tropical cyclones frequently change course and intensity and the resulting uncertainties reduce public confidence in the warning, and response to warnings when they are issued. To increase confidence to levels where the need for prompt action is rarely questioned, it will be important to distinguish between the **possibility** of a cyclone striking Bangladesh and the **probability** of landfall, where and when.

Despite the high rainfall and great rivers that typify Bangladesh, every year brings months without rainfall that bring hardship to people living in areas with poor access to surface and groundwater resources. Low monsoon rainfall can seriously damage the aman crop while droughts in April and May has the same effect on the aus. Furthermore, the depressed groundwater tables that result often render ineffective village hand pumps in the area, driving women to seek water from contaminated surface sources. Adequate notice of drought conditions would be helpful to those responsible for arranging food imports or releases from Government godowns. And of particular usefulness would be a system that forecasts droughts for the period April to October. Advance warning of potentially disastrous flood and drought events would not only preserve live and livelihoods; it could also pre-empt knock on food security and other economic shocks.



Inland floods affect much of Bangladesh every year, and agriculture and human settlements have adapted to normal floods caused by rainfall or lateral flow from rivers. However, severe monsoon floods, like those of 1998, cause significant damage to crops and property. Floods can also be associated with major changes in river planform and sedimentation, the sources of erosion, accretion and disruption of navigation in the lean season. Understanding the behaviour of rivers is crucial in a country like Bangladesh.

The area of naturally-occurring water bodies has declined as a result of the increasing pressure on land and man's interventions. The eco-systems that depend on these water bodies are changing as a consequence, leading to loss of suitable habitats for a wide variety of aquatic vegetation and other natural resources, which are themselves important for the poor in particular. The Government is committed to preserving the natural environment and has given special, but by no means exclusive, emphasis to the wetlands found in the NE of the country.

This programme provides for capacity building in three important organisations who must respond to these policy directives: (i) the Department of Meteorology, (ii) the River Research Institute and (iii) the Bangladesh Haor and Wetland Development Board.

## Programme Outline

### (i) Bangladesh Meteorological Department (BMD)

Essentially, the whole point of improving the Bangladesh Meteorological Department's ability to forecast and quantify extreme climatic events, be they coastal floods, inland floods or droughts, is to provide time for adequate responses or preparations to be made as appropriate:

Event	Rapid Response needed	Advance Warning needed
Cyclones	<ul style="list-style-type: none"> <li>Evacuation of people and livestock to shelters, killas, embankments and high ground</li> <li>Securing of ships and boats</li> </ul>	<ul style="list-style-type: none"> <li>Safe havens provided</li> </ul>
Inland Floods	<ul style="list-style-type: none"> <li>Evacuation of people and livestock to embankments and high ground</li> </ul>	<ul style="list-style-type: none"> <li>Stock piling of food, blankets and medicines</li> </ul>
Droughts	<ul style="list-style-type: none"> <li>Not applicable</li> </ul>	<ul style="list-style-type: none"> <li>Macro food security measures</li> </ul>

Thus the programme, which is scheduled for the short term, provides for the establishment in Bangladesh of digital equipment with which to make more accurate forecasts not only of cyclone intensity, but also time and location of landfall. Equally, multi-parameter warning systems, ideally based on regional rather than local monitoring, will be introduced for the purpose of forecasting extreme hydrological events and lines already being considered, at least conceptually, by USAID. Finally, the programme will ensure that all relevant staff are adequately trained in the use of the new facilities.

### (ii) River Research Institute (RRI)

Under the Ministry of Water Resources, the River Research Institute is mandated to undertake studies of river behaviour. Currently established in Faridpur, RRI conducts physical modelling of rivers as well as undertaking engineering soil testing, mainly in support of BWDB activities. A part of its income is derived from contracting out these services to other agencies and projects. Whilst increasing use is made of mathematical models, it is considered by many important to retain and improve domestic capacity for physical modelling. Given the significance of sediment transport in Bangladesh and the greater focus on integrated river system management in the

NWMP, it is anticipated that there will be an increase in demand upon RRI's services and a consequent need to upgrade their skills and capacity in modelling sediment transport.

### (iii) Bangladesh Haor and Wetland Development Board (BHWDB)

The newly formed Bangladesh Haor and Wetland Development Board is faced with the demanding task of preserving the declining wetlands of Bangladesh, especially those in the Northeast. Whilst many of necessary the skills for river engineering have been imported with staff deputed from BWDB, there is a dearth of environmental knowledge. To address this will require a proper skills inventory, with a downstream capacity building programme involving both training and recruitment. This programme will support these activities.

## **Financing Arrangements**

The programme is suitable for GoB funding, possibly with donor or development bank assistance and is expected to cost some Tk300M, all of which will be required in the first five years of the NWMP.

## **Objectives and Indicators**

<b>Objective</b>	<b>Suffix</b>	<b>Indicators/Mean of Verification</b>	<b>Due</b>
• Capacity building programmes agreed for BMD, RRI and BHWDB	I1	• Signed Project Documents	2005
• State of the art climate forecasting facilities available to the BMD	I2	• Equipment inventory	2010
• Reliable predictions of extreme climatic events (both short and long term), and morphological changes; and effective wetland management procedures	K	• Annual performance reviews	2012
• Capacities of Bangladesh's restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) independent training reviews	2027

## **Institutional Arrangements**

It is intended that the programme by the concerned organisations with some international technical assistance. Close association with the Disaster Management Bureau, co-operation with BWDB's Flood Forecasting and Warning Centre, the Field Service Wing of DAE and the Integrated Coastal Management Programme will be desirable for the DoM programme, and with DoE for the BHWDB programme.

## **Existing Documentation**

A useful, fairly detailed description of the cyclone warning challenge can be found in "Flood Forecasting in Coastal Areas" Danish Hydraulics Research Institute, May 2000; but no existing documentation relative to the forecasting of long term hydrological extremes, or for RRI and BHWDB strengthening, has so far been located.

## **Linkages**

There are obvious links with NWMP Programmes DM 001 (Cyclone Shelters and Killas), DM 002 (Bari-level Cyclone Shelters), ID 008 (Disaster Management Bureau Capacity Building), ID 010 (BWDB Capacity Building), MR 001 (Main River Studies and Research) and MR 006 (Regional River Management and Improvement).

## **Risks and Assumptions**

Two classic risks are associated with early warning systems of this kind. First is the risk that people will feel over-confident to the extent that they will wait for the warnings from the official system, which may have failed even as the event approaches. Secondly, communities can become complacent or cynical in the wake of false alarms. It is assumed that both risks can be obviated by appropriate levels of community involvement especially as regards the selection of community contact individuals and emergency task groups. People will be more likely to trust community members that they themselves have given responsibility to. There is also a risk that recurring costs will not be met by official sources; but it may be possible to establish the early warning system on a revenue basis whereby users of the information are required to pay a small sum for the privilege of doing so.

For RRI, as primarily a service agency, the risk is of course is that there is insufficient demand for the services provided. Whilst in principle the demand will exist and indeed increase as a result of other NWMP programmes, the strength of demand will depend upon the quality and cost-effectiveness of the services provided by RRI. Building the skills and capacity of RRI should therefore be seen as a holistic exercise embracing all employees who contribute to the service, not just for a limited number of specialists.

As a relatively young organisation, BHWDB faces many challenges ahead in resolving the intricate problems of wetland management. The risk for BHWDB, given its roots, is that it becomes an implementing agency for engineering works, alienated from both the environmental and local communities, without whose support the BHWDB will not prosper. The programme seeks to avert this by broadening the skill base, and it is assumed that the top management will fully support a pro-active stance towards environmental issues.

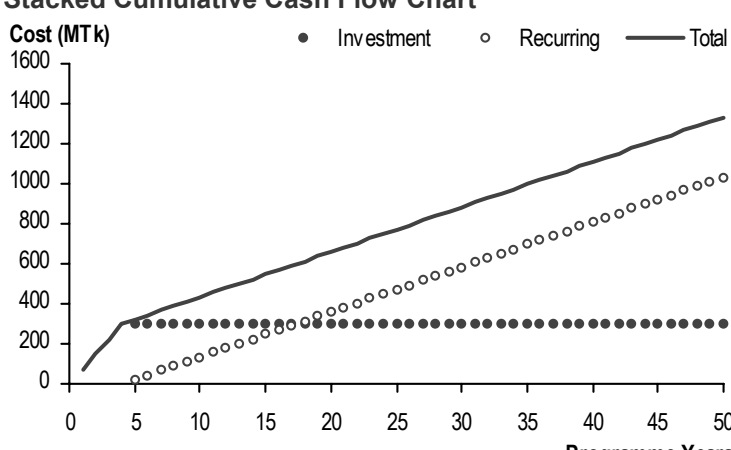
**Capacity Building for Other Organisations**

Ref :

**ID 009**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Other Agencies</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>4 year(s)</b>
		Agency(s) Responsible :	<b>BMD, RRI, (Lead) BHWDB (Supporting) None</b>
Short Description :	The NWPo §4.02(o) requires the GoB or its responsible agencies to undertake comprehensive and integrated analysis of relevant hydrological factors across all related water-using sectors for the purpose of managing the river systems and providing early warning systems of natural disasters like flood and drought. NWPo §4.13 also requires water bodies like haors, baors and beels are preserved for maintaining the aquatic environment and facilitating drainage. This programme provides for capacity building of three key agencies involved in these activities, namely: Bangladesh Meteorological Department, River Research Institute and Bangladesh Haor and Wetland Development Board.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 009 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 009 PgP.doc

	Costs		Funding (%)		Expected by ProgrammeYear
		Private	GoB	Beneficiaries	
Total Capital <sup>3</sup>	<b>300.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>4</b>
Ultimate Recurring	<b>22.50</b> MTk/yr	<b>n/a</b>	<b>100%</b>	<b>0%</b>	<b>5</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b> 			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Capacity building programmes agreed for DoM, RRI and BHWDB	• Signed Project Documents	NYD
• State of the art climate forecasting facilities available to the BMD	• Equipment inventory	NYD
• Reliable predictions of extreme climatic events (both short and long term), and morphological changes; and effective wetland management procedures	• Annual performance reviews	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design ,supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	<b>ID 009</b>
Title	<b>Capacity Building for Other Organisations</b>

*Assumptions:*

Taka/US\$	51.000	TA duration	4.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	84.0	20,000		85.7		
Senior National consultants (all-in rate)	p-m	104.0		150	15.6	0.0%	-
Mid-level National consultants (all-in rate)	p-m	208.0		90	18.7	0.0%	-
Sub-totals					120.0		-
Other general TA programme costs		25%			30.0		-
Specific other TA programme costs	Equipment and training				150.0	15.0%	22.5
<b>Total TA Costs</b>					<b>300.0</b>		<b>22.5</b>
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-
<b>Overall Programme Costs</b>					<b>300.0</b>		<b>22.5</b>

**Break up**

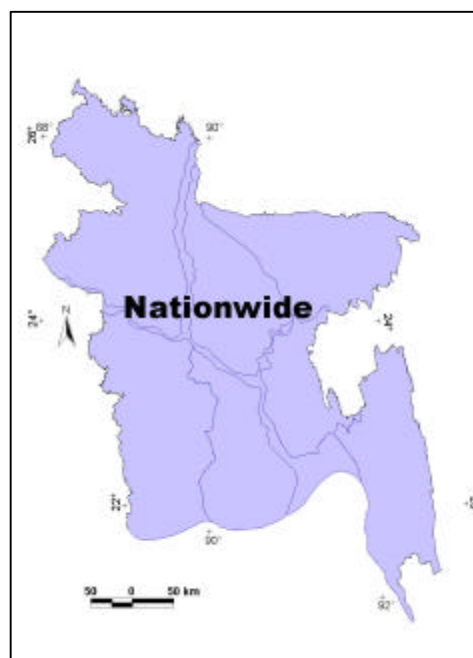
Technical Assistance	Expat	National 1	National 2	TA Total (TkM)	Equipment and Training (TkM)	Total (TkM)
1. BMD Capacity Building	40.0	60.0	120.0	75.8	37.50	113.3
1. RRI Capacity Building	30.0	30.0	60.0	50.6	75.00	125.6
1. BHWDB Capacity Building	14.0	14.0	28.0	23.6	37.50	61.1

**BWDB Capacity Building**

Ref: ID 010

**Basic Data**NWMP Sub-sector      **Institutional Development**Region(s)              **Nationwide Significance****Relevance to NWPo**

§3 of the NWPo confirms that all agencies working in the water sector are subject to the policy which is intended to result in sustainable public and private water delivery systems (§3.c); institutional changes that will help decentralize water resources management (§3.d) and a legal and regulatory environment that helps the process of decentralization. The preamble to §5 states that Government will restructure and strengthen...the existing institutions to ensure that the agenda for reform ...is implemented efficiently. §5.a confirms that the Government will formulate a framework for institutional reforms to guide all water sector activities and review the mandates of all water sector institutions. Finally and where appropriate, Government will restructure its present institutions (§4.1) and to this end, public water schemes are designed with specific provision for future disinvestments if and when feasible.

**Purpose of Programme**

Under the BWDB Act 2000, BWDB is repositioned to place a central role in water resource development and management, with a mandate fully consistent with the Policy. Many of BWDB's earlier functions are retained and it is assumed that in-service training, supported by project assistance as needed, will continue. However, in a number of key areas, new functions are included and existing ones are to be undertaken in modified ways. BWDB needs to respond to these challenges in a number of ways. This programme, together with ID 003: FCD and FCD/I Management Rationalisation and ID 004: BWDB Regional and Sub-Regional Management, is designed to provide support for BWDB to bring about the necessary internal changes and restructured skill mix envisaged under NWPo. It will be incumbent upon BWDB to review its staffing mix, and to recruit a significant proportion of non-engineering professionals to complement the efforts to re-train staff included within this programme. Efforts will also be needed for institutional development and HRD of the RRI and BHWDB.

**Programme Outline**

The programme aims to strengthen BWDB in four specific areas, to provide induction and in-service training within a broader framework of promoting a truly integrated and participatory approach to water resource management, and to upgrade BWDB's office accommodation consistent with its revised role. The important elements of the programme are as follows, which would be preceded by a preparatory technical assistance to assist in programme design and planning:

- Support for flood forecasting and warning dissemination
- Strengthening surface and groundwater monitoring and dissemination
- Support for erosion and accretion forecasting
- Support for Planning, design and O&M activities
- Support for drought forecasting
- Re-orientation programmes
- Management Information System (MIS) for BWDB
- Human Resource Development (HRD) for different departments of BWDB
- New central office
- Upgrading regional centres

It is envisaged that the programme would take 10 years to complete.

### **Financing Arrangements**

The total cost of the programme over 10 years is estimated to be Tk1316M, of which Tk50M is for preparation and Tk300M is for new office and upgrades. The re-orientation programmes are targeted at 3000 BWDB staff and are estimated to cost Tk302M, with remaining four specific programmes costing Tk190M, Tk163M, Tk222M and Tk89M respectively. Financing is appropriately from Government with the potential for donor support.

### **Objectives and Indicators**

<b>Objective</b>	<b>Suffix</b>	<b>Indicators/Mean of Verification</b>	<b>Due</b>
• BWDB long term needs assessed	I1	• Needs Assessment Report	2003
• Future roles and responsibilities of BWDB agreed	I2	• Acceptance of the Needs Assessment Report	2003
• BWDB capacity building programme agreed	I3	• Signed Project Document	2003
• BWDB capacity building programme completed	K	• Ex-post evaluation	2013
		• Programme completion report	
• Capacities of Bangladesh's restructured water sector institutions strengthened in line with future demands on them	D	• Regular (5 yearly) independent training reviews	2025

### **Institutional Arrangements**

BWDB will take a lead and pro-active role in developing its own organisation under the guidance of its management board. Co-operation will be needed with Disaster Management Bureau, Department of Meteorology, Department of Environment, Local Government and with data collecting agencies for the different programme components.

### **Existing Documentation**

Various reports are available with BWDB on flood forecasting. EGIS are working on erosion forecasting. USAID are supporting long range weather forecasting. DSR Chapter 4 describes new directions for BWDB. Copies of relevant legislation are held by WARPO on NWRD.

### **Linkages**

The programme has direct linkages with ID 003: FCD and FCD/I Management Rationalisation and ID 004: BWDB Regional and Sub-Regional Management. It also has bearing on EE 007: NWRD Improved Data Collection and Processing Facilities, MR 006: Regional River Management and Improvement, MR 010: Main Rivers Erosion Control at Selected Locations,

DM 006: Supplementary Irrigation and Drought Proofing of Rural Water Supplies, and EA 003: National Water Quality Monitoring.

### **Risks and Assumptions**

The principle risk for the programme is a lack of commitment from within BWDB to embrace the changes ordained by NWPo and the BWDB Act 2000. The impetus for change must come from the Board of Directors, but it is up to the Director General and his staff to stimulate the organisation as a whole to willingly cooperate. This will require rapid establishment of a common vision for what BWDB will be like in 10 years time along and thereafter a sustained effort to achieve it. Frequent changes in top management, as happens now, are not conducive to carrying through change programmes, and it is assumed that BWDB will introduce new arrangements to ensure more continuity.



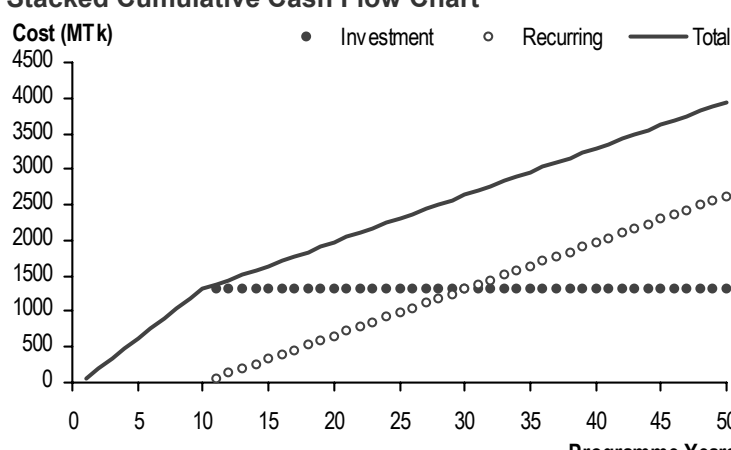
**BWDB Capacity Building**

Ref :

**ID 010**

Cluster :	<b>Institutional Development</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Bangladesh Water Development Board</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>10 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>None</b> (Supporting)
Short Description :	This programme is intended to strengthen BWDB in several ways: improved flood forecasting and warning; strengthened surface and groundwater monitoring and dissemination; support for erosion and accretion forecasting; support for drought forecasting; re-orientation programmes especially with regard to the social and environmental dimensions of water resources management, MIS, HRD and other related fields of BWDB; a new central office and upgraded regional centres.		

<b>MIS Links</b>	Cost Calculation : ID Programme costing.xls	Map : ID 010 Map.jpg
	Disb't Schedule : ID Programme costing.xls	Description : ID 010 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme		Year	
	Total Capital <sup>3</sup>		1,316.00 MTk	0%	100%	0%	10		
	Ultimate Recurring		65.70 MTk/yr	n/a	100%	0%	11		
	Date of Data :		31 07 01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring	— Total		
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• BWDB long term needs assessed	• Needs Assessment Report	NYD
• Future roles and responsibilities of BWDB agreed	• Acceptance of the Needs Assessment Report	NYD
• BWDB capacity building programme agreed	• Signed Project Document	NYD
• BWDB capacity building programme completed	• Ex-post evaluation • Programme complete report	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	ID 010
Title	BWDB Capacity Building

### Assumptions:

Taka/US\$	51.000	TA duration	1.0	years	All prices in mid-2000 values
		Investment duration	9.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b> <i>Programme design</i>							
Expatriate consultants (all-in rate)	p-m	28.0	20,000		28.6		
Senior National consultants (all-in rate)	p-m	48.0		150	7.2	0.0%	-
Mid-level National consultants (all-in rate)	p-m	47.0		90	4.2	0.0%	-
Sub-totals					40.0		-
Other general TA programme costs		25%			10.0		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					<b>50.0</b>		<b>-</b>
<b>Other Programme Costs</b>							
1. Support for Flood Forecasting and Warning Dissemination				PS	190.0	4.0%	7.6
2. Strengthening surface and groundwater monitoring and dissemination				PS	163.0	5.0%	8.2
3. Support for erosion and accretion forecasting				PS	222.0	1.0%	2.2
4. Support for drought forecasting				PS	89.0	3.0%	2.7
5. Re-orientation programmes				PS	302.0	5.0%	15.1
6. New central office				PS	100.0	10.0%	10.0
7. Upgrading 8 regional centres				PS	200.0	10.0%	20.0
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>1,266.0</b>		<b>65.7</b>
<b>Overall Programme Costs</b>					<b>1,316.0</b>		<b>65.7</b>

### Break up

<b>Technical Assistance</b>		Expat	National 1	National 2	Total (TkM)	
1. Flood Forecasting and Warning		80	80	160	135.0	
2. Water monitoring		80	80	160	108.0	
3. Erosion and accretion forecasting		120	120	240	162.0	
4. Drought forecasting		40	40	80	54.0	
5. Re-orientation programmes		120	120	240	162.0	
<b>Capacity Building</b>		Trainees	Unit rate	Total (TkM)	Equipment Total (TkM)	O&M
1. Flood Forecasting and Warning		600	50,000	30.0	25.0	55.0
2. Water monitoring		600	50,000	30.0	25.0	55.0
3. Erosion and accretion forecasting		100	500,000	50.0	10.0	60.0
4. Drought forecasting		50	500,000	25.0	10.0	35.0
5. Re-orientation programmes		3,000	30,000	90.0	50.0	140.0

# **Enabling Environment**

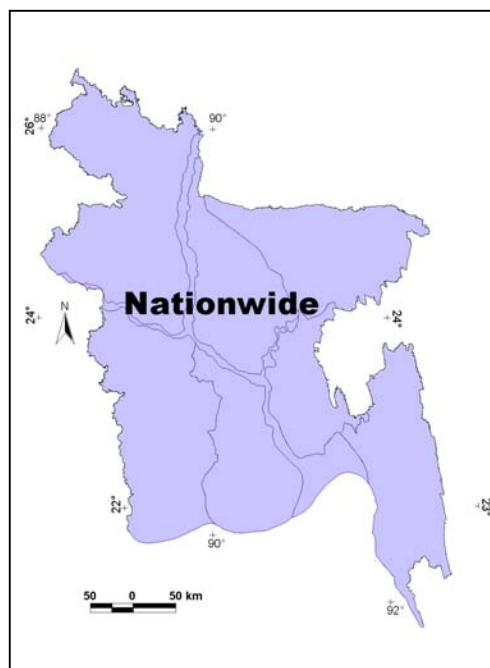
**Support to the Preparation of New Legislation**

Ref: EE 001

**Basic Data**NWMP Sub-sector      **Enabling Environment**Region(s)              **National Significance****Relevance to NWPo**

In §3e of the NWPo the GoB calls for the development of “...a legal and regulatory framework that will help the process of decentralization, sound environmental management and improve the investment climate for the private sector in water development and management”.

In order to achieve this and thereby ensure that water resources management in Bangladesh remains efficiently managed and coordinated §6a of the NWPo requires that the relevant legal framework is periodically reviewed and where indicated changed or otherwise amended. And in order to reinforce the concept of water as a wisely exploited good, §6b of the NWPo demands the establishment of a Water Code which revises and consolidates the laws governing ownership, development, appropriation, utilisation, conservation and protection of water resources. Finally, §4 of the NWPo calls for increased community participation in water sector development and management. This pre-supposes the emergence of a suitable registration process that formally establishes community based organisations as well as their rights and obligations.

**Purpose of Programme**

As acknowledged by the NWPo, the existing legal framework does not reflect the decentralised, participatory characteristics intended for the water sector. As such it needs revision and supplementation in a number of key areas. This programme is intended to provide support in the form of technical assistance and study tours that will i) assist in identifying where and how legislation needs to be revised or augmented, ii) facilitate the preparation of a Water Resources Act and iii) result in an appropriate registration process for the community based organisations.

**Programme Outline**

A Water Policy Advisory Group is already engaged on a review of existing legislation to ensure effective implementation of the NWPo. Equally, a task force has been constituted to draft the National Water Code. It is expected to review all relevant extant legislation and recommend a consolidated yet comprehensive Water Code by the end of September 2001. This programme is based on the assumption that such a deadline is both unrealistic and inconsistent with the NWMP preparation timetable. Accordingly five steps are anticipated. First, the Task Force finishes its review by the end of June; secondly, a broad outline draft code, which inter-alia addressed future institutional mandates is prepared by the original deadline; thirdly, after a

process of consultation and review the Code's outline is finalized and a drafting specialist recruited to right the necessary legal document; fourthly, by end June 2002, the full Code is endorsed by the Task Force and sent to ECNWRC for comment and endorsement; and fifthly, the final draft Code is prepared and sent to the Ministry of Law for vetting by November 2002 and presentation to Parliament in early 2003.

## Financing Arrangements

The programme, which should be funded by the Government, will provide Tk12.5M largely for the technical assistance during stage three above. The balance is intended for miscellaneous operational costs associated with workshops; internet research and the like. The anticipated technical assistance includes a small amount of international support both for legal drafting and study tour preparation.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Water Policy Advisory Group Review	I1	• Review accepted	2001
• Outline Code endorsed by ECNWRC	I2	• ECNWRC official minutes	2001
• Final Draft National Water Code establishing GoB's obligation to manage water as a public good while facilitating the participation of equitable, well regulated, community based organisations presented to Parliament	K	• The Draft Water Code • Parliamentary proceedings	2002
• Rights, obligations and rules of business as they apply to all water sector stakeholders promulgated via a coherent and comprehensive set of documents	D	• Use of the documents as verified by survey • Government funding of water sector development and management (which should reduce as an overall % of water sector costs)	2014

## Institutional Arrangements

Bangladesh's complex water sector has many stakeholder institutions. Already participating in the Task Force are representatives of: MoWR, WARPO, JRC, BWDB, MoEF, MoA, LGD, MoFL, MoShipping, MoLand and BELA as well as the Chairman of WPAG. It is recommended that a representative of the Ministry of Law is also co-opted. WARPO should be provided with funds to recruit the necessary Technical Assistance.

## Existing Documentation

Existing documentation includes the myriad Acts that have bearing on the water sector. Especially important among these are: The Irrigation Act of 1987; the State Acquisition and Tenancy Act of 1950; the Embankment and Drainage Act of 1952; the Acquisition and Requisition of Immovable Property Ordinance of 1982; the Irrigation Water Rate Ordinance of 1983 and the Groundwater Management Ordinance of 1985. In addition, for inspiration, it will be very helpful to study precedent water codes recently developed or under development in other countries engaged in mobilizing similar reformist water policies, hence the mention of internet usage in the financing section above.

## **Linkages**

As a pivotal tactic towards the establishment of the enabling environment a Water Code of the kind anticipated has fundamental linkages with every NWMP programme which is likely to depend on i) the conception of water as a good that needs to be wisely used, well regulated and of sustainable good quality and ii) the involvement of appropriately mandated and well regulated institutions which themselves reflect decentralized or devolved responsibility. In fact the success of any such programme will depend in part but nonetheless firmly on the existence of a suitable and responsive Water Code within the sector's legal framework.

## **Risks and Assumptions**

It is assumed that the existing deadline will not be met; that the authorities will welcome the opportunity to prolong the existing study in order, inter-alia to allow the NWMP to guide the process and finally, that Parliament will pass the draft Code with a minimum of delay. The main risk is that consensus on the legal reform embodied in the new Act will take much longer to achieve than envisaged.

**Support to the Preparation of New Legislation**

Ref :

**EE 001**

Cluster :	<b>Enabling Environment</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Legislation</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2001</b>	Duration <sup>2</sup> :	<b>2 year(s)</b>
		Agency(s) Responsible :	<b>WARPO</b> (Lead) None (Supporting)
Short Description :	As acknowledged by the NWPo and other sources, the existing legal framework does not reflect the decentralized participatory characteristics intended for the water sector. As such it needs revision and supplementation in a number of key areas. This programme is intended to provide support in the form of technical assistance and study that will i) assist in identifying where and how legislation needs to be revised or augmented; ii) facilitate the preparation of a Water Resources Act and iii) result in an appropriate registration process for the community based organisations.		

<b>MIS Links</b>	Cost Calculation :	EE Programme costing.xls	Map :	EE 001 Map.jpg
	Disb't Schedule :	EE Programme costing.xls	Description :	EE 001 PgP.doc

<b>Finance</b>					
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>12.50</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>2</b>
Ultimate Recurring	<b>0.00</b> MTk/yr	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Water Policy Advisory Group Review	• Review accepted	NYD
• Outline Code endorsed by ECNWRG	• ECNWRG official minutes	NYD
• Final Draft National Water Code establishing GoB's obligation to manage water as a public good while facilitating the participation of equitable, well regulated, community based organisations presented to Parliament	• The Draft Water Code • Parliamentary proceedings	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	EE 001
Title	Support to the Preparation of New Legislation

*Assumptions:*

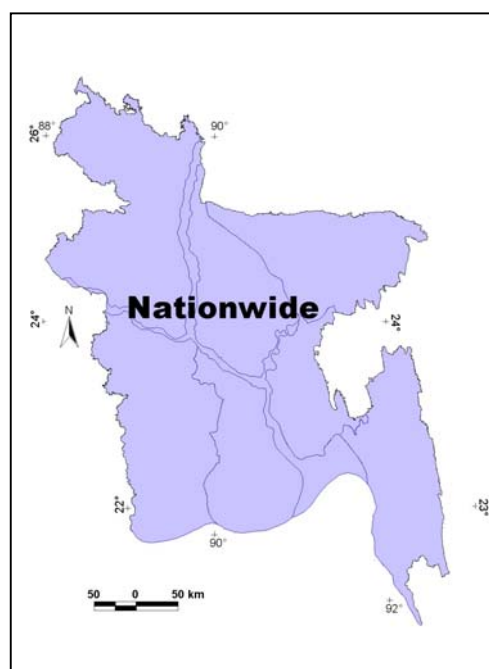
Taka/US\$	51.000	TA duration	1.5	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	3.0	20,000		3.1	0.0%	-
Senior National consultants (all-in rate)	p-m	6.0		150	0.9	0.0%	-
Mid-level National consultants (all-in rate)	p-m	5.0		90	0.5	0.0%	-
Sub-totals					4.4		-
Other general TA programme costs		25%			1.1		-
Specific other TA programme costs	Study tours	2		3,500	7.0	0.0%	-
<b>Total TA Costs</b>					<b>12.5</b>		-
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-
<b>Overall Programme Costs</b>							
					<b>12.5</b>		-



**Field Testing of Participatory Management Models**Ref: **EE 002****Basic Data**NWMP Sub-sector      **Enabling Environment**Region(s)              **Nationwide significance****Relevance to NWPo**

The importance of stakeholder participation in the development and management of Bangladesh's water sector is stressed repeatedly in the NWPo. In particular the preamble to §4.16 stresses that "stakeholder participation should be established in a form that elicits direct input from people at all levels of engagement. Stakeholder involvement should be an integral part of water resources management, at all stages of the project cycle. Towards that objective there should be a complete reorientation of the institutions for increasing the role of stakeholders and the civil society in decision making and implementation of water projects.". Equally, §4.02f requires the "...participation of all project affected persons, individually and collectively" to be ensured during "...the planning, design, implementation, and operation and maintenance (O&M) of publicly funded surface water resources development plans and projects. Local Governments (Parishads) will be the principal agencies for coordinating these efforts. Community level self-help groups (private) and Non-Government Organisations will also be relied on to assist in the participatory process.". Finally, the 2<sup>nd</sup> paragraph of §4.14's preamble makes it clear that a "...system of cost recovery, pricing, and economic incentives/disincentives is necessary to balance the supply and demand of water....An important principle, for the long-term, in this regard is that public service agencies should be converted into financially autonomous entities, with effective authority to charge and collect fees. The participation of users in managing and maintaining water facilities and operations is an important element of financial accountability."

**Purpose of Programme**

Globally, water sector decentralization remains very much an innovative approach for which the range of possible models is still expanding. This is especially so in an ideal situation such as that intended for Bangladesh where the models are to reflect not only decentralized civil administration but also an appropriate degree of responsibility devolved to civil society. Encouragingly, the potential that this represents is already being addressed in the form of several successful models for participatory planning in the drainage, flood-proofing and urban water service sub-sectors. But in addition to the acceptability and sustainability of the institutional models, the policy also makes very clear the extreme importance of successful and sustainable cost recovery options. This aspect will consequently be a major focus of the evaluation effort delivered under the programme which is intended to evaluate functioning models while identifying, piloting and evaluating others yet to be identified in the context of conventional

wisdom, best practice and comprehensive stakeholder participation Several models have already been identified in this way, for instance:

- i. **Management of FCD schemes:** (a) BWDB manage schemes in partnership with Water User Groups, (b) Schemes are handed over to a multi-tier co-operative with funding through member contributions, tenure either being retained by BWDB/LGED or transferred to Local Government (LG). (c) Schemes are handed over to LG to manage, raising funds through a new Land Improvement Tax, leasing of embankments, and/or in part by central Government subsidy. (d) Schemes are handed over to Local Government who delegate authority to a Non-Profit Management Company (NPMC) with funding from Land Improvement Tax, leasing and/or subsidies. NPMC board could be chaired from LG with Directors from the scheme area and staff recruited from the private sector. (e) Whilst LGIs are being established, BWDB could delegate authority to an NPMC as above. Community-based initiatives may be taken up in any of the above to encourage local people to take a lead role in identifying and planning any remedial measures prior to scheme hand-over, and to arrange contributions to the cost of this.
- ii. **Management of Public Irrigation Projects:** (a) BWDB retains overall control of the system down to tertiary outlets and WUGs collect water charges, which are retained locally. (b) Management is through an authority on Barind MDA lines. (c) Local Government is involved in scheme management. (d) The operator awards contracts for some or all of the services. (e) The operator itself is privatised.
- iii. **Rural Village Water Supply and Sanitation:** Public-private partnership would be fostered through build/operate contracts supported by GoB subsidies.

## Programme Outline

Different participatory management models for sustainable water sector operation, maintenance and cost recovery will be identified and tested over an initial five-year period and evaluated before replication. New institutional formulations will be defined by the demands expected of them rather than supply driven re-structuring of existing organisations. Equally, the evaluations will include modern procedures which measure a) changes in actors, powers and accountability as they affect baseline institutional structures and b) changes in understanding, choice and comparative advantage among the institutions to which responsibility is decentralised or devolved. To the greatest possible extent, the evaluations will be based on the views of all parties affected by management transfer in each case while including specific audits to ensure that gender and landlessness issues are adequately addressed. During this period, the GoB will also assess the possibility of introducing new local taxes to fund O&M and will also identify the circumstances by which centrally-funded emergency relief is provided to the scheme operators. Adjustments to legislation may be required accordingly. Finally, experience elsewhere suggests that considerable benefits will accrue to increased exposure of Bangladesh's experts to international examples and best practice, and later to facilitate their increased participation in the global debate. Accordingly the programme will also involve study tours and increased international communications.

## Financing Arrangements

Operational costs for the programme will be included in those of the actual transfer pilot projects. Nonetheless, additional costs for technical assistance, study tours and international communications will be incurred by WARPO. These are expected to total some Tk100M over 5 years and are suitable for Government, perhaps with donor support.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Long list of potential institutional models agreed by GoB	I1	• Formal agreement of GOB	2005
• Shortlist of potential institutional models agreed by GoB	I2	• Formal agreement of GoB	2005
• Field test programme formulated	I3	• Programme document	2006
• Field test completed	I4	• Programme reports	2011
• A range of appropriate and replicable institutional models for decentralised water management in Bangladesh	K	• Required document prepared and approved • Stakeholder consent verified	2012
• Rights, obligations and rules of business as they apply to all water sector stakeholders promulgated via a coherent and comprehensive set of documents	D	• Use of the documents as verified by survey • Government funding of water sector development and management (which should reduce as an overall % of water sector costs)	2025

## Institutional Arrangements

Responsibility for the identification, establishment and pilot testing of the participatory, decentralised management models will be the responsibility of the relevant Government line or civil administrative agencies at each location. The close and ongoing oversight, coordination and guidance of WARPO will be vital however, especially as regards ensuring comprehensive stakeholder participation at all stages and international technical assistance will support WARPO to this end. Evaluations however, should be carried out by 3rd parties comprising a mix of international and local expertise complemented by representatives of local NGO's and research institutions or academia.

## Existing Documentation

There is a wealth of technical papers relevant to this programme, some of which are already available within the WARPO library, others are available from the websites of an increasing range of learned institutions across the globe, hence the inclusion of international communications costs mentioned above. Equally, DSR §'s 5.5, 5.11.4 and its supporting annexes provide much in the way of background analyses.

## Linkages

Programme EE 001 (Support to the Preparation of New Legislation), this and programmes EE 003 (Water Resources Legislation - Preparation of Supporting Ordinances), EE 004 (Project Preparation Procedures - Guidelines and Manuals), EE 005 (Regulatory and Economic Instruments) and EE 006 (Field Testing and Finalisation of the Guidelines for Participatory Water Management) respectively comprise very much a suite of linked programmes intended as a whole to achieve the development objective stated above.

## Risks and Assumptions

There is a significant risk that certain agencies may feel that deeply rooted, historic vested interests may be compromised or threatened by the Government's reformist policies, and consequently that they will refuse to cooperate in the execution of the programme. It can be assumed however, that strong, ongoing Governmental commitment to reform together with a combination of thorough, consultative needs assessment and sensitization processes, will make

the agencies aware of the fresh challenges and opportunities associated with a decentralised sector, as well as improved employment packages made possible by improved cost recovery. Expert and patient sensitisation along these lines has the potential, realised in the case of growing numbers of other countries, to create a demand for reform even among the agencies scheduled for it.

**Field Testing of Participatory Management Models**

Ref :

**EE 002**

Cluster :	Enabling Environment		Region(s) :	All	
Focus/Foci :	Participatory Management Models		Location :	Nationwide	
Start Year <sup>1</sup> :	2003	Duration <sup>2</sup> :	5 year(s)	Agency(s) Responsible :	BWDB (Lead) LGED, LGIs, CBOs (Supporting)
Short Description :	The NWPo calls for the decentralisation and/or devolution of the water sector. Various models have already been proposed, most of which are prescribed by the size of scheme involved. The programme is intended to test the efficacy of the models proposed to date as well as other potential options to be identified on the basis of comprehensive stakeholder consultation.				

<b>MIS Links</b>	Cost Calculation :	EE Programme costing.xls	Map :	EE 002 Map.jpg
	Disb't Schedule :	EE Programme costing.xls	Description :	EE 002 PgP.doc

Finance						
	Costs	Private	Funding (%)	Beneficiaries	Expected by	
			GoB		ProgrammeYear	
Total Capital <sup>3</sup>	100.00 MTk	0%	100%	0%	5	
Ultimate Recurring	0.00 MTk/yr	n/a	n/a	n/a	n/a	
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart		
	(dd)	(mm)	(yy)	Cost (MTk) ● Investment ○ Recurring — Total		
Status :	Identified					
Financial Base Year:	mid-2000					
Planned Expenditure (to date) :	0 MTk					
Actual Expenditure <sup>4</sup> (to date) :	0 MTk					

Programme Years	Investment (MTk)	Recurring (MTk)	Total (MTk)
0	18	0	18
5	100	0	100
10	100	0	100
15	100	0	100
20	100	0	100
25	100	0	100
30	100	0	100
35	100	0	100
40	100	0	100
45	100	0	100
50	100	0	100

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Long list of potential institutional models agreed by GoB	• Formal agreement of GOB	NYD
• Shortlist of potential institutional models agreed by GoB	• Formal agreement of GoB	NYD
• Field test programme formulated	• Programme document	NYD
• Field test completed	• Programme reports	NYD
• A range of appropriate and replicable institutional models for decentralised water management in Bangladesh	• Required document prepared and approved	NYD
	• Stakeholder consent verified	

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates

5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	EE 002
Title	Field Testing of Participatory Management Models

### Assumptions:

Taka/US\$	51.000	TA duration	5.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

### Technical Assistance

Expatriate consultants (all-in rate)	p-m	45.0	20,000		45.9		
Senior National consultants (all-in rate)	p-m	70.0		150	10.5		
Mid-level National consultants (all-in rate)	p-m	129.0		90	11.6		
Sub-totals					68.0		
Other general TA programme costs		25%			17.0		
Specific other TA programme costs	Annual surveys				15.0		
<b>Total TA Costs</b>					<b>100.0</b>		

### Other Programme Costs

1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>-</b>		<b>-</b>

### Overall Programme Costs

100.0 -

### Notes:

Based on support to WARPO in providing independent oversight of pilot testing of participatory management with provision for annual stakeholder surveys over 5 years.

## Water Resources Legislation – Preparation of Supporting Ordinances

Ref: EE 003

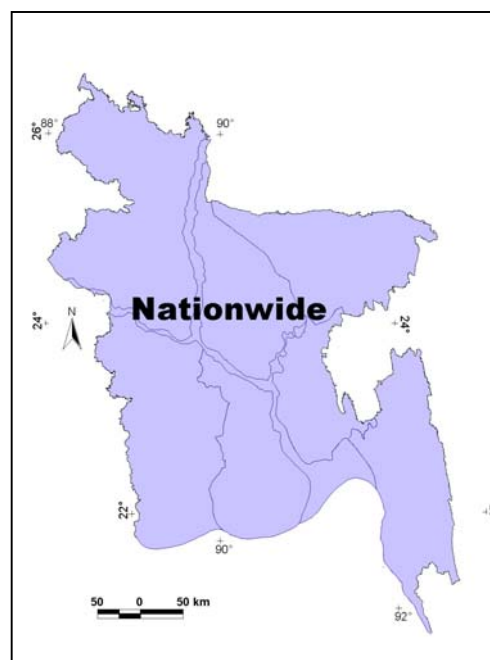
### Basic Data

NWMP Sub-sector **Enabling Environment**

Region(s) **Nationwide Significance**

### Relevance to NWPo

In §3e of the NWPo the GoB calls for the development of “...a legal and regulatory framework that will help the process of decentralisation, sound environmental management and improve the investment climate for the private sector in water development and management”. However, as confirmed by the preamble to §6 of the NWPo states that “..The existing legislation related to any form of water management in Bangladesh requires supplementing in a number of key areas...” and “...This policy will be given effect through a National Water Code encoding specific provisions of the water policy to facilitate its implementation..”, while §6.b stresses that the NWC is intended to revise and consolidate “...the laws governing ownership, development, appropriation, utilisation, conservation, and protection of water resources.’. Notwithstanding this clearly stated demand for an overall legal framework, §6.a recognises that wherever meaningful, any such framework should be responsive rather than prescriptive while reflecting periodic reviews of “...the provisions of the body of laws and regulations that have an impact on water resource management and to recommend changes and amendments in them for efficient coordination of the work of different water-related sub-sectors.”



### Purpose of Programme

One of the outputs of NWMP Programme EE 001 will be a National Water Act that establishes the Government’s obligation to manage and administer the country’s water resources as a public good, while facilitating the participation of equitable, well regulated community based organisations. It is both usual and ideal that legislation of this type mainly addresses broad issues of principle, rather than detailed provisions of application, at least in their first version. This is because the requirements of complicated legal frameworks are easier to circumvent than simple alternatives. However, broad catch-all legislation while being vital for the quick establishment of new paradigms, eventually has to be expanded by precedents and regulations etc in order to be effective in the long term. Such precedents and regulations are best formulated in response to lessons learned and issues raised by the application of new legislation. By studying experiences gained during application of the National Water Act, this programme is indeed intended to “review and revise” the legal framework resulting from Programme EE 001, while confirming the precedents and establishing the enforceable regulations necessary to inform and support long term application of the new law.

## Programme Outline

The new water sector envisaged by the NWPo will be achieved by initiating major changes to the following elements of water sector management:

- institutional restructuring
- regulation and the enabling environment
- representation and consultation
- decentralisation and participation
- rights, responsibilities, powers and accountability
- and
- cost recovery

Ultimately, the legal framework will have to be appropriate to any combinations of issues between and within these clusters. This programme will therefore monitor the practical applicability of the legal framework to the changes or issues as they take place or arise respectively, and when necessary draft the prescriptive regulations or responsive precedents necessary to render the law applicable, enforceable and understandable across the board. This cannot proceed any faster than the process of institutional development itself. A 15 year horizon has been assumed, although it is reasonable to assume that there will be more to do in the short term, with the workload slowly diminishing with time.

## Financing Arrangements

The programme is expected to cost Tk120M of which say Tk30M, Tk30M and Tk60M will be required in the short, medium and long terms respectively. It is suitable for GoB funding, although donor support would be appropriate, especially in the case of international technical assistance.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Comprehensive needs assessment	I1	• Needs assessment reports accepted by GoB	2005
• Scope and range of documents agreed by GOB	I2	• GoB decision	2007
• An easily understood legal framework for water sector development and management	K	• 90% of legal challenges to the Water Resources Act fail	2017
• Rights, obligations and rules of business as they apply to all water sector stakeholders promulgated via a coherent and comprehensive set of documents	D	• Use of the documents as verified by survey • Government funding of water sector development and management (which should reduce as an overall % of water sector costs)	2025

## Institutional Arrangements

Bangladesh's complex water sector has many stakeholder institutions of which many are already participating in a task force constituted specifically to draft the National Water Act. It comprises representatives of MoWR, WARPO, JRC, BWDB, MoEF, MpA, LGD, MoFL, MoShipping, MoLand and BELA as well as the Chairman of WPAG. It is recommended that a similar group is retained as a review panel and charged with the responsibility to review and amend the legal framework as experience accumulates. However, such a panel will benefit from international technical assistance while depending heavily on feed back and advice from subject matter



specialists working fully conversant with Bangladesh's Laws as well as regular consultations with line agencies, LGI's, NGO's and the country's legal community.

### **Existing Documentation**

Existing documentation obviously includes the myriad Acts that have bearing on Bangladesh's water sector. Especially important among these are: The Irrigation Act of 1987; The State Acquisition and Requisition and Tenancy Act of 1950; The Embankment and Drainage Act of 1952; The Acquisition and Requisition of Immovable Property Ordinance of 1982; The Irrigation Water Rate Ordinance of 1983 and The Groundwater Management Ordinance of 1985. In addition, for inspiration, it will be very helpful to review the processes engaged by the increasing number of other countries involved in mobilising similar reformist water polices, hence the mention of internet usage in the financing section above.

### **Linkages**

Programmes EE 001 (Support to the Preparation of New Legislation), EE 002 (Field Testing of Participatory Management Models), this and programmes EE 004 to 006 (Project Preparation Procedures – Guidelines and Manuals; Regulatory and Economic Instruments and Field Testing and Finalisation of the Guidelines for Participatory Water Management respectively) comprise very much a suite of linked programmes intended as a whole to achieve the development objective stated above.

### **Risks and Assumptions**

First, a programme of this nature involves a change of status quo and to be successful, will need to overcome resistance to change, in some cases involving redistribution of responsibilities. Secondly, achieving consensus on revised legislation and rules can be a lengthy process, requiring dedicated people to drive it forward. Thirdly, successful decentralisation of the water sector will require far more attention to be paid to the demands likely to be placed on the new institutional arrangements as compared with the top-down prescriptive approach that has prevailed historically. These risks can be mitigated through a strengthened WARPO in the role of champion with respect to the underlying policy principles and the mobilisation of public support.

**Water Resources Legislation - Preparation of Supporting Ordinances**Ref : **EE 003**

Cluster :	Enabling Environment		Region(s) :	All	
Focus/Foci :	Regulations, Guidelines and Manuals		Location :	Nationwide	
Start Year <sup>1</sup> :	2003	Duration <sup>2</sup> :	20 year(s)	Agency(s) Responsible :	MoLJP (Lead) NWC, WARPO (Supporting)
Short Description :	Programme EE 001 is intended to result in a new Water Resources Act; this complementary programme is intended to address the need for legal commentary, under-laws and precedents to the new Act that will shape and arbitrate its enforcement. Inter-alia these will incorporate or address experiences gained while field testing institutional structures and modalities under Programme EE 002				

<b>MIS Links</b>	Cost Calculation :	EE Programme costing.xls	Map :	EE 003 Map.jpg
	Disb't Schedule :	EE Programme costing.xls	Description :	EE 003 PgP.doc

Finance					
	Costs		Private	Funding (%) GoB	Expected by ProgrammeYear
	Beneficiaries				
	Total Capital <sup>3</sup>	120.00 MTk	0%	100%	0%
	Ultimate Recurring	0.00 MTk/yr	n/a	n/a	n/a
Date of Data :	31	07	01	<div>Stacked Cumulative Cash Flow Chart</div> <div>Cost (MTk)</div> <div><div>● Investment</div><div>○ Recurring</div><div>— Total</div></div> <div>Programme Years</div>	
	(dd)	(mm)	(yy)		
Status :	Identified				
Financial Base Year:	mid-2000				
Planned Expenditure (to date) :	0 MTk				
Actual Expenditure <sup>4</sup> (to date) :	0 MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Comprehensive needs assessment	• Needs assessment reports accepted by GoB	NYD
• Scope and range of documents agreed by GOB	• GoB decision	NYD
• An easily understood legal framework for water sector development and management	• 90% of legal challenges to the Water Resources Act fail	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
 5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref

EE 003

Title

Water Resources Legislation - Preparation of Supporting Ordinances

Assumptions:

Taka/US\$ 51.000

TA duration 5.0 years

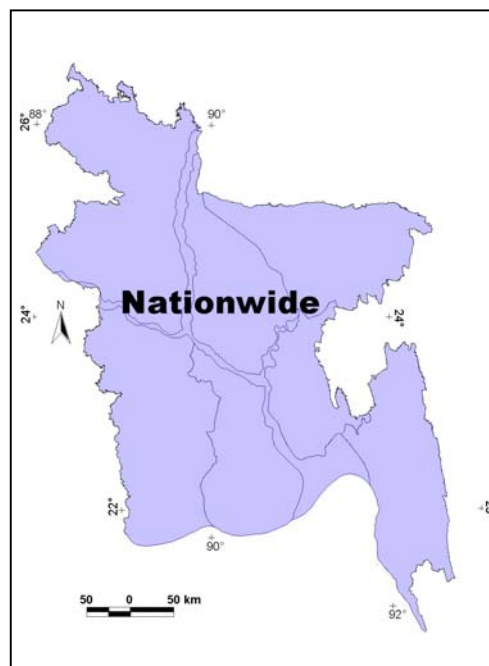
All prices in mid-2000 values

Investment duration 15.0 years

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	15.0	20,000		15.3		
Senior National consultants (all-in rate)	p-m	18.0		150	2.7	0.0%	-
Mid-level National consultants (all-in rate)	p-m	22.0		90	2.0	0.0%	-
Sub-totals					20.0		-
Other general TA programme costs		25%			5.0		-
Specific other TA programme costs	Research in other countries				5.0	0.0%	-
<b>Total TA Costs</b>					<b>30.0</b>		<b>-</b>
<b>Other Programme Costs</b>							
1. Medium term programme					30.0	0.0%	-
2. Long term programme					60.0	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>90.0</b>		<b>-</b>
<b>Overall Programme Costs</b>							
					<b>120.0</b>		<b>-</b>

**Project Preparation Procedures – Guidelines and Manuals**Ref: **EE 004****Basic Data**NWMP Sub-sector **Enabling Environment**Region(s) **National Significance****Relevance to NWPo**

In its introduction, the NWPo states clearly that it's primary objectives are to "...lay down the broad principles of development of water resources and their rational utilisation under these constraints..." while guiding "...both public and private actions in the future for ensuring optimal development and management of water that benefits both individuals and the society at large." As such it is a reformist policy with operational implications for the institutional landscape which it is intended to engender. Accordingly, some 28 clauses provide specific guidance as to the operational issues likely to be faced directly or indirectly during the preparation of actual projects (§3d,e; §4.2d,e,f,g,h,I; §4.3 e,f; §4.4c,d,e,f,g,h; §4.5b,d,e; §4.6c,d; §4.12b; §4.14f and §4.16a,b,c,d,e). In particular, §4.2h requires that rules procedures and guidelines covering "...all aspects of water management..." are framed and periodically revised thereafter.

**Purpose of Programme**

In accordance with the above policy requirements, the Government's Development Strategy for the NWMP (June '01) includes a relevant and focused section covering documents for the enabling environment. It identifies a hierarchy of such documents beginning with the Water Resources Act (Programme EE 001 refers) which will be at the apex and enforceable by definition. At a similar level will be the Guidelines for participatory Water Management (Programme EE 006 refers). Thereafter will be the equally enforceable supporting ordinances to the Water Resources Act (Programme EE 003 refers) followed guidelines and manuals. To this end two suites of guidelines and manuals are required. One will cover regulation and economic instruments the other project preparation. This programme provides for the preparation of guidelines and manuals for project preparation, while Programme EE 005 covers regulation and economic instruments. It should be noted that it is intended that, like the law and its ordinances, guidelines also have legal weight whereas manuals will be advisory only.

**Programme Outline**

The Development Strategy identifies at least seven different subjects relevant to project preparation that will require guidelines and manuals:

- Steps required in the development process
- Consultation processes
- Mobilisation of grass roots interests
- Transfer of assets and management responsibilities
- Mobilisation of private sector
- Gender requirements and audit
- Environmental requirements and audit

Paying due regard to existing documentation (see below), it is intended that these guidelines and manuals are prepared, pre-tested and finalised during the first ten years of the NWMP, but provision is also made into the long term to allow for any others found needful during NWMP implementation.

## Financing Arrangements

The programme is expected to cost some Tk160M over 15 years. It is ideal for Government funding, possibly with donor support.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Range of documents agreed by GoB	I1	• Approved reports	2005
• Scope of documents agreed by GoB	I2	• Approved reports	2005
• Water sector programme and project preparation regulated by an approved set of guidelines and manuals	K	• Legal framework ratified and promulgated	2012
• Rights, obligations and rules of business as they apply to all water sector stakeholders promulgated via a coherent and comprehensive set of documents	D	• Use of the documents as verified by survey • Government funding of water sector development and management (which should reduce as an overall % of water sector costs)	2025

## Institutional Arrangements

Bangladesh's complex water sector has many stakeholder institutions of which many are already participating in a task force constituted specifically to draft the National Water Act. A similar arrangement would be suitable here in the form of a committee responsible for coordinating the preparation of the guidelines and manuals. Chaired by a representative of the NWRC and vice-chaired by the WARPO Director General, it should comprise representatives of all generic stakeholder institutions or organisations including; but not limited to: MoWR, WARPO, BWDB, MoEF, MoA, LGD, MoFL, Ministry of Justice and BELA.

However, such a panel will benefit from international technical assistance as well as depending heavily on feed back and advice from subject matter specialists fully conversant with the development issues in question, and regular consultations with line agencies, LGI's, NGO's and the country's legal community.

## Existing Documentation

Relevant existing documentation includes the Development Strategy for the NWMP; Guidelines for People's Participation which has been superseded by Guidelines for Participatory Water Management; Guidelines for Project Assessment; and Guidelines for Environmental Impact Assessment. Existing guidelines should be seen as a starting point however, since it is highly likely that they will benefit from redrafting, or even disaggregation and redistribution into other documents, once lessons are learned and consolidated in the wake of institutional development, decentralization, devolution and disinvestment processes as called for by the NWPo.

## **Linkages**

Programmes EE 001, 002 and 003 (Support to the Preparation of New Legislation; Field Testing of Participatory Management Models, Water Resources Legislation - Preparation of Supporting Ordinances); this and programmes EE 005 and 006 (Regulatory and Economic Instruments and Field Testing and Finalisation of the Guidelines for Participatory Water Management respectively) comprise very much a suite of linked programmes intended as a whole to achieve the development objective stated above.

## **Risks and Assumptions**

There is little risk associated with the preparation of the guidelines and manuals themselves, especially if those responsible for their preparation are ready to learn from other countries' examples. There is a risk however, that the documents and the legal framework that they represent will be obviated if considered incompatible with vested interests or "traditional" practice. It is hoped that adequate levels of political will can be generated and/or maintained and applied to the process. Equally given the long view wisely recommended by the Development Strategy in respect of institutional development, it is reasonable to expect that vested interests will change gradually as the nature of the water sector's demands on the national cadre of professionals changes as a result of reforms suggested in the NWPo.

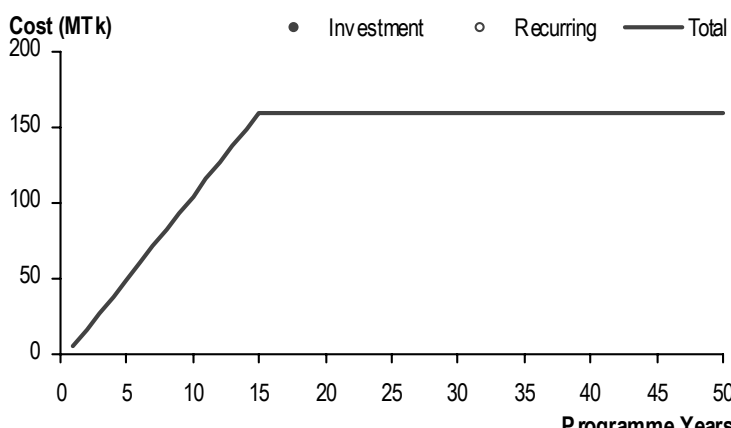
**Project Preparation Procedures - Guidelines and Manuals**

Ref :

**EE 004**

Cluster :	Enabling Environment		Region(s) :	All	
Focus/Foci :	Regulations, Guidelines and Manuals		Location :	Nationwide	
Start Year <sup>1</sup> :	2003	Duration <sup>2</sup> :	15 year(s)	Agency(s) Responsible :	WARPO (Lead) NGOs (Supporting)
Short Description :	This programme is intended to prepare enforceable guidelines and advisory manuals covering the processes and procedures considered necessary during the preparation of water sector initiatives.				

<b>MIS Links</b>	Cost Calculation :	EE Programme costing.xls	Map :	EE 004 Map.jpg
	Disb't Schedule :	EE Programme costing.xls	Description :	EE 004 PgP.doc

Finance						Funding (%)	Expected by
	Costs		Private	GoB	Beneficiaries	ProgrammeYear	
	Total Capital <sup>3</sup>		160.00 MTk	0%	100%	0%	15
	Ultimate Recurring		0.00 MTk/yr	n/a	n/a	n/a	n/a
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart			
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring	— Total
Status :	Identified						
Financial Base Year:	mid-2000						
Planned Expenditure (to date) :	0 MTk						
Actual Expenditure <sup>4</sup> (to date) :	0 MTk						

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Range of documents agreed by GoB	• Approved reports	NYD
• Scope of documents agreed by GoB	• Approved reports	NYD
• Water sector programme and project preparation regulated by an approved set of guidelines and manuals	• Legal framework ratified and promulgated	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	EE 004
Title	Project Preparation Procedures - Guidelines and Manuals

### Assumptions:

Taka/US\$	51.000	TA duration	1.0	years	All prices in mid-2000 values
		Investment duration	14.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b> <i>First Guideline</i>							
Expatriate consultants (all-in rate)	p-m	2.5	20,000		2.6		
Senior National consultants (all-in rate)	p-m	6.0		150	0.9	0.0%	-
Mid-level National consultants (all-in rate)	p-m	6.0		90	0.5	0.0%	-
Sub-totals					4.0		-
Other general TA programme costs		25%			1.0		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					<b>5.0</b>		-
<b>Other Programme Costs</b>							
1. Technical Support for preparation Guidelines		9 No.	5,000		45.0	0.0%	-
2. Technical Support for preparation of Manuals		11 No.	10,000		110.0	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>155.0</b>		-
<b>Overall Programme Costs</b>					<b>160.0</b>		-

### Documents required by Development Strategy:

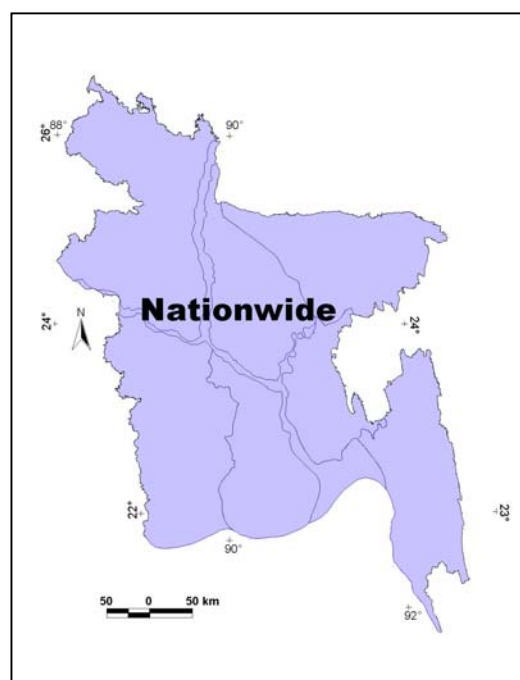
	Guidelines	Manuals		Guidelines	Manuals
<b>Process/ Preparation Documents</b>			<b>Regulation and Economic Instruments</b>		
▣ Steps required in development process		1	▣ Technical standards	1	
▣ Consultation process to be followed	1	1	▣ Service supply standards	1	
▣ Mobilisation of grass root interests	1	1	▣ Social standards	1	
▣ Transfer of assets/management responsibilities		1	▣ Environmental standards	1	
▣ Mobilisation of private sector		1	▣ Cost recovery	1	1
▣ Gender requirements and audit	1	1	▣ Zones applicable to special powers		1
▣ Environmental requirements and audit	1	1	▣ Enforcement of standards		1
			▣ Tariffs, taxes and subsidies	1	1
<b>Totals</b>	<b>4</b>	<b>7</b>		<b>6</b>	<b>4</b>



**Regulatory and Economic Instruments**Ref: **EE 005****Basic Data**NWMP Sub-sector      **Enabling Environment**Region(s)              **National Significance****Relevance to NWPo**

The NWMP advocates more effective demand management of water resources and water services in Bangladesh. This approach will require appropriate regulatory and economic instruments if the Plan is to deliver improved water-use efficiency, more effective allocation of scarce capital resources, and more equitable resource distribution especially for the poor. The NWPo recognises the need for clear management structures, guidelines and instruments to fulfil long term policy objectives (see: §4.2 and §4.14). Regulatory and economic instruments are expected to play an important role

in overall management. Policy mandates the government to frame appropriate regulatory rules and procedures “....on all aspects of water management” and “....for combining water-use and land-use planning.” Considerable emphasis is also placed on the effective application of a full range of economic and financial instruments. Policy states that “Changes are required in the system of prices and other economic incentives affecting water demand and supply in Bangladesh. Unless the users pay a price for water, there will be a tendency to misuse and deplete it ....” and “A system of cost recovery, pricing, and economic incentives/disincentives is necessary to balance the demand and supply of water.” These policy statements are also endorsed by the NPSWSS.

**Purpose of Programme**

Regulatory and economic instruments (REI) are an important part of modern demand management in the water resources sector, and their utility and effectiveness need to be increased. In the past, government institutions and agencies in the water sector have made little or no effective use of such instruments. As a consequence, some water resources have been over-exploited causing environmental damage and seasonal water shortages, many capital assets in the water sector are in poor condition, and water service delivery standards are continuing to decline. This downward trend impacts mainly on the rural and urban poor, and on the natural environment in general. The situation must be addressed and reversed in order to promote increased efficiency and effective use of water resources, as well provide a range of demand management instruments which are targeted at sustained financial viability of individual water operations.

The REI programme will review recent studies on the subject, prepare a comprehensive operational manual by sub-sector, and outline detailed action plans for implementation. The NWMP has identified the following main areas for consideration:

(a) Regulatory instruments for water abstraction management:

- Groundwater regulation in areas of severe seasonal water-table decline, especially restrictions on shallow tubewell irrigation.
- Restrictions on deep tubewell irrigation development in the coastal zone to limit saline penetration in the deep aquifer.
- Regulation of surface water abstraction for irrigation in specific areas of the country with potential conflicts in water resource allocation.
- Regulation of surface water diversions and damming of streams and khals in order to address the adverse impact on downstream users.

(b) Economic instruments for water demand management:

- Irrigated agriculture - use of irrigation service fees which vary by crop and season, but retain the principle that fees should at least cover the annual operations and maintenance costs of each scheme.
- Potable water supplies - in order to improve and sustain financial viability: (i) rural water supply schemes should charge tariffs which cover operations and maintenance costs as a minimum; and (ii) urban water supply schemes should phase in full cost recovery charging with a continuing expansion of water metering. In this context, key issues for tariff setting will be effective revenue collection, affordability and poverty impact.
- Government prices and taxation - consideration of possible adjustments in specific central government prices and taxes which impact on the sector e.g. fuel and energy for water pumping. Any recommendations will need to assess the potential impacts on the environment and market distortions. Municipal taxes could be expanded to cover some proportion of the maintenance costs for flood protection and stormwater drainage in urban areas.

(c) Regulatory and economic instruments for pollution control and environmental management:

- Regulation and monitoring of wastewater discharges from municipal and industrial sources, including the issue of effective enforcement of environmental laws and regulations.
- Pollution charges and fines based on the strength of wastewater discharges from municipal and industrial sources, with the aim of reducing polluting discharges and promoting effective wastewater treatment.

The Government will complement this initiative with parallel and supporting programmes under the NWMP in: Public Awareness Raising in Water Management (EE 010); Private Sector Participation in Water Management (EE 011); Water and Environment Funds (EE 012); and Alternative Financing Methods for Water Management (EE 013). The issue of regulatory and economic instruments is also directly relevant to the programmes for Towns and Rural Areas, Major Cities, Agriculture and Water, and Environment and Aquatic Resources.

## **Programme Outline**

The study and manual on Regulatory and Economic Instruments (REI) will be commissioned within the next two (2) years. It is expected that the project programme will cover the following major topics, among others:

- (a) Review of Bangladesh and international experience with REI;
- (b) Analysis of alternative REI strategies and options for the water sector;
- (c) Pilot studies in selected sectors;

- (d) Institutional aspects and implications;
- (e) Results of wide-ranging stakeholder consultation process;
- (f) Detailed REI Manual; and
- (g) Recommendations for a series of time-bound Sub-Sector Action Plans for the water sector.

The first few years of the subsequent implementation programme will demonstrate GoB's serious intent to push forward with the effective use and application of regulatory and economic instruments.

## Financing Arrangements

The proposed programme (study, manual and action plan) for Regulatory and Economic Instruments is suitable for GoB funding with the support of the international donor community. The estimated funding requirement is Tk152M at mid-2000 prices.

One of the principal outputs of the study will be a series of Sub-Sector Action Plans. It is expected that these plans will be costed, and will probably require modest additional capital funds to support the phased implementation of proposed regulatory and economic instruments, including: regional presentations; public awareness raising; training; and specific detailed individual studies.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Options for regulatory and economic instruments studied	I1	• Report approved	2005
• Manual for Regulatory and Economic Instruments	I2	• Report approved	2010
• Regulatory and Economic instruments in force	K	• Legal framework ratified and promulgated	2012
• Rights, obligations and rules of business as they apply to all water sector stakeholders promulgated via a coherent and comprehensive set of documents	D	• Use of the documents as verified by survey • Government funding of water sector development and management (which should reduce as an overall % of water sector costs)	2025

## Institutional Arrangements

The Ministry of Water Resources, in co-ordination with the Ministry of Finance, will be responsible for commissioning the study for Regulatory and Economic Instruments. WARPO will be the executing agency, and be responsible for preparing the Terms of Reference and other background documentation, possibly in collaboration with an international donor.

Institutional arrangements for the implementation of the action plan on Regulatory and Economic Instruments will depend on the detailed recommendations of the proposed study.

## References and Documentation

- (a) Chapters 5, 7, 8 and 10, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO, existing legislation etc.

## **Linkages**

Programmes EE 001 to 004 (Water Resources Act Preparation; Field Testing of Participatory Management Models; Water Resources Act – Preparation of Supporting Ordinances; Project Preparation – Guidelines and Manuals), this and programme EE 006 (Field Testing and Finalisation of the Guidelines for Participatory Water Management respectively) comprise very much a suite of linked programmes intended as a whole to achieve the development objective stated above.

The programme for Regulatory and Economic Instruments is a cross-cutting issue and should be closely linked and co-ordinated with other NWMP programmes, namely: (a) ID 003 (FCD and FCD/I Management Rationalisation); (b) ID 001 (Local Government Needs Assessment for Water Management); (c) ID 005 (Local Government Capacity Building for Water Management); (d) ID 002 (Independent Regulatory Bodies for Water Supply and Sanitation Service Sector); (e) EE 002 (Field Testing of Participatory Management Models); (f) EE 004 (Project Preparation Procedures - Guidelines and Manuals); (g) EE 010 (Raising Public Awareness in the Wise Use and Management of Water); (h) EE 011 (Private Sector Participation in Water Management); (i) EE 012 (Water and Environment Funds); (j) EE 013 (Alternative Financing Methods); and (k) EA 010 (Public Awareness Raising and Empowerment in respect of Environmental Issues).

Preparation and development of the Regulatory and Economic Instruments programme should also be co-ordinated with ECNWRC, Ministry of Finance (MoF), Ministry of Water Resources (MoWR); Ministry of Industry (MoI), Ministry of Agriculture (MoA), Ministry of Environment and Forests (MoEF), Ministry of Local Government, Rural Development and Co-operatives (MoLGRDC), Bangladesh Water Development Board (BWDB), Department of Public Health Engineering (DPHE), Local Government Engineering Department (LGED), Department of Environment (DoE), DWASA, CWASA, Local Government authorities, NGOs, the private sector and other stakeholders.

## **Risks and Assumptions**

The risks associated with the commissioning and execution of the proposed REI Study and Manual are minimal, providing a suitable international donor partner is identified and well qualified international consultants are engaged to carry out the work. The main risks will arise after the study and manual have been completed. They will fall into three categories: institutional, financial and social. The institutional risks are twofold: firstly, whether GoB will have the real political will and commitment to carry out the REI programme; and secondly, whether government line agencies and enterprises will provide effective support and co-operation to implement the proposals. The NWPo and NPSWSS give unequivocal statements that REI is an integral part of water sector policy; therefore, GoB must give sustained support if demand management and service delivery are to show real signs of improvement. In this context, parallel co-ordination and implementation of the other EE Programmes will be crucial. The main financial risk is that if the REI programme is not effectively implemented then water services will continue to decline, and the government inaction will prejudice private sector participation and discourage international donor support for the water sector. GoB is aware of these issues and needs to demonstrate a firm commitment to implement its own policy. The social risk is that water users and consumers will resist moves to levy realistic water tariffs and charges. This risk can be minimised with effective stakeholder consultation, raising awareness of the issues, involvement in the decision-making process, appropriate charging structures, and a clear commitment to improved service delivery.

**Regulatory and Economic Instruments**

Ref :

**EE 005**

Cluster :	Enabling Environment		Region(s) :	All	
Focus/Foci :	Regulations, Guidelines and Manuals		Location :	Nationwide	
Start Year <sup>1</sup> :	2003	Duration <sup>2</sup> : 2 year(s)	Agency(s) Responsible :	WARPO	(Lead)
				None	(Supporting)
Short Description :	This programme is intended to prepare enforceable guidelines and advisory manuals concerning standards, regulation and economic instruments for the water sector.				

<b>MIS Links</b>	Cost Calculation :	EE Programme costing.xls	Map :	EE 005 Map.jpg
	Disb't Schedule :	EE Programme costing.xls	Description :	EE 005 PgP.doc

Finance						
	Costs		Private	Funding (%)	Expected by	
				GoB	Beneficiaries	ProgrammeYear
	Total Capital <sup>3</sup>	152.00 MTk	0%	100%	0%	2
	Ultimate Recurring	0.00 MTk/yr	n/a	n/a	n/a	n/a
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart		
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring
Status :	Identified			— Total		
Financial Base Year:	mid-2000					
Planned Expenditure (to date) :	0 MTk					
Actual Expenditure <sup>4</sup> (to date) :	0 MTk					

Programme Years	Investment (MTk)	Recurring (MTk)	Total (MTk)
0	0	0	0
1	150	0	150
2	150	0	150
3	150	0	150
4	150	0	150
5	150	0	150
6	150	0	150
7	150	0	150
8	150	0	150
9	150	0	150
10	150	0	150
11	150	0	150
12	150	0	150
13	150	0	150
14	150	0	150
15	150	0	150
16	150	0	150
17	150	0	150
18	150	0	150
19	150	0	150
20	150	0	150
21	150	0	150
22	150	0	150
23	150	0	150
24	150	0	150
25	150	0	150
26	150	0	150
27	150	0	150
28	150	0	150
29	150	0	150
30	150	0	150
31	150	0	150
32	150	0	150
33	150	0	150
34	150	0	150
35	150	0	150
36	150	0	150
37	150	0	150
38	150	0	150
39	150	0	150
40	150	0	150
41	150	0	150
42	150	0	150
43	150	0	150
44	150	0	150
45	150	0	150
46	150	0	150
47	150	0	150
48	150	0	150
49	150	0	150
50	150	0	150

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Options for regulatory and economic instruments studied	• Report approved	NYD
• Manual for Regulatory and Economic Instruments	• Report approved	NYD
• Regulatory and Economic instruments in force	• Legal framework ratified and promulgated	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

## National Water Management Plan

### Programme Costing Sheet

Programme Ref	EE 005
Title	Regulatory and Economic Instruments

#### Assumptions:

Taka/US\$	51.000	TA duration	2.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	60.0	20,000		61.2		
Senior National consultants (all-in rate)	p-m	100.0		150	15.0	0.0%	-
Mid-level National consultants (all-in rate)	p-m	60.0		90	5.4	0.0%	-
Sub-totals					81.6		-
Other general TA programme costs		25%			20.4		-
Specific other TA programme costs	Study Tours				50.0	0.0%	-
<b>Total TA Costs</b>					<b>152.0</b>		-
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-
<b>Overall Programme Costs</b>							
					<b>152.0</b>		-

## Field Testing and Finalisation of the Guidelines for Participatory Water Management

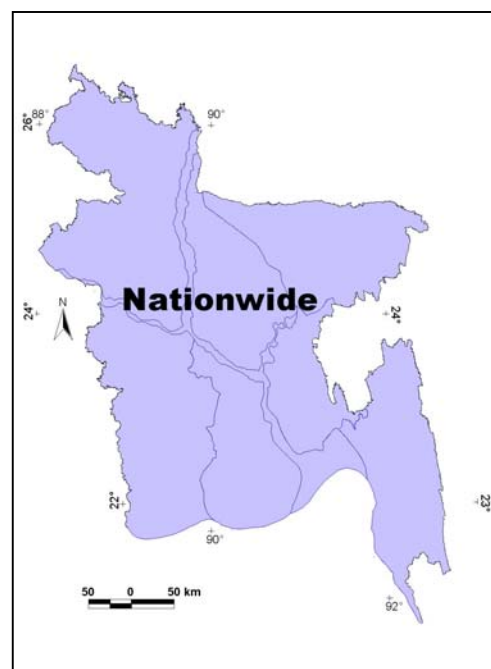
Ref: EE 006

### Basic Data

NWMP Sub-sector      **Enabling Environment**Region(s)              **Nationwide Significance**

### Relevance to NWPo

In its introduction, the NWPo states clearly that its primary objectives are to “...lay down the broad principles of development of water resources and their rational utilisation under these constraints...” while guiding “...both public and private actions in the future for ensuring optimal development and management of water that benefits both individuals and the society at large.” As such it is a reformist policy with operational implications for the institutional landscape which it is intended to engender. Accordingly, some 28 clauses provide specific guidance as to the operational issues likely to be faced directly or indirectly during the preparation of actual projects (§3d,e; §4.2d,e,f,g,h,i; §4.3 e,f; §4.4c,d,e,f,g,h; §4.5b,d,e; §4.6c,d; §4.12b; §4.14f and §4.16a,b,c,d,e). In particular, §4.2h requires that rules procedures and guidelines covering “...all aspects of water management...” are framed and periodically revised thereafter.



### Purpose of Programme

Programmes EE 001, EE 003 and EE 004 will result in a nested suite of laws, ordinances, guidelines and manuals in pursuance of the above requirements of the NWPo. Equally, in accordance with the policy, Programme EE 002 is concerned with the identification, pilot testing and evaluation of participatory management models. It remains to produce a framework reference document that gathers up and summarises the manuals, guidelines and ordinances pertaining to participatory water management while incorporating the lessons learned during i) field testing of the management models and ii) application of the said manuals, guidelines and ordinances. Guidelines for People's Participation emerged in fact from the Flood Action Plan activities in 1992; but were superseded by the Guidelines for Participatory Water Management (GPWM, MoW 2001). As issued, the GPWM provide a perfectly adequate first draft, or point of departure. However, finalisation of the GPWM would be premature before field testing and before conclusions and recommendations emerge from Programmes EE 002 – 005. Equally there remain some technical shortcomings in the 2001 Draft which will have to be addressed before the Guidelines are formalized, including the following:

1. Although the GPWM appears to acknowledge the difference between civil-administrative and social boundaries (giving priority to the latter), it does not make any mention of the difference between these boundaries and hydrological boundaries which are more meaningful in terms of water resources management.

2. The GPWM acknowledges that the Cooperative Laws are inappropriate for the establishment of participatory water management institutions, by stating that they will only be used until a bespoke legal framework is developed. However, there seems to be no provision for how an organisation, formed under one law, can be dissolved under that law and reformed under another. As trading entities cooperatives may have to follow winding up procedures that are incompatible with water management mandates. Furthermore, the proposed water management organisations have three perfectly logical nested tiers. Can the Cooperative Laws accommodate a structure of this nature?
3. The question of obligations is raised by the GPWM, albeit in a cursory fashion at this stage. The all important appurtenant issue of rights (without which obligations are difficult to transfer or confer) is all but neglected, except for one mention
4. Successful decentralization of natural resource management requires clear changes in accountability. There is no mention of who is accountable to whom for what in the GPWM.
5. The GPWM suggests that production plans are to be decided by the water management organisation. This may well be appropriate for cooperatives; but not for decentralized water management organisations which should be more concerned with water resource distribution plans that satisfy household production plans (so long as those plans are compatible with the wise and equitable use of water).
6. At every level within the hierarchy of the water management organisations, local officials are required to participate as “advisers”. Far better to speak in terms of the provision of advisory services where and when the demand arises from any stakeholder – including other agencies. Furthermore, the advice could be sourced not just from local government; but from any potential supplier according to comparative advantage.
7. The guidelines speak of voluntary membership of the management groups. While this is absolutely essential for groups established under cooperative law and which therefore have the potential to bankrupt their members, it is inconsistent with conventional wisdom and the concepts of exclusion control rights generally associated with sustainable water use. Water user association membership should be mandatory, not voluntary.
8. The GPWM is confusing when it speaks of joint management between WMO’s and agencies, and is inadequate as regards the mobilization and regulation of the private sector in this context.
9. It is also confusing in that it suggests both asset transfer and leasing modalities, yet is unclear regarding when one or the other modalities is appropriate and who is involved.
10. The water fee is presented as entirely a civil revenue, whereas it should comprise a user group revenue from the resulting coffers of which all WMO running costs are paid, including fair and reasonable civil revenues.

This programme is intended to provide both framework and resources necessary to i) evaluate the aptness of the existing GPWM as they are applied to an increasing range of water sector initiatives and ii) finalise them in such a way that encapsulates the lessons learned during field testing in an umbrella framework summarizing all subordinate regulations, guidelines and manuals.

## **Programme Outline**

Since the GPWM are ultimately intended for practical application they must essentially be tested practically. To this end and in line with Government policy, it is expected that most of not all future water sector initiatives will be prepared and operated in accordance with the draft GPWM. The programme will evaluate the effectiveness of the guidelines, ideally in every case. Ideally, this seemingly difficult task could be simplified by using routine questionnaires to be filled in by the responsible parties, which will include representatives of the beneficiary groups. Anomalous



or interesting cases could then be subjected to more detailed or rigorous evaluation. A local panel of experts could be established to coordinate the process; but they will need technical assistance from time to time, some of it of an international nature. Equally, the value of exposure to other approaches and solutions would justify the use of international study tours.

## Financing Arrangements

Since it is intended that the existing guidelines are tested during the implementation and commissioning of actual programmes and projects, the only costs associated with this programme will be the running costs of the local panel of experts, which will include international communications, along with limited technical assistance and study tours. The total has been estimated at some Tk70M spread over the ten years. It is suitable for GoB funding perhaps with the support of a bilateral donor.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"> <li>Guidelines for Participatory Water Management finalized</li> </ul>	I1	<ul style="list-style-type: none"> <li>The Guidelines</li> </ul>	2010
<ul style="list-style-type: none"> <li>Guidelines for Participatory Water Management applied to all relevant programmes and projects</li> </ul>	K	<ul style="list-style-type: none"> <li>Project agreements and implementation records</li> </ul>	2011
<ul style="list-style-type: none"> <li>Rights, obligations and rules of business as they apply to all water sector stakeholders promulgated via a coherent and comprehensive set of documents</li> </ul>	D	<ul style="list-style-type: none"> <li>Use of the documents as verified by survey</li> <li>Government funding of water sector development and management (which should reduce as an overall % of water sector costs)</li> </ul>	2025

## Institutional Arrangements

The Ministry of Water Resources will be responsible for appointing the panel of experts which should be convened and managed by WARPO. It will be supported by technical assistance from time to time.

## Existing Documentation

Existing documentation is limited to the February 2001 draft of the Guidelines for Participatory Water Management; but there is a burgeoning wealth of literature appearing on the websites of an increasing range of learned institutions (hence the inclusion of international communications in the programme budget).

## Linkages

Programmes EE 001 to 005 (Support to the Preparation of New Legislation; Field Testing of Participatory Management Models; Water Resources Act – Preparation of Supporting Ordinances; Project Preparation Procedures – Guidelines and Manuals; Regulatory and Economic Instruments) and this comprise very much a suite of linked programmes intended as a whole to achieve the development objective stated above.

## **Risks and Assumptions**

There are two obvious risks. The first is that the existing guidelines will be considered adequate and applied in their existing version. This would not only be in direct contravention of the NWPo which, as quoted in the first section, calls for regular reviews of all “rules, procedures and guidelines...”, but would also be in contravention of the guidelines themselves, which in the Foreword to the current version stresses that they “..will have to be updated regularly”. The second is that they will never be enforced, whether finalized or not; but this would fall foul of the international financial community without which the future development of Bangladesh’s water sector will be severely constrained for many years to come and from which successful implementation of reformist policies and procedures could catalyse significant new commitments.

**Field Testing and Finalisation of the Guidelines for Participatory Water Management**

Ref :

**EE 006**

Cluster :	Enabling Environment	Region(s) :	All			
Focus/Foci :	Regulations, Guidelines and Manuals	Location :	Nationwide			
Start Year <sup>1</sup> :	2004	Duration <sup>2</sup> :	10 year(s)	Agency(s) Responsible :	WARPO	(Lead)
					CBOs, NGOs	(Supporting)
Short Description :	A set of Guidelines For Participatory Water Management was issued in February 2001. While the document represents an excellent point of departure, it needs more work if it is to be made consistent with conventional wisdom and international best practice. This programme is intended to finalise the Guidelines via a process of pilot testing and evaluation complemented by further research, international technical assistance and study tours.					

<b>MIS Links</b>	Cost Calculation :	EE Programme costing.xls	Map :	EE 006 Map.jpg
	Disb't Schedule :	EE Programme costing.xls	Description :	EE 006 PgP.doc

Finance						
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear	
	Total Capital <sup>3</sup>	70.00 MTk	0%	100%	0%	10
	Ultimate Recurring	0.00 MTk/yr	n/a	n/a	n/a	n/a
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart		
	(dd)	(mm)	(yy)	<div>Cost (MTk)</div> <div><div>● Investment</div><div>○ Recurring</div><div>— Total</div></div>		
Status :	Identified					
Financial Base Year:	mid-2000					
Planned Expenditure (to date) :	0 MTk					
Actual Expenditure <sup>4</sup> (to date) :	0 MTk					

Programme Years	Investment (MTk)	Recurring (MTk)	Total (MTk)
0	0	0	0
1	10	0	10
2	20	0	20
3	30	0	30
4	40	0	40
5	50	0	50
6	60	0	60
7	65	0	65
8	68	0	68
9	69	0	69
10	70	0	70
11	70	0	70
12	70	0	70
13	70	0	70
14	70	0	70
15	70	0	70
16	70	0	70
17	70	0	70
18	70	0	70
19	70	0	70
20	70	0	70
21	70	0	70
22	70	0	70
23	70	0	70
24	70	0	70
25	70	0	70
26	70	0	70
27	70	0	70
28	70	0	70
29	70	0	70
30	70	0	70
31	70	0	70
32	70	0	70
33	70	0	70
34	70	0	70
35	70	0	70
36	70	0	70
37	70	0	70
38	70	0	70
39	70	0	70
40	70	0	70
41	70	0	70
42	70	0	70
43	70	0	70
44	70	0	70
45	70	0	70
46	70	0	70
47	70	0	70
48	70	0	70
49	70	0	70
50	70	0	70

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Guidelines for Participatory Water Management finalised	• The Guidelines	NYD
• Guidelines for Participatory Water Management applied to all relevant programmes and projects	• Project agreements and implementation records	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

## National Water Management Plan Programme Costing Sheet

Programme Ref	EE 006
Title	Field Testing and Finalisation of the GPWM

### Assumptions:

Taka/US\$	51.000	TA duration	10.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	10.0	20,000		10.2		
Senior National consultants (all-in rate)	p-m	20.0		150	3.0	0.0%	-
Mid-level National consultants (all-in rate)	p-m	31.0		90	2.8	0.0%	-
Sub-totals					16.0		-
Other general TA programme costs		25%			4.0		-
Specific other TA programme costs	Stakeholder surveys, study tours etc				50.0	0.0%	-
<b>Total TA Costs</b>					<b>70.0</b>		-
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-
<b>Overall Programme Costs</b>							
					<b>70.0</b>		-

Note:

TA assistance and expert panel to support WARPO

**NWRD Improved Data Collection and Processing Facilities**

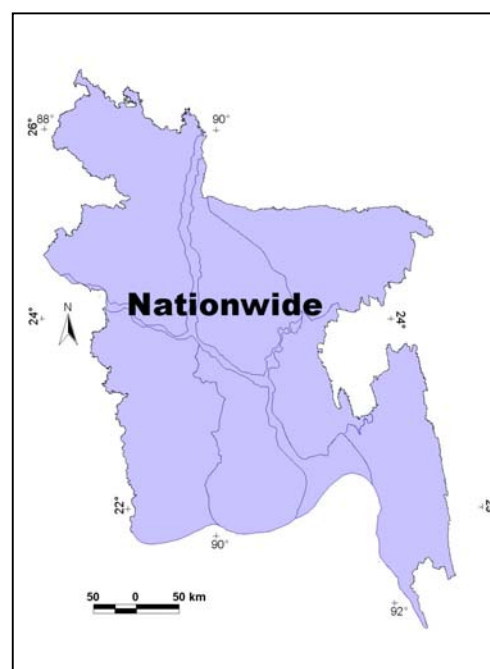
Ref: EE 007

**Basic Data**NWMP Sub-sector **Enabling Environment**Region(s) **National Significance****Relevance to NWPo**

As an essential approach to providing water sector professionals with i) improved, better organised management information and ii) timely and responsive decision making frameworks, §4.15 of the NWPo calls for a systematic, comprehensive overhaul and expansion of the sector's data systems and refined mandates for all institutions having a stake in water sector research.

**Purpose of Programme**

At present inadequate quality of data is a widespread problem. Planners generally spend too much time and resources collating and correcting datasets, but the results are seldom disseminated to other potential users, neither are the corrected data even fed back to source. Equally, the exchange of data is hampered by too many administrative barriers and an irrational desire for secrecy. Modern technology, which is increasingly accessible and understandable to Bangladeshi experts, facilitates improved use of data; but entrenched attitudes have to change if advantage is to be taken of new technology. Given that water resource planning and management requires a very wide range of information drawn from myriad institutional sources, this programme is intended to familiarise the many stakeholder institutions with the potential benefits that well organised, accessible data represents and to facilitate the realisation of that potential.

**Programme Outline**

Beginning with a process of consultations with all stakeholder institutions, principles of common standards; access protocols and data pricing options will be agreed and a proposal written. Simultaneously, and coordinated by WARPO, each water sector data-collecting agency will review its own collection and processing arrangements and thereafter an investment, training and operational plan will be drawn up. Both documents should be ready for presentation to the NWRD within eighteen months. Specific issues to be addressed will include i) data format compatibility especially with respect to the NWRD; ii) the establishment of a consolidated, rationalised observation network with minimal redundancies; iii) rationalised storage and retrieval systems with minimal redundancies; iv) pricing and copyrights structures; and, v) a review of the legal framework governing data access and dissemination.

## Financing Arrangements

Provision is kept for technical advisory support to WARPO costing Tk15M over two years. Further investment in field equipment on defined by the outcome of this programme will be borne under the relevant institutional capacity building programmes.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"><li>• A comprehensive proposal for the rationalisation of Bangladesh's water sector data resources under consideration by NWC</li></ul>	I1	<ul style="list-style-type: none"><li>• Registration of the document by NWC</li><li>• Proceedings of the NWC</li></ul>	2003
<ul style="list-style-type: none"><li>• All major databases functionally linked in a manner that avoids system redundancies</li></ul>	I2	<ul style="list-style-type: none"><li>• Database architecture</li></ul>	2004
<ul style="list-style-type: none"><li>• All water sector reports archived in digital format and available to all users in hard or soft copies</li></ul>	K	<ul style="list-style-type: none"><li>• Percentage of reports available in digital format</li></ul>	2004
<ul style="list-style-type: none"><li>• Development and management of water sector resources, institutions and infrastructure characterised by the use of reliable, well organised data and targeted adaptive research</li></ul>	D	<ul style="list-style-type: none"><li>• Data reliability</li><li>• Clarity of data</li><li>• Status of knowledge gaps</li></ul>	2020

## Institutional Arrangements

WARPO will be responsible for initiating and coordinating the programme, while the NWRC will be responsible for deliberating the results and thereafter setting the appropriate institutional mandates and ratifying the necessary regulations. It is anticipated however, that some 24 institutions will participate in the consultations.

## Existing Documentation

A Management Information System comprises part of the NWMP. It is supported by a suite of documents ('The WARPO MIS', 'The NWMP Projects Database User Manual', and 'The NWMP Programmes Database User Manual') which describe current capability; specifications for future expansion in line with policy as well as operation manuals for its various components. These documents should be both used and expanded during the programme; equally the current NWRD Phase III Workplan (2001-5) should be consulted. Finally, emerging documentation with respect to EGIS's proposals for blue accounting (EGIS Technical Note 15) should be considered and taken into account.

## Linkages

There is an operational link with Programmes ID 006 (WARPO Capacity Building), EE 008 (Water Resources Management Research and Development Studies) which will be important in defining typical data demand scenarios. Institutional linkages between the 24 stakeholder institutions will obviously be facilitated; but of specific importance among these will be EGIS, especially with respect to the blue accounting proposals referred to above.

## Risks and Assumptions

The main risk is that the data collecting agencies will fail to adequately cooperate in rationalisation of data collection and revision and enforcement of data standards. Further risks are lack of commitment to disseminate data and overcome past tendencies to hold information secret. WARPO and NWRC will need to work with all agencies concerned to overcome these risks.

**NWRD Improved Data Collection and Processing Facilities**Ref : **EE 007**

Cluster :	Enabling Environment		Region(s) :	All	
Focus/Foci :	Research and Information Management		Location :	Nationwide	
Start Year <sup>1</sup> :	2001	Duration <sup>2</sup> :	2 year(s)	Agency(s) Responsible :	WARPO (Lead) None (Supporting)
Short Description :	Given that water resource planning and management requires a very wide range of information drawn from myriad institutional sources, this programme is intended to familiarize the many stakeholder institutions with the potential benefits that well organized, accessible data represents and to facilitate the realization of that potential. Beginning with a process of consultations with all stakeholder institutions, principles of common standards; access protocols and data pricing options will be agreed and a proposal written. Other objectives include the establishment of one-stop data retrieval and the availability of all reports in digital format. This programme is relevant to the NWPo as it provides improved, better organised management of information, and is in keeping with the NWPo call for a systematic, comprehensive overhaul of the sector's data systems.				

<b>MIS Links</b>	Cost Calculation :	EE Programme costing.xls	Map :	EE 007 Map.jpg
	Disb't Schedule :	EE Programme costing.xls	Description :	EE 007 PgP.doc

Finance							
	Costs		Private	Funding (%)	Expected by		
				GoB	Beneficiaries	ProgrammeYear	
	Total Capital <sup>3</sup>		15.00 MTk	0%	100%	0%	2
	Ultimate Recurring		0.00 MTk/yr	n/a	n/a	n/a	n/a
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart			
	(dd)	(mm)	(yy)	Cost (MTk) ● Investment ○ Recurring — Total			
Status :	Identified						
Financial Base Year:	mid-2000						
Planned Expenditure (to date) :	0 MTk						
Actual Expenditure <sup>4</sup> (to date) :	0 MTk						

Programme Years	Investment (MTk)	Recurring (MTk)	Total (MTk)
0	0	0	0
1	14.5	0	14.5
2	14.5	0	14.5
3	14.5	0	14.5
4	14.5	0	14.5
5	14.5	0	14.5
6	14.5	0	14.5
7	14.5	0	14.5
8	14.5	0	14.5
9	14.5	0	14.5
10	14.5	0	14.5
11	14.5	0	14.5
12	14.5	0	14.5
13	14.5	0	14.5
14	14.5	0	14.5
15	14.5	0	14.5
16	14.5	0	14.5
17	14.5	0	14.5
18	14.5	0	14.5
19	14.5	0	14.5
20	14.5	0	14.5
21	14.5	0	14.5
22	14.5	0	14.5
23	14.5	0	14.5
24	14.5	0	14.5
25	14.5	0	14.5
26	14.5	0	14.5
27	14.5	0	14.5
28	14.5	0	14.5
29	14.5	0	14.5
30	14.5	0	14.5
31	14.5	0	14.5
32	14.5	0	14.5
33	14.5	0	14.5
34	14.5	0	14.5
35	14.5	0	14.5
36	14.5	0	14.5
37	14.5	0	14.5
38	14.5	0	14.5
39	14.5	0	14.5
40	14.5	0	14.5
41	14.5	0	14.5
42	14.5	0	14.5
43	14.5	0	14.5
44	14.5	0	14.5
45	14.5	0	14.5
46	14.5	0	14.5
47	14.5	0	14.5
48	14.5	0	14.5
49	14.5	0	14.5
50	14.5	0	14.5

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• A comprehensive proposal for the rationalisation of Bangladesh's water sector data resources under consideration by NWC	• Registration of the document by NWC • Proceedings of the NWC	NYD
• All major databases functionally linked in a manner that avoids system redundancies	• Database architecture	NYD
• All water sector reports archived in digital format and available to all users in hard or soft copies	• Percentage of reports available in digital format	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	EE 007
Title	NWRD Improved Data Collection and Processing Facilities

### Assumptions:

Taka/US\$	51.000	TA duration	2.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	6.0	20,000		6.1		
Senior National consultants (all-in rate)	p-m	24.0		150	3.6	0.0%	-
Mid-level National consultants (all-in rate)	p-m	25.0		90	2.3	0.0%	-
Sub-totals					12.0		-
Other general TA programme costs		25%			3.0		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					<b>15.0</b>		-
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>-</b>		-
<b>Overall Programme Costs</b>							
					<b>15.0</b>		-

Note:

Costs are for advisory support panel for WARPO only. Follow-up investments are included within capacity building programmes for different organisations.



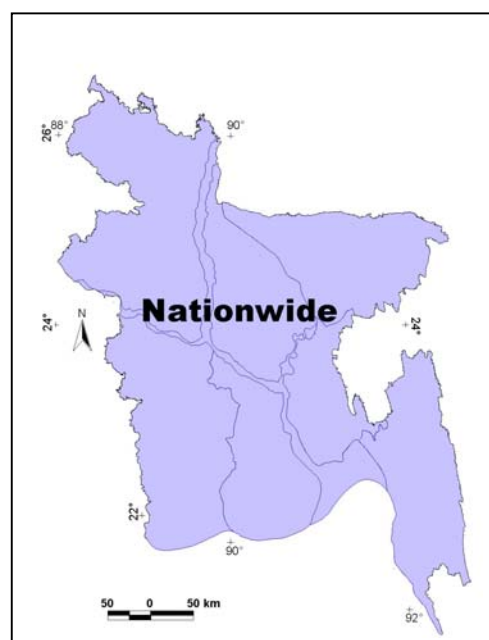
<b>Water Resources Management Research and Development Studies</b>	Ref: <b>EE 008</b>
--	--------------------

**Basic Data**NWMP Sub-sector      **Enabling Environment**Region(s)                      **National Significance****Relevance to NWPo**

§4.15 of the NWPo recognizes the importance contribution that well focused and coordinated research can play in facilitating the wise and sustainable use of water resources. In particular, the Policy calls for strengthened research capacity at water resource and agricultural institutions. It also prescribes focused research into important flood control and management; water resources management; sociological and institutional issues.

**Purpose of Programme**

Water sector research needs to be focused on areas that directly contribute to the improved performance of the sector and the sustainable use of the resource on which it depends. Consistent with the NWPo therefore, the NWMP development strategy studies identified a range of research needs and opportunities. Some of these are subsumed into specific programmes, others (such as those directed at the country's arsenic problem or coastal management) are ongoing. This programme is intended to provide a vehicle for those research programmes that do not fit into these two categories. Ten such programmes are proposed.

**Programme Outline**

Essentially the programme, which will span the remainder of the short and all of the medium term, will operationalise and support the following research programmes:

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• Models for groundwater availability and surface / groundwater interactions</li> <li>• Coastal sedimentation</li> <li>• Storm surge dynamics</li> <li>• Water tariff structures</li> <li>• Potential for arsenic to enter the food chain through irrigation</li> <li>• Impacts of climate change and sea-level rise</li> <li>• Indicators for the sustainable management of wetlands and sensitive areas</li> <li>• Economic and regulatory instruments for pollution control</li> </ul> | <ul style="list-style-type: none"> <li>• Groundwater monitoring throughout Bangladesh</li> <li>• Water management in polders</li> <li>• Monitoring technology for climate changes</li> <li>• Industrial pollution control measures and effects of subsidies</li> <li>• Impact of crop diversification on water resources</li> <li>• Managing social conflict in water resources management</li> <li>• Technology improvement for minor irrigation</li> </ul> |
|--|--|

## Financing Arrangements

The programme will cost some Tk800M and is appropriate for Government funding. For the purposes of programme preparation a uniform rate of annual disbursement of has been assumed throughout the programme's lifetime.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"><li>• A minimum of ten fully reported, demand driven water sector research studies</li></ul>	I1	<ul style="list-style-type: none"><li>• Terms of Reference</li><li>• Documents</li></ul>	2009
<ul style="list-style-type: none"><li>• Research playing a Key role in quinquennial NWMP updates</li></ul>	K	<ul style="list-style-type: none"><li>• Updated NWMP documents</li></ul>	2006
<ul style="list-style-type: none"><li>• Development and management of water sector resources, institutions and infrastructure characterized by the use of reliable, well organized data and targeted adaptive research</li></ul>	D	<ul style="list-style-type: none"><li>• Data reliability</li><li>• Clarity of data</li><li>• Status of knowledge gaps</li></ul>	2019

## Institutional Arrangements

The research will be coordinated and, where appropriate commissioned by WARPO. Stakeholder agencies will remain responsible for undertaking the specific studies, sometimes in consortia with others. They are expected to include:

SWMC	BARC	NGO's	BWDB	RRI	DPHE
DAE	DoE	CEGIS	BIDS	BADC	

## Existing Documentation

The research programmes suggested above were identified during the development strategy studies. None have been started at the time of writing, consequently there is no existing documentation.

## Linkages

There are obvious linkages with Programme EE 009 (Water Resources Management Long Term Research and Development) which this programme is intended to precede and inspire. Equally however, improved information facilities resulting from Programme EE 007 (NWRD Improved Data Collection and Processing Facilities) will play an important role during the implementation of this programme. Furthermore, since at least half of the proposed research studies will involve more than one institution or agency, the programme will result in helpful operational linkages between the various stakeholder institutions.

## Risks and Assumptions

There is a significant risk either due to lack of interest/motivation by the relevant institutions that some of the proposed research studies may never be implemented. Nonetheless, the programme is largely notional and it is reasonable to assume that un-disbursed funds can be reallocated to currently unforeseen lines of research according to demand.

**Water Resources Management Research and Development Studies**Ref : **EE 008**

Cluster :	Enabling Environment		Region(s) :	All	
Focus/Foci :	Research and Information Management		Location :	Nationwide	
Start Year <sup>1</sup> :	2001	Duration <sup>2</sup> :	8 year(s)	Agency(s) Responsible :	WARPO (Lead) None (Supporting)
Short Description :	NWPo §4.15 of the NWPo recognizes the important contribution that well focused and coordinated research can play in facilitating the wise and sustainable use of water resources. In particular, the Policy calls for strengthened research capacity at water resource and agricultural institutions. It also prescribes focused research into important flood control and management; water resources management; sociological and institutional issues. This programme comprises ten specific research programmes that are not contained within any other programmes, and that are not already ongoing.				

<b>MIS Links</b>	Cost Calculation :	EE Programme costing.xls	Map :	EE 008 Map.jpg
	Disb't Schedule :	EE Programme costing.xls	Description :	EE 008 PgP.doc

Finance						
	Costs	Private	Funding (%)	Beneficiaries	Expected by	
			GoB		ProgrammeYear	
	Total Capital <sup>3</sup>	800.00 MTk	0%	100%	0%	8
	Ultimate Recurring	0.00 MTk/yr	n/a	n/a	n/a	n/a
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart		
	(dd)	(mm)	(yy)			
Status :	Identified					
Financial Base Year:	mid-2000					
Planned Expenditure (to date) :						
Actual Expenditure <sup>4</sup> (to date) :						

Cost (MTk)

1000

800

600

400

200

0

0 5 10 15 20 25 30 35 40 45 50

Programme Years

● Investment ○ Recurring — Total

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• A minimum of ten fully reported, demand driven water sector research studies	• Terms of Reference	NYD
	• Documents	
• Research playing a Key role in quinquennial NWMP updates	• Updated NWMP documents	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
 5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	EE 008
Title	Water Resources Management Research and Development Studies

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	8.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Models for groundwater availability and surface and groundwater interactions					100.0	0.0%	-
2. Re-establishment of groundwater monitoring study areas					100.0	0.0%	-
3. Potential for arsenic to enter the food chain through irrigation					50.0	0.0%	-
4. Impact of crop diversification on water resources					50.0	0.0%	-
5. Impacts of climate change and sea-level rise					50.0	0.0%	-
6. Managing social conflict in water resources management					50.0	0.0%	-
7. Technology improvement for minor irrigation					100.0	0.0%	-
8. Indicators for sustainable management of wetlands and sensitive areas					200.0	0.0%	-
9. Industrial pollution control measures and effects of subsidies					50.0	0.0%	-
10. Economic and regulatory instruments for pollution control					50.0	0.0%	-
<b>Total Other Programme Costs</b>					800.0		-
<b>Overall Programme Costs</b>							
					800.0		-

Note

Provisonal estimates of R&D costs

## Water Resources Management Long Term Research and Development

Ref: EE 009

### Basic Data

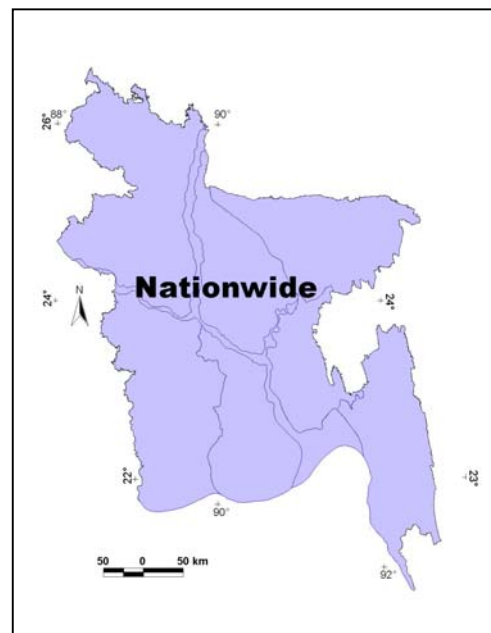
NWMP Sub-sector **Enabling Environment**Region(s) **National Significance**

### Relevance to NWPo

§4.15 of the NWPo recognizes the important contribution that well focused and coordinated research can play in facilitating the wise and sustainable use of water resources. In particular, the Policy calls for strengthened research capacity at water resource and agricultural institutions. It also prescribes focused water resources management; sociological and institutional issues.

### Purpose of Programme

Given that the NWMP has a 25 year timeframe, split into three phases, short medium and long term it would be neither possible nor wise to prescribe the long term research needs. Yet such needs will inevitably be encountered during implementation of the Plan, either as a result of problems that cannot be solved without responsive research or as spin-offs from the research activities of Programme EE 008. This programme simply provides for unspecified long term research.



### Programme Outline

No outline has been prepared at the time of writing and to have done so would have been premature until a clearer picture of needs emerges during the short and medium terms.

### Financing Arrangements

The programme is provisionally allocated some Tk1,700M and is appropriate for Government funding.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"><li>Water sector institutions engaged in commissioning or undertaking targeted adaptive research</li></ul>	I1	<ul style="list-style-type: none"><li>Institutional work plans and budgets</li><li>Research reports</li></ul>	2004
<ul style="list-style-type: none"><li>Bangladesh's water sector considered to represent a regional center of research excellence</li></ul>	K	<ul style="list-style-type: none"><li>International Research Collaborations</li><li>International recruitment or engagement of local researchers</li><li>Incoming study tours</li></ul>	2019
<ul style="list-style-type: none"><li>Development and management of water sector resources, institutions and infrastructure characterized by the use of reliable, well organized data and targeted adaptive research</li></ul>	D	<ul style="list-style-type: none"><li>Data reliability</li><li>Clarity of data</li><li>Status of knowledge gaps</li></ul>	2019

## Institutional Arrangements

Other than suggesting that WARPO will be responsible for coordinating and in some cases commissioning the research no institutions have been identified at the time of writing and to have done so would have been premature until a clearer picture of needs emerges during the short and medium terms.

## Existing Documentation

Given that initiation of this programme is not due until NWMP Year 10 (2009-2010), existing documentation is effectively non-existent at the time of writing. Nonetheless, many other NWMP programmes will generate a wealth of documentary sources which should be archived and digitized as they become available. Of these it is inevitable that many will inspire, complement or inspire research activities in the long term.

## Linkages

There are obvious linkages with Programme EE 008 (Water Resources Management Research and Development Studies) which this programme is intended to follow. Equally however, improved information facilities resulting from Programme EE 007 (NWRD Improved Data Collection and Processing Facilities).

## Risks and Assumptions

There is a risk that the budget, regardless of size, might be viewed as a limit on research activities, thereby stifling any momentum that might have been achieved. It is assumed however, that as the quality of research in Bangladesh increased, fresh demands will result in fresh funding, ideally on a contract basis.

**Water Resources Management Long Term Research and Development**Ref : **EE 009**

Cluster :	<b>Enabling Environment</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Research and Information Management</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2009</b>	Duration <sup>2</sup> :	<b>17 year(s)</b>
		Agency(s) Responsible :	<b>WARPO</b> (Lead) <b>None</b> (Supporting)
Short Description :	The NWPO recognizes the important contribution that well focused and coordinated research can play in facilitating the wise and sustainable use of water resources. In particular, the Policy calls for strengthened research capacity at water resource and agricultural institutions. This programme simply provides funds for unspecified research in the long term.		

<b>MIS Links</b>	Cost Calculation : EE Programme costing.xls	Map : EE 009 Map.jpg
	Disb't Schedule : EE Programme costing.xls	Description : EE 009 PgP.doc

<b>Finance</b>	Costs	Private	Funding (%)	Expected by
			GoB	Beneficiaries
Total Capital <sup>3</sup>	<b>1,700.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>
Ultimate Recurring	<b>0.00</b> MTk/yr	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>		
Status :	<b>Identified</b>			
Financial Base Year:	<b>mid-2000</b>			
Planned Expenditure (to date) :	MTk			
Actual Expenditure <sup>4</sup> (to date) :	MTk			

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Water sector institutions engaged in commissioning or undertaking targeted adaptive research	• Institutional work plans and budgets • Research reports	NYD
• Bangladesh's water sector considered to represent a regional centre of research excellence	• International Research Collaborations • International recruitment or engagement of local researchers • Incoming study tours	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

## National Water Management Plan

### Programme Costing Sheet

Programme Ref	EE 009
Title	Water Resources Management Long Term Research and Development

#### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	17.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Provision for research and development in the long-term					1,700.0	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					1,700.0		-
<b>Overall Programme Costs</b>							
					1,700.0		-



## Raising Public Awareness in the Wise Use and Management of Water

Ref: EE 010

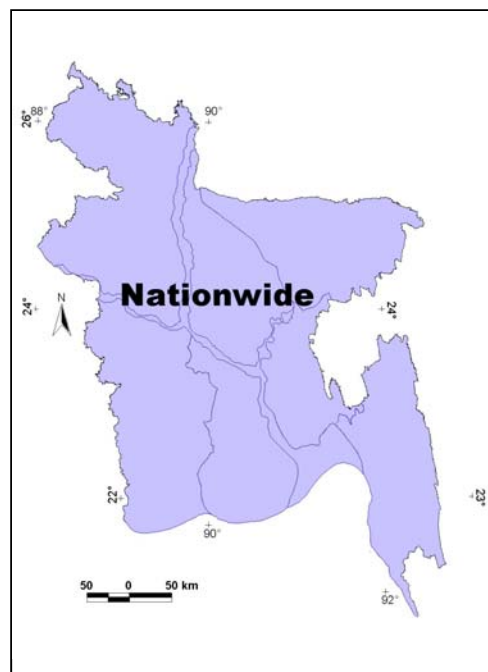
### Basic Data

NWMP Sub-sector      **Enabling Environment**

Region(s)              **Nationwide**

### Relevance to NWPo and other Policies:

§4.2.c of the NWPo requires planning methodologies that promote people's participation while the preamble to §4.16 stresses that such participation should be i) “an integral part of water resources management, at all stages of the project cycle”; and ii) increase “the role of stakeholders and the civil society in decision making and implementation of water projects”. In order to achieve this, line agencies and local government institutions are required to “impart a precise awareness of the issues and an unambiguous understanding of their role in water management”



### Purpose of Programme

Clearly, the NWPo is intended to involve ordinary water users much more in the planning, management and exploitation of Bangladesh's water resources than hitherto. This represents a significant challenge given that most water users have viewed water as a limitless and valueless commodity to be used at will, not only for consumption purposes but also as a sink for waste products of all kinds. The new paradigm however, requires them to re-conceptualise water as regulated public good and one which, by mismanagement, can render life more difficult, rather than easier. If this strategy is to be successful, a major public awareness campaign will be needed if people are to be sensitized as to the value of their water; more productive ways to use it and the imperatives of protecting it. Furthermore, the new legal, policy and institutional framework will have to be explained to them along with their responsibilities within it and towards it, all in the context of why such changes are considered necessary.

### Programme Outline

The programme will run for ten years and will involve the establishment of a specialist unit within WARPO that will identify key areas where publicity and education on participatory water management issues amongst civil society is required, and facilitate dissemination of information on these through various media. The Unit will work with all agencies in Government directly and indirectly involved in water resources development and management, and assist each agency as appropriate to prepare and disseminate information on water resources matters. Funds will be provided to the unit to prepare core material and to help other agencies in preparing their own specific material. The cost of disseminating the information, including media campaigns whenever appropriate, will normally be borne by the agency in question, with the preparation costs subsidised as above.

The unit's responsibilities will include monitoring the impact of information campaigns, and identifying gaps and potential new issues to address on a rolling basis. The unit will work also with NGOs and be responsive to issues raised by all sectors of the community, subject to these being within the Government's policy and strategic frameworks. It is anticipated that the unit will have only a small core staff, and will employ suitably qualified subject matter specialists and private sector advertising companies on a contract basis to prepare material. In order to ensure the relevance and quality of the unit's outputs, a steering committee in the form of an editorial board should be established with programme funds and comprise eminent specialists from a broad spread of backgrounds, both from within and from outside Government, drawing particularly upon academia.

## Financing Arrangements

The programme is expected to cost some Tk170M over ten years plus one-off establishment costs of Tk10.0 million. It is suitable for GoB expenditure, especially if it can be partially or wholly financed by revenues accruing from water fees.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Dissemination Unit established at WARPO	I1	• Job descriptions	2002
• Sensitisation campaign prepared	I1	• Contracts of employment	2003
• Sensitisation campaign agreed by GoB	I3	• The Plan document	2003
• Effective public demand for sustainable water resources management	K	• Formal agreement	2012
• User commitment to the sustainable and wise use of Bangladesh's water resources	D	• Knowledge, Attitude and Practices (KAP) surveys	2025
		• Knowledge, Attitude and Practices (KAP) surveys	

## Institutional Arrangements

The Unit will be established within WARPO. It will retain close links with all relevant agencies, NGOs and stakeholders.

## Existing Documentation

No relevant existing documentation has been identified. It is likely however that searches of international sources and on-line sources will identify many helpful texts

## Linkages

Links will be needed with other awareness-raising programmes covering water developments, environment, people's participation, institutional reform and empowerment of local people through measures for government reform such as good governance initiatives.

## Risks and Assumptions

The principal risks are three-fold. First, the quality of the material produced by the Unit may inadequate, and cause dissemination of mis-information on crucial issues. Secondly, the dissemination message may be regarded simply as more political propaganda. To mitigate against these risks, the editorial board has been included within the Unit's set-up, and a substantial

recurring budget provided to pay for the costs of professional campaign designers. The third risk however, is that the necessary long-term funding will not be maintained until the end of the programme, and that the experience and capability built in the initial years will be dissipated. It is assumed that the continuing growth and encouragement of local pressure groups such as BELA and others will confirm both the usefulness and continuing demand for the programme.

**Raising Public Awareness in the Wise Use and Management of Water**Ref : **EE 010**

Cluster :	Enabling Environment		Region(s) :	All	
Focus/Foci :	Media and Awareness Raising		Location :	Nationwide	
Start Year <sup>1</sup> :	2002	Duration <sup>2</sup> :	20 year(s)	Agency(s) Responsible :	WARPO (Lead) Various (Supporting)
Short Description :	Public awareness campaigns by all relevant agencies in the water sector are to be seen as an important vehicle for the active promotion of all the key components in the NWPo and the NWMP, fostering increased consultation and participation, and increased awareness of all water sector issues at local, regional and national levels. This programme will consider, assess and implement various publicity campaigns around the country to this end, such as radio broadcasts, newspaper articles, cinema advertising, promotional videos, rural trade fairs, extension services, etc.				

<b>MIS Links</b>	Cost Calculation :	EE Programme costing.xls	Map :	EE 010 Map.jpg
	Disb't Schedule :	EE Programme costing.xls	Description :	EE 010 PgP.doc

<b>Finance</b>					
	Costs	Private	Funding (%)	Expected by	
			GoB	Beneficiaries	ProgrammeYear
Total Capital <sup>3</sup>	<b>180.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>20</b>
Ultimate Recurring	<b>0.00</b> MTk/yr	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>
Date of Data :	<b>31 07 01</b>	<b>Stacked Cumulative Cash Flow Chart</b>			
	(dd) (mm) (yy)				
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Dissemination Unit established at WARPO	• Job descriptions • Contracts of employment	NYD
• Sensitisation campaign prepared	• The Plan document	NYD
• Sensitisation campaign agreed by GoB	• Formal agreement	NYD
• Effective public demand for sustainable water resources management	• Knowledge, Attitude and Practices (KAP) surveys	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	EE 010
Title	Raising Public Awareness in the Wise Use and Management of Water

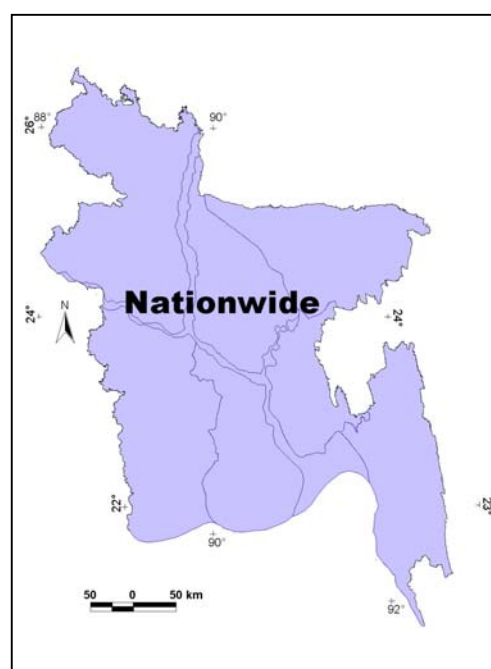
### Assumptions:

Taka/US\$	51.000	TA duration	10.0	years	All prices in mid-2000 values
		Investment duration	10.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	6.0	20,000		6.1		
Senior National consultants (all-in rate)	p-m	120.0		150	18.0	0.0%	-
Mid-level National consultants (all-in rate)	p-m	240.0		90	21.6	0.0%	-
Sub-totals					45.7		-
Other general TA programme costs		25%			11.4		-
Specific other TA programme costs	Editorial Board fees etc				12.8	0.0%	-
<b>Total TA Costs</b>					<b>70.0</b>		-
<b>Other Programme Costs</b>							
1. Equipment for media unit and replacement/upgrades					10.0	0.0%	-
2. Campaign core material production costs	10 yrs @ TkM		10 per yr		100.0	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>110.0</b>		-
<b>Overall Programme Costs</b>					<b>180.0</b>		-

**Private Sector Participation in Water Management**Ref: **EE 011****Basic Data**NWMP Sub-sector      **Enabling Environment**Region(s)              **National Significance****Relevance to NWPo**

The private sector is expected to play an important role in the future management and operation of water resources and water services in Bangladesh. Government policy aims to forge a constructive partnership in order to access the capital resources, management expertise, and performance efficiency of the private sector. The NWPo states that “Public water institutions will, to the extent feasible, use private providers of specific water resources in carrying out their mandates, giving preference to beneficiary groups and organisations” and “Public water schemes, barring municipal schemes, with command area of over 5000 ha will be gradually placed under private management, through



leasing, concession or management contract under open competitive bidding procedures, or jointly managed by the project implementing agency along with local government and community organisations.” The National Policy for Safe Water Supply and Sanitation (NPSWSS) reinforces these objectives by stating that “Many functions of the water supply and sanitation sector can be undertaken by private organisations. This will promote increased service coverage and thereby lessen the burden on the government. It is necessary to strengthen an administratively and financially enabling environment for the private sector to participate and contribute to sector development. Involvement of the private sector is essential to establish a closer relationship between the quality of services of the sector and its financial viability.” NPSWSS also states that “A guideline on private sector participation in the sector will be prepared by the government.”

**Purpose of Programme**

During the 1990s, the private sector successfully penetrated the minor irrigation sector and more recently the rural sanitation sector. The evidence suggests that this has led to substantial improvements in sector performance and service coverage. Therefore, in line with policy, GoB intends to broaden the scope and coverage of Private Sector Participation (PSP) in the water sector in order to: reduce the pressure on the Government’s capital and revenue budgets; increase access to private sector capital resources and management expertise; and improve sector efficiency and service delivery. The programme will give specific attention to the opportunities for private sector investment in partnership with community-based organisations in rural and peri-urban areas. In addition, the Government will complement this initiative with parallel and supporting programmes under the NWMP in: Regulation and Economic Instruments (EE 005); Public Awareness Raising (EE 010); Water and Environment Funds (EE 012); and Alternative Financing Methods (EE 013).

The programme will also build on and extend the experience of three ongoing projects which include components for PSP in the water sector, namely:

- (a) Private Sector Infrastructure Development Project (PSIDP - supported by the World Bank and UK) which operates through the Infrastructure Development Company Limited (IDCOL) and offers secured loans to the private sector for justified and viable infrastructure projects, including water supply and urban environmental services;
- (b) the Infrastructure Investment Facilitation Centre (IIFC - supported by UK and Canada) provides advice and training to both the public and private sectors in order to develop private investment in infrastructure; and
- (c) 18 Towns Municipal Services Project (supported by Denmark) which includes a component to promote PSP in municipal water services in the form of management contracts and BOT schemes.

### **Programme Outline**

Preparation of the PSP Manual will be commissioned within the next two (2) years. It is expected that the project programme will cover the following major topics, among others:

- (a) Review of Bangladesh and international experience with PSP;
- (b) Analysis of alternative PSP strategies and options for the water sector;
- (c) Results of wide-ranging stakeholder consultation process;
- (d) Guidelines for a Regulatory Framework (see: ID 002, EE 004 and EE 005);
- (e) Detailed PSP Manual; and
- (f) Recommendations for a series of time-bound Sub-Sector Action Plans for the water sector.

The first few years of the subsequent implementation programme will demonstrate GoB's serious intent to push forward with private sector participation.

### **Financing Arrangements**

The proposed PSP Programme is suitable for GoB funding with the support of the international donor community. The estimated funding requirement for the PSP Study and Manual preparation is Tk35M at mid-2000 prices.

One of the principal outputs of the study will be a series of Sub-Sector Action Plans. It is expected that these plans will be costed, and will probably require additional investment funds to support the proposed PSP process and encourage private firms to offer their expertise, especially Bangladeshi companies.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Study of options and opportunities for Private Sector Participation	I1	• Report approved	2006
• Manual for Private Sector Participation	I2	• Report approved	2007
• Government acceptance of sectoral reform preconditions necessary to facilitate the private sector's participation	I3	• Relevant Government orders issued	2009
• Full but regulated access to water sector investment and service delivery opportunities to the private sector	K	• Legal framework ratified and promulgated • Fiscal arrangements promulgated	2021
• Bangladesh's water sector costs shared between public, private and grass roots entities according to comparative advantage	D	• Government funding of water sector development and management (which should reduce as an overall % of water sector costs)	2021

## Institutional Arrangements

The Ministry of Water Resources, in co-ordination with the Ministry of Finance, will be responsible for commissioning the PSP Study and Manual preparation. WARPO will be the executing agency, and be responsible for preparing the Terms of Reference and other background documentation, possibly in collaboration with an international donor.

Institutional arrangements for the implementation of the Sub-Sector Action Plans will depend on the detailed recommendations of the PSP Study and Manual.

## References and Documentation

(a) Chapters 5, 7 and 8, Development Strategy Report, March 2001

(b) Main references:

- Bangladesh: Private Sector Infrastructure Development Project
- Strategy Study to Mobilise Finance and Increase Efficiency in the Dhaka Water Supply and Sewerage Sector, Halcrow Management Sciences Limited, August 1998

(c) National Water Resources Database in WARPO

## Linkages

The programme for private sector participation (PSP) is a cross-cutting issue and should be closely linked and co-ordinated with other NWMP programmes, namely: (a) ID 003 (FCD and FCD/I Management Rationalisation); (b) ID 001 (Local Government Needs Assessment for Water Management); (c) ID 005 (Local Government Capacity Building for Water Management); (d) ID 002 (Independent Regulatory Bodies for Water Supply and Sanitation Service Sector); (e) EE 002 (Field Testing of Participatory Management Models); (f) EE 004 (Project Preparation Procedures - Guidelines and Manuals); (g) EE 005 (Regulation and Economic Instruments); (h) EE 010 (Raising Public Awareness in the Wise Use and Management of Water); (i) EE 012 (Water and Environment Funds); (j) EE 013 (Alternative Financing Methods); and (k) EA 010 (Public Awareness Raising and Empowerment in respect of Environmental Issues).

Preparation and development of the PSP programme should also be co-ordinated with ECNWRC, WARPO, Ministry of Finance (MoF), Ministry of Industry (MoI), Ministry of Agriculture (MoA), Ministry of Environment and Forests (MoEF), Ministry of Water Resources



(MoWR), Ministry of Local Government, Rural Development and Co-operatives (MoLGRDC), Bangladesh Water Development Board (BWDB), Department of Public Health Engineering (DPHE), Local Government Engineering Department (LGED), Department of Environment (DoE), DWASA, CWASA, Local Government authorities, NGOs and other stakeholders.

Finally, it is expected that wide-ranging consultations will take place with the Private Sector in Bangladesh and internationally.

### **Risks and Assumptions**

The risks associated with the commissioning and execution of the proposed PSP Study and Manual are minimal, providing a suitable international donor partner is identified and well qualified international consultants are engaged to carry out the work. The main risks will arise after the study and manual have been completed. They will fall into two categories: institutional and financial. The institutional risks are twofold: firstly, whether GoB will have the real political will and commitment to carry out the PSP programme and provide the necessary stable framework which will encourage the private sector; and secondly, whether government line agencies will provide effective support and co-operation. The NWPo and NPSWSS give unequivocal statements that PSP is an integral part of water sector policy; therefore, GoB must give sustained support to an effective and robust public-private partnership. In this context, good governance and parallel implementation of the other EE Programmes will be crucial factors. There are also two important financial risks: firstly, that the private sector (domestic and international) may not be prepared to commit substantial capital resources and sufficient management expertise to the Bangladesh water sector because of the inherent high risks and poor past performance; and secondly, the historical resistance to full cost recovery pricing and effective revenue collection, especially in the water supply and sanitation sector. GoB is aware of these issues and has to demonstrate clear intent that the ethos of inefficiency and financial weakness will change. The potential consequences of inaction are that the water sector will be seriously under-funded and services throughout the sector will continue to decline.

**Private Sector Participation in Water Management**

Ref :

**EE 011**

Cluster :	<b>Enabling Environment</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Promoting Private Sector Participation</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>2 year(s)</b>
		Agency(s) Responsible :	<b>WARPO</b> (Lead) None (Supporting)
Short Description :	One of the main objectives of the NWPo is to "...improve the investment climate for the private sector in water development and management" (NWPo §3.01e) To this end, the ongoing Infrastructure Development Company Ltd. (IDCOL) has already been established and provides 'top-up' funds to private led projects. This programme continues in the same vein by promoting the creation of a legal and regulatory framework to aid investor/provider confidence, and also in improving access of the rural and urban poor to adequate credit facilities. Special tax/duty privileges to attract foreign investment to the water sector, and establishment and public awareness raising of consumer rights in relation to private water supply schemes will also be undertaken.		

<b>MIS Links</b>	Cost Calculation :	EE Programme costing.xls	Map :	EE 011 Map.jpg
	Disb't Schedule :	EE Programme costing.xls	Description :	EE 011 PgP.doc

<b>Finance</b>					
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>35.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>2</b>
Ultimate Recurring	<b>0.00</b> MTk/yr	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Study of options and opportunities for Private Sector Participation	• Report approved	NYD
• Manual for Private Sector Participation	• Report approved	NYD
• Government acceptance of sectoral reform preconditions necessary to facilitate the private sector's participation	• Relevant Government orders issued	NYD
• Full but regulated access to water sector investment and service delivery opportunities to the private sector	• Legal framework ratified and promulgated Fiscal arrangements promulgated	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	EE 011
Title	Private Sector Participation in Water Management

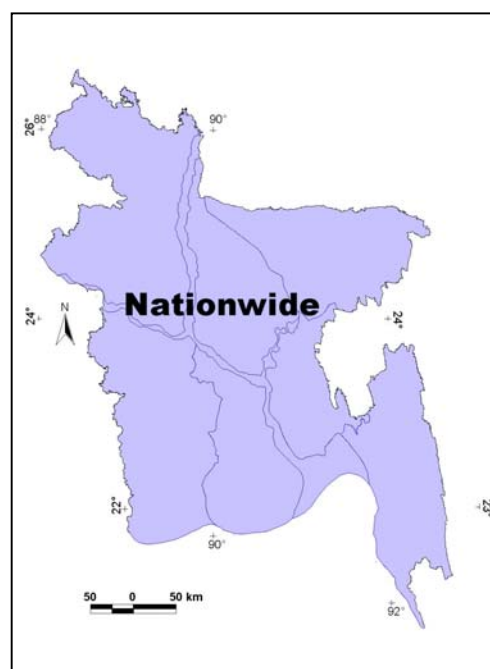
### Assumptions:

Taka/US\$	51.000	TA duration	1.5	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	18.0	20,000		18.4		
Senior National consultants (all-in rate)	p-m	28.0		150	4.2	0.0%	-
Mid-level National consultants (all-in rate)	p-m	34.0		90	3.1	0.0%	-
Sub-totals					25.6		-
Other general TA programme costs		25%			6.4		-
Specific other TA programme costs	Seminars and conferences				3.0	0.0%	-
<b>Total TA Costs</b>					<b>35.0</b>		-
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-
<b>Overall Programme Costs</b>							
					<b>35.0</b>		-

**Water and Environment Funds**Ref: **EE 012****Basic Data**NWMP Sub-sector      **Enabling Environment**Region(s)              **National Significance****Relevance to NWPo**

The NWPo does not make any direct statements about the creation of water and environment funds to support appropriate water management initiatives in Bangladesh. However, it is implicit in the policy that capital funds will be allocated to meet the investment needs identified in the NWMP. The proposed establishment of water and environment funds could offer a suitable financial vehicle to channel capital resources into specific areas of the water sector which may require grants, subsidies or soft loans. Indeed, the magnitude of the total capital investments required by the NWMP strongly indicates that GoB should examine and pursue a wide range of funding mechanisms and investment avenues.

**Purpose of Programme**

The purpose of the programme will be twofold: (a) to examine the potential for and viability of establishing water and environment funds in Bangladesh; and (b) to prepare an operating manual, management plan and implementation schedule for the launch and operation of the fund(s). The NWMP has identified a number of potential funding sources and recipients, as follows:

**(a) Potential sources of funding:**

- Percentage surcharge on all water, wastewater and environmental tariffs and charges
- Contributions from beneficiaries
- Contributions from local NGOs, charities and the private sector
- Contributions from central and local government
- Contributions from international agencies and donors
- Preferential credit lines from manufacturers and suppliers
- Preferential loans and overdraft facilities from local banks
- Repayment of “soft” and “hard” loans
- Others

**(b) Potential recipients of funding:**

- Arsenic mitigation in rural areas and towns
- Community-based initiatives in rural and peri-urban areas (water supply, sanitation, flood protection and drainage)
- Private sector initiatives in rural and peri-urban areas (water supply and sanitation)
- Community-based initiatives in minor irrigation

- Industrial wastewater treatment and control in urban areas
- Clean-up of pollution in specified water bodies
- Other water management initiatives

It is envisaged that the fund(s) will focus primarily on small to medium investments in the water sector. The WEF would provide a defined proportion of the capital requirements (e.g. 10% to 50%) of each approved project, providing: (a) it conforms with the NWPo and related policies; (b) conforms with the NWMP and its objectives; (c) the project beneficiaries have secured the rest of the required capital funds; and (d) the project beneficiaries have a financially sustainable O&M programme. All projects which apply for capital support from the fund(s) will be screened and evaluated in accordance with the specifications in the WEF Manual.

Water and environment funds (WEF) exist in many countries and are operated successfully for the direct benefit of sustainable water resources management. International experience indicates that the fund(s) should be operated in an independent and transparent manner if the objectives of the NWPo are to be realised for the benefit of the people of Bangladesh, especially the poor and disadvantaged communities. Therefore, the proposed organisation and management of the fund(s) will be crucial in securing the confidence of the target beneficiaries and making a long term sustainable contribution to the development of the water sector.

The Government will complement this initiative with parallel and supporting programmes under the NWMP in: Regulatory and Economic Instruments (EE 005); Public Awareness Raising in Water Management (EE 010); Private Sector Participation in Water Management (EE 011); and Alternative Financing Methods for Water Management (EE 013). The issue of water and environment funds is also directly relevant to the programmes for Towns and Rural Areas, Major Cities, Agriculture and Water, and Environment and Aquatic Resources.

### **Programme Outline**

The study and manual on Water and Environment Funds (WEF) will be commissioned within the next two (2) years. It is expected that the project programme will cover the following major topics, among others:

- (a) Review of international experience in WEFs;
- (b) Analysis of alternative WEF strategies and options for the water sector;
- (c) Institutional aspects and implications;
- (d) Results of wide-ranging stakeholder consultation process;
- (e) Detailed WEF Manual; and
- (f) Recommendations for a time-bound Action Plan for implementation.

The first few years of the subsequent implementation programme will demonstrate GoB's serious intent to push forward with the effective use and application of water and environment funds.

### **Financing Arrangements**

The proposed programme (study, manual and implementation plan) for Water and Environment Funds is suitable for GoB funding with the support of the international donor community. The estimated funding requirement is Tk40M at mid-2000 prices.

One of the principal outputs of the study will be an Action Plan for implementation. It is expected that the plans will be costed, and will probably require additional capital funds to support the phased implementation of the proposed WEFs, including: regional presentations; public awareness raising; training; and specific detailed individual studies.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"> <li>Studies of options for water and environment funds</li> </ul>	I1	<ul style="list-style-type: none"> <li>Reports issued</li> </ul>	2006
<ul style="list-style-type: none"> <li>Options agreed by Government</li> </ul>	I2	<ul style="list-style-type: none"> <li>GoB agreement</li> </ul>	2011
<ul style="list-style-type: none"> <li>Water and Environment Funds</li> </ul>	I3	<ul style="list-style-type: none"> <li>The funds themselves</li> </ul>	2011
<ul style="list-style-type: none"> <li>Increased pollution clean up and arsenic mitigation catalysed by grants and subsidies</li> </ul>	K	<ul style="list-style-type: none"> <li>Impact survey reports</li> </ul>	2013
<ul style="list-style-type: none"> <li>Bangladesh's water sector costs shared between public, private and grass roots entities according to comparative advantage</li> </ul>	D	<ul style="list-style-type: none"> <li>Government funding of water sector development and management (which should reduce as an overall % of water sector costs)</li> </ul>	2023

## Institutional Arrangements

The Ministry of Water Resources (MoWR), in co-ordination with the Ministry of Finance and Ministry of Environment and Forests, will be responsible for commissioning the study for Water and Environment Funds. WARPO will be the executing agency, and be responsible for preparing the Terms of Reference and other background documentation, possibly in collaboration with an international donor.

Institutional arrangements for the implementation of the action plan on Water and Environment Funds will depend on the detailed recommendations of the proposed study.

## References and Documentation

- (a) Chapters 5, 7, 8 and 10, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

## Linkages

The programme for Water and Environment Funds (WEF) is a cross-cutting intervention and should be closely linked and co-ordinated with other NWMP programmes, namely: (a) ID 003 (FCD and FCD/I Management Rationalisation); (b) ID 001 (Local Government Needs Assessment for Water Management); (c) ID 005 (Local Government Capacity Building for Water Management); (d) ID 002 (Independent Regulatory Bodies for Water Supply and Sanitation Service Sector); (e) EE 002 (Field Testing of Participatory Management Models); (f) EE 004 (Project Preparation Procedures - Guidelines and Manuals); (g) EE 005 (Regulatory and Economic Instruments); (h) EE 010 (Raising Public Awareness in the Wise Use and Management of Water); (i) EE 011 (Private Sector Participation in Water Management); (j) EE 013 (Alternative Financing Methods); and (k) EA 010 (Public Awareness Raising and Empowerment in respect of Environmental Issues).

Preparation and development of the WEF programme should also be co-ordinated with ECNWRC, Ministry of Industry (MoI), Ministry of Agriculture (MoA), Ministry of Local Government, Rural Development and Co-operatives (MoLGRDC), Bangladesh Water

Development Board (BWDB), Department of Public Health Engineering (DPHE), Local Government Engineering Department (LGED), Department of Environment (DoE), Local Government authorities, NGOs, the private sector and other stakeholders.

### **Risks and Assumptions**

The risks associated with the commissioning and execution of the proposed WEF Study and Manual are minimal, providing a suitable international donor partner is identified and well qualified international consultants are engaged to carry out the work. The main risks will arise after the study and manual have been completed. They will fall into two categories: institutional and financial. The institutional risks are twofold: firstly, whether GoB will have the real political will and commitment to carry out the WEF programme; and secondly, whether government line agencies and enterprises will provide effective support and co-operation to implement the proposals. On the other hand, the future pressure on the GoB investment budget will be so great that the Government must adopt a constructive approach to new sources of capital funds for the water sector. In this context, parallel co-ordination and implementation of the other EE Programmes will be crucial. The main financial risk is that the WEF programme will not be managed effectively, resulting in inefficient use of funds and loss of confidence by contributing stakeholders and potential beneficiaries. In these circumstances, the programme is likely to collapse. GoB should be aware of this risk and the concomitant need for an autonomous or semi-autonomous organisation to manage the fund(s).

**Water and Environment Funds**

Ref :

**EE 012**

Cluster :	<b>Enabling Environment</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Development Finance</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2004</b>	Duration <sup>2</sup> :	<b>2 year(s)</b>
		Agency(s) Responsible :	<b>WARPO</b> (Lead) <b>MoEF</b> (Supporting)
Short Description :	Regulatory and economic instruments are an important part of demand management in a modern decentralized water sector. This programme is intended to broaden the scope and increase the utility and effectiveness of such instruments in Bangladesh particularly those pertaining to the abstraction of both surface and groundwater; arsenic mitigation, effluent scrubbing and cost recovery across the board.		

<b>MIS Links</b>	Cost Calculation :	EE Programme costing.xls	Map :	EE 012 Map.jpg
	Disb't Schedule :	EE Programme costing.xls	Description :	EE 012 PgP.doc

<b>Finance</b>	<div>Costs</div> <div>Private</div> <div>Funding (%)</div> <div>GoB</div> <div>Beneficiaries</div> <div>Expected by</div> <div>ProgrammeYear</div>				
Total Capital <sup>3</sup>	<b>40.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>2</b>
Ultimate Recurring	<b>0.00</b> MTk/yr	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b> 			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Studies of options for water and environment funds	• Reports issued	NYD
• Options agreed by Government	• GoB agreement	NYD
• Water and Environment Funds	• The funds themselves	NYD
• Increased pollution clean up and arsenic mitigation catalysed by grants and subsidies	• Impact survey reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done



# National Water Management Plan

## Programme Costing Sheet

Programme Ref	EE 012
Title	Water and Environment Funds

### Assumptions:

Taka/US\$	51.000	TA duration	1.5	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	18.0	20,000		18.4		
Senior National consultants (all-in rate)	p-m	28.0		150	4.2	0.0%	-
Mid-level National consultants (all-in rate)	p-m	34.0		90	3.1	0.0%	-
Sub-totals					25.6		-
Other general TA programme costs		25%			6.4		-
Specific other TA programme costs	Seminars and conferences				8.0	0.0%	-
<b>Total TA Costs</b>					<b>40.0</b>		-
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-
<b>Overall Programme Costs</b>							
					<b>40.0</b>		-

Note:

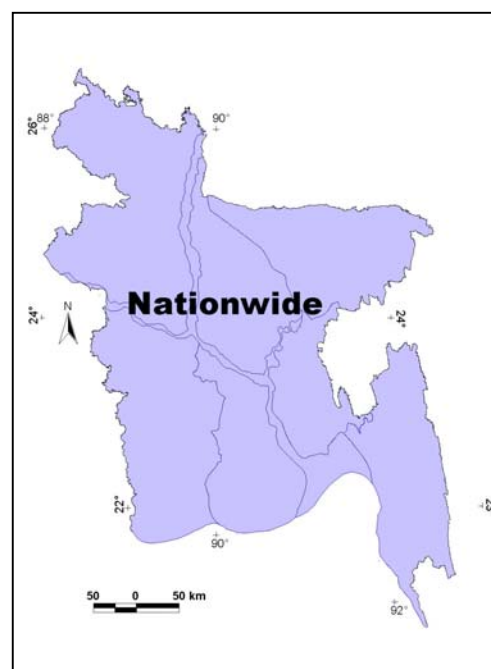
Cost estimate for study phase only. Investment costs are effectively included in other programme costs, and are not included here to avoid duplication.

**Alternative Financing Methods for Water Management**

Ref: EE 013

**Basic Data**NWMP Sub-sector      **Enabling Environment**Region(s)              **National Significance****Relevance to NWPo**

The NWPo does not make any direct statements about the methods and options for the capital financing of policy objectives and the NWMP itself. It is implicit that funds will be made available. However, given the magnitude of the total investment required to implement the NWMP, it is probable that GoB will have great difficulty in raising all of the necessary capital funds. Therefore, it is important that GoB should examine and pursue Alternative Financing Methods (AFM) for Water Management.

**Purpose of Programme**

The availability of and access to adequate capital resources will be one of the major challenges for the effective implementation of the NWMP. In line with the NWPo, it is GoB's intention to explore all options with an open mind and with a clear commitment to make the water sector financially robust, viable and sustainable. Specific attention will be given to mobilising local capital resources with the active involvement of local communities and the private sector. For these objectives to be achieved, the Government needs a coherent long term financing strategy which will attract domestic and international resources from both the public and private sectors. The strategy should be based on a thorough examination and quantification of the alternatives. It also means that the financing strategy must be fully integrated with the main institutional and financial reforms which the Government is committed to by the NWPo and the officially adopted Development Strategy for NWMP. Without this essential framework and evidence of marked performance improvements within the sector, the Government will find it difficult to "sell" the proposed financing strategy.

Traditionally, water infrastructure (especially urban water supply and sewerage) have been regarded as public services to be provided by the state, often based on government investment grants and subsidies. With the increasing pressure on GoB's investment budget, the flow of financial resources to the water sector has declined and may continue unless new financing methods and capital markets are identified and attracted to invest in the sector. However, this initiative will only succeed if the Government pushes forward with the institutional and financial reforms which are set out in the NWPo and the NWMP.

The purpose of the programme will be to: (a) prepare a study of alternative financing methods; and (b) outline an action plan to implement the recommendations. The NWMP has identified a range of potential local and international funding sources, many of which are particularly applicable to the water supply and sanitation sector:

(a) Local funding sources:

- Local community funds - financed by one-off or periodic contributions from beneficiaries.
- Development agencies with local or regional branches - lending small sums of money or channelling grants for local community schemes.
- Water and environment funds - grants, subsidies and loans from new fund(s) to be set up under Programme EE 012.
- Local commercial banks and micro-finance institutions - lending small to medium sums of money for local community and municipal schemes.
- Pension and insurance funds - lending medium to large sums of money for medium to large schemes. This mechanism has been used with some success in India.
- Private sector companies - encouraged to enter the water sector to finance and operate small to medium water supply projects (see: Programme EE 011).
- Municipal bonds - the development of a municipal bond system would provide direct access to capital markets for public service delivery agencies. Municipal bond markets are being developed in China and India.
- Local and municipal government - loans and grants to small, medium and large schemes.
- Central government - loans and grants which could be channelled through local and municipal governments, development agencies, local banks, and water and environment funds (see: Programme EE 012). Limited government investment funds could also be leveraged to stimulate improvements in sector performance e.g. incentive funds to induce good municipal practice; grants linked to financial and tariff reforms; and funds linked to commercial credits or bank loans.

(b) International funding sources:

- Multilateral development banks and institutions - the major international development agencies are already closely involved in the water sector in Bangladesh, but future co-operation is likely to be dependent on firm commitments to effective institutional and financial changes in the sector.
- Bilateral donor agencies - many countries have had substantial aid programmes in the water sector. This is expected to continue, but with increased emphasis on the poor, community participation and institutional/financial improvements.
- International NGOs - expected to remain active in the water supply and sanitation sector, with special focus on the poor and disadvantaged communities in rural and urban areas.
- International commercial banks - in the longer term, lending for medium to large schemes as part of a financing consortium or in support of a major private sector initiative. International banks will require collateral guarantees, robust cash flow projections and full risk analysis.
- International private sector companies - in the longer term, private companies may be interested in water supply and sewerage operations in the major cities, through full concessions for 25 years or BOT schemes for discrete operational units (e.g. water treatment plants and bulk water transmission). However, the potential interest of international companies would require significant sustained improvements in operational performance, staff reductions and tariff adjustments focusing on full financial viability.

Many other countries in the Asian Region have been actively exploring and engaging in alternative capital funding mechanisms and markets to finance water sector investments,

especially in the water supply and sanitation sector e.g. China, India, Indonesia, Malaysia, Philippines, Sri Lanka, Thailand and Vietnam. The comparative experiences in these countries will provide useful indicators for Bangladesh.

The Government will complement this initiative with parallel and supporting programmes under the NWMP in: Regulatory and Economic Instruments (EE 005); Public Awareness Raising in Water Management (EE 010); Private Sector Participation in Water Management (EE 011); and Water and Environment Funds (EE 012).

## Programme Outline

The study on Alternative Financing Methods (AFM) for Water Management will be commissioned within the next two (2) years. It is expected that the project programme will cover the following major topics, among others:

- (a) Review of international experience in AFM, especially in the Asian Region;
- (b) Analysis of AFMs and their suitability to Bangladesh;
- (c) Institutional aspects and implications;
- (d) Results of wide-ranging stakeholder consultation process; and
- (e) Detailed recommendations for a time-bound Action Plan for implementation.

The first few years of the subsequent implementation programme will demonstrate GoB's serious intent to push forward with the effective use and application of alternative financing methods in the water sector.

## Financing Arrangements

The proposed programme (study and implementation plan) for Alternative Financing Methods for Water Management is suitable for GoB funding with the support of the international donor community. The estimated funding requirement is Tk40M at mid-2000 prices.

One of the principal outputs of the study will be an Action Plan for implementation. It is expected that the plan will be costed, and will probably require additional capital funds to support the phased implementation. A sum of Tk250M has been included in the NWMP to cover implementation costs.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Studies of alternative financing models	I1	• Reports issues	2006
• Increasing use of non-traditional financing for water sector development and management	P	• Audit reports	2011
• Bangladesh's water sector costs shared between public, private and grass roots entities according to comparative advantage	D	• Government funding of water sector development and management (which should reduce as an overall % of water sector costs)	2021

## Institutional Arrangements

The Ministry of Water Resources (MoWR), in co-ordination with the Ministry of Finance and Ministry of Environment and Forests, will be responsible for commissioning the study for Water and Environment Funds. WARPO will be the executing agency for the preparatory study, and be responsible for preparing the Terms of Reference and other background documentation, possibly in collaboration with an international donor.

Institutional arrangements for the implementation of the action plan on Alternative Financing Methods will depend on the detailed recommendations of the proposed study.

## **References and Documentation**

(a) Chapters 2, 3, 4, 5, 7, 8, 10 and 12, Development Strategy Report, March 2001

(b) Main references:

- Bangladesh: Private Sector Infrastructure Development Project
- Strategy Study to Mobilise Finance and Increase Efficiency in the Dhaka Water Supply and Sewerage Sector, Halcrow Management Sciences Limited, August 1998
- 

(c) National Water Resources Database in WARPO

## **Linkages**

The programme for Alternative Financing Methods (AFM) is a cross-cutting intervention and should be closely linked and co-ordinated with other NWMP programmes, namely: (a) ID 003 (FCD and FCD/I Management Rationalisation); (b) ID 001 (Local Government Needs Assessment for Water Management); (c) ID 005 (Local Government Capacity Building for Water Management); (d) ID 002 (Independent Regulatory Bodies for Water Supply and Sanitation Service Sector); (e) EE 002 (Field Testing of Participatory Management Models); (f) EE 004 (Project Preparation Procedures - Guidelines and Manuals); (g) EE 005 (Regulatory and Economic Instruments); (h) EE 010 (Raising Public Awareness in the Wise Use and Management of Water); (i) EE 011 (Private Sector Participation in Water Management); (j) EE 012 (Water and Environment Funds); and (k) EA 010 (Public Awareness Raising and Empowerment in respect of Environmental Issues).

Preparation and development of the AFM programme should also be co-ordinated with ECNWRC, Ministry of Industry (MoI), Ministry of Agriculture (MoA), Ministry of Local Government, Rural Development and Co-operatives (MoLGRDC), Bangladesh Water Development Board (BWDB), Department of Public Health Engineering (DPHE), Local Government Engineering Department (LGED), Department of Environment (DoE), Local Government authorities, NGOs, the private sector and other stakeholders.

## **Risks and Assumptions**

The risks associated with the commissioning and execution of the proposed AFM Study are minimal, providing a suitable international donor partner is identified and well qualified international consultants are engaged to carry out the work. The main risks will arise after the study has been completed. They will fall into two categories: institutional and financial. The institutional risks are twofold: firstly, whether GoB will have the real political will and commitment to carry out the AFM programme; and secondly, whether government line agencies and enterprises will provide effective support and co-operation to implement the proposals. On the other hand, future pressure on the GoB investment budget will be so great that the Government must adopt a constructive approach to new sources of capital funds for the water sector. In this context, parallel co-ordination and implementation of the ID and EE Programmes will be crucial. The main financial risk is that insufficient capital funds will be forthcoming from other financial mechanisms and sources. This is a risk which GoB can mitigate with sustained action to implement the institutional and financial reforms set out in the NWPo and the NWMP.

**Alternative Financing Methods for Water Management**

Ref :

**EE 013**

Cluster :	Enabling Environment			Region(s) :	All																									
Focus/Foci :	Development Finance			Location :	Nationwide																									
Start Year <sup>1</sup> :	2002	Duration <sup>2</sup> : 10 year(s)		Agency(s) Responsible :	WARPO	(Lead) (Supporting)																								
Short Description :	The availability of and access to adequate financial resources for operations and maintenance; emergency work; rehabilitation; replacement and new development is a major sustainability issue in Bangladesh's water sector. The current trend to decentralise management responsibility is expected to take the pressure off central finances. This programme will study needs and opportunities for alternative financing (such as an independent regulatory framework), and then promote various local and international sources of finance (thirteen different sources have been identified at this stage). The NWPo recognises the importance of promoting alternative financing in such clauses as: "... improve the investment climate for the private sector in water development and management" (NWPo §3.01e), and; "the formulation of options for investment and management" (NWPo §4.051).																													
MIS Links	Cost Calculation :		EE Programme costing.xls	Map :	EE 013 Map.jpg																									
	Disb't Schedule :		EE Programme costing.xls	Description :	EE 013 PgP.doc																									
Finance	<table><tr><td></td><td>Costs</td><td>Private</td><td>Funding (%)</td><td>Beneficiaries</td><td>Expected by</td></tr><tr><td></td><td></td><td></td><td>GoB</td><td></td><td>ProgrammeYear</td></tr><tr><td>Total Capital<sup>3</sup></td><td>290.00 MTk</td><td>0%</td><td>100%</td><td>0%</td><td>10</td></tr><tr><td>Ultimate Recurring</td><td>0.00 MTk/yr</td><td>n/a</td><td>n/a</td><td>n/a</td><td>n/a</td></tr></table>							Costs	Private	Funding (%)	Beneficiaries	Expected by				GoB		ProgrammeYear	Total Capital <sup>3</sup>	290.00 MTk	0%	100%	0%	10	Ultimate Recurring	0.00 MTk/yr	n/a	n/a	n/a	n/a
	Costs	Private	Funding (%)	Beneficiaries	Expected by																									
			GoB		ProgrammeYear																									
Total Capital <sup>3</sup>	290.00 MTk	0%	100%	0%	10																									
Ultimate Recurring	0.00 MTk/yr	n/a	n/a	n/a	n/a																									
Date of Data :	31 (dd)	07 (mm)	01 (yy)	Stacked Cumulative Cash Flow Chart																										
Status :	Identified																													
Financial Base Year:	mid-2000																													
Planned Expenditure (to date) :	0 MTk																													
Actual Expenditure <sup>4</sup> (to date) :	0 MTk																													

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Studies of alternative financing models	• Reports issued	NYD
• Increasing use of non-traditional financing for water sector development and management	• Audit reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
 5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

## National Water Management Plan

### Programme Costing Sheet

Programme Ref	EE 013
Title	Alternative Financing Methods for Water Management

#### Assumptions:

Taka/US\$	51.000	TA duration	1.5	years	All prices in mid-2000 values
		Investment duration	8.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	18.0	20,000		18.4		
Senior National consultants (all-in rate)	p-m	28.0		150	4.2	0.0%	-
Mid-level National consultants (all-in rate)	p-m	34.0		90	3.1	0.0%	-
Sub-totals					25.6		-
Other general TA programme costs		25%			6.4		-
Specific other TA programme costs	Seminars and conferences				8.0	0.0%	-
<b>Total TA Costs</b>					<b>40.0</b>		-
<b>Other Programme Costs</b>							
1. Follow-on programme costs					250.0	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>250.0</b>		-
<b>Overall Programme Costs</b>							
					<b>290.0</b>		-

Note:

Cost estimate for study phase and subsequent promotional costs. Investment costs are effectively included in other programme costs, and are not included here to avoid duplication.

## **Main Rivers**



<b>Main Rivers Studies and Research Programmes</b>	<b>Ref: MR 001</b>
--	--------------------

**Basic Data**NWMP Sub-sector      **Main River Development**Region(s)              **Nationwide****Relevance to NWPo**

NWPo §3(f) states that a key Policy objective is to develop a state of knowledge and capability that will enable the country to design water resources management plans by itself. § 4.2(j) and (k) provide for development of the main rivers for multi-purpose use, which will be the main subject covered by this Programme. Research and information management for such tasks is covered under §4.15.

**Purpose of Programme**

Management of the major rivers potentially requires major investments. The purpose of this Programme is to establish a cost-effective approach to long-term development of the river systems for multi-purpose use. The studies will each contribute to the understanding of individual river development prospects as well as to an overall integrated development plan, set within the context of the international water-sharing issues that Bangladesh has to deal with. Prospects for hydro-power development within Bangladesh will also be considered.

**Programme Outline**

The Programme will include the following seven studies:

- (i) **GDA Feasibility Study of Integrated Development Project:** This study will be in three parts (a) Detailed studies of the **barrage sites, Gorai headworks**, and the three promising **link channels**, including surveys, geotechnical investigations and modelling studies, with due attention given to morphological impacts on river regime, environmental and social impact assessment of construction works, construction methods and phasing, and operational requirements; Detailed studies of the **polder improvement works**, involving extensive hydrodynamic and morphological modelling of the river systems under alternative configurations and development sequences, taking into consideration the impacts of sea-level rise, changes in tidal range and anticipated variations in salinity boundaries, all under different augmentation scenarios. Additional data collection will be required for calibration of models; and (c) **Overall implementation planning and assessment studies**, including detailed arrangements for programme implementation, overall environmental, social and economic impact assessments, institutional and financing aspects, risk assessment and recommended action plan. The studies are expected to take three years from commissioning.

- (ii) **NE & SE Regional Development Options Study for Meghna:** An inter-regional study of potential development of the Meghna river to serve the needs of the NE and SE regions by means of a barrage and/or by river pumping, including consideration of a barrage downstream of the Bhairab Bridge. Water management issues in these regions of relevance to this study include effective management of the haor basins, flood management and drainage congestion, arsenic contamination of aquifers and gassy aquifers, remedial actions for public sector schemes and erosion control. The study will lead to a development of a long-term strategic plan for development and management of the Meghna river system.
- (iii) **NE & SE Feasibility Study of Integrated Development Project:** This study will follow from the strategic study above on the basis of the identified development proposals for the Meghna River.
- (iv) **Brahmaputra Barrage Study:** Brahmaputra Barrage Study will be carried out under this programme. Depending on the outcome of this study, feasibility study and detailed engineering will be carried out for harnessing and development of water of the Brahmaputra to cater the present and future demands of the NW, NC and NE regions. On the basis of the outcome of the this study, implementation works will be taken up (MR 005).
- (v) **Review and update of Master Plan for major river training:** The aim of the study would be to develop a cost-effective and affordable strategy for dealing with erosion in each of the major rivers. It would include a review and update of the existing Brahmaputra River Training Study Master Plan for erosion control in the Brahmaputra, and the commissioning studies for other major rivers. The review would include re-examination of China-Bangladesh Joint Expert Team proposals for canalisation and the results of pilot works on alternative river training techniques. Both structural and non-structural solutions to erosion management would be investigated in the light of past investments and attention would be given to both short and long-term planning perspectives, as they may affect development sequencing.
- (vi) **Hydropower Master Development Plan:** This plan would overview the relatively modest prospects for hydro-power development in Bangladesh and set guidelines for future works. The potential role for hydro-electric power within the context of overall energy development requirements would be reviewed. The possibility of further development of large schemes would be considered in the context of possibly detrimental social and environmental impacts that could arise. Emphasis would be given to examining the prospects for mini- or micro-schemes in the CHT and the potential for encouraging private investment in these.

## Financing Arrangements

Financing would be by GoB, with the potential for donor assistance.

## Objectives and Indicators

Objective	Suff ix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"> <li>Timely completion of the Programme studies and investigations</li> </ul>	I1	<ul style="list-style-type: none"> <li>Progress of the work based on regular monitoring</li> </ul>	2010
<ul style="list-style-type: none"> <li>A sound basis for strategic decision-making and the planning of future Main River development accepted by the due authorities</li> </ul>	K	<ul style="list-style-type: none"> <li>Strategy reports</li> <li>Formal agreement of the reports</li> </ul>	2011
<ul style="list-style-type: none"> <li>Bangladesh's main and regional rivers comprehensively developed for sustainable multi-purpose use</li> </ul>	D	<ul style="list-style-type: none"> <li>Returns per unit of water</li> <li>River maintenance costs</li> <li>Quality and Quantity of in-stream flows</li> </ul>	2025

## Institutional Arrangements

In accordance with the NWPo, WARPO is responsible for preparation of national and regional development plans, whereas BWDB are to set their own plans within the framework established by WARPO. Thus, primary responsibility for the studies would be as follows:

Study	Responsibility
<ul style="list-style-type: none"> <li>GDA Feasibility Study of Integrated Development Project</li> </ul>	BWDB
<ul style="list-style-type: none"> <li>NE &amp; SE Regional Development Options Study for Meghna</li> </ul>	WARPO
<ul style="list-style-type: none"> <li>NE &amp; SE Feasibility Study of Integrated Development Project</li> </ul>	BWDB
<ul style="list-style-type: none"> <li>Brahmaputra Barrage study</li> </ul>	BWDB
<ul style="list-style-type: none"> <li>Review and update of Master Plan for major river training</li> </ul>	WARPO
<ul style="list-style-type: none"> <li>Hydropower Development Master Plan</li> </ul>	WARPO

The nature of these studies is that each will require extensive consultation with different organisations and stakeholders. It will be incumbent on those responsible to ensure that this is achieved.

## Existing Documentation

There are many previous reports relating to the previous studies conducted on these issues. These include DSR Chapter 6, the FAP 4, FAP5 and FAP6 Regional Study Reports, the FAP1 BRTS 1994 report, the Expert Studies Group reports of 1984 to 1986, and other information held on the National Water Resources Database (NWRD).

## Linkages

The Programme findings would have a direct influence on the need and justification for, and the planning of, the Main River Development interventions covered by Programmes MR 002 to MR 003, MR 005, and MR 007 to MR 012. The studies would draw upon information obtained in Programme EE 008: Water Resources Management Research and Development Studies.

## Risks and Assumptions

The main risk is that inadequacy of timely and detailed data makes it difficult to produce the clear findings and detailed strategy and plans required. A key assumption is that current efforts to engender information exchange between the co-riparian States will bear fruit.

**Main Rivers Studies and Research Programmes**

Ref :

**MR 001**

Cluster :	<b>Main Rivers</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Studies and Research</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>10 year(s)</b>
		Agency(s) Responsible :	<b>WARPO</b> (Lead) <b>BWDB</b> (Supporting)
Short Description :	This Programme comprises a series of studies to establish a cost-effective approach to long-term development of the river systems for multi-purpose use. The studies will each contribute to the understanding of individual river development prospects as well as to an overall integrated development plan, set within the context of the international water-sharing issues. Topics covered include a regional development plan for the Meghna and Brahmaputra rivers, master planning of major river training and hydro-power development, Brahmaputra Barrage study, and feasibility studies of development of the Ganges Dependent Area.		

<b>MIS Links</b>	Cost Calculation :	MR Programme costing.xls	Map :	MR 001 Map.jpg
	Disb't Schedule :	MR Programme costing.xls	Description :	MR 001 PgP.doc

<b>Finance</b>	<div>Costs</div> <div>Private</div> <div>Funding (%)</div> <div>GoB</div> <div>Beneficiaries</div> <div>Expected by</div> <div>ProgrammeYear</div>				
Total Capital <sup>3</sup>	<b>2,000.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>10</b>
Ultimate Recurring	<b>0.00</b> MTk/yr	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>  • Investment    ○ Recurring    — Total			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Timely completion of the Programme studies and investigations	• Progress of the work based on regular monitoring	NYD
• A sound basis for strategic decision-making and the planning of future Main River development accepted by the due authorities	• Strategy reports • Formal agreement of the reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	<b>MR 001</b>
Title	<b>Main Rivers Studies and Research Programmes</b>

*Assumptions:*

Taka/US\$	51.000	TA duration	10.0	years	All prices in mid-2000 values
		Investment duration	10.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
<i>Project management assistance to WARPO</i>							
Expatriate consultants (all-in rate)	p-m	40.0	20,000		40.8	0.0%	-
Senior National consultants (all-in rate)	p-m	80.0		150	12.0	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					52.8		
Other general TA programme costs		25%			13.2		-
Specific other TA programme costs					34.0	0.0%	-
<b>Total TA Costs</b>					<b>100.0</b>		<b>-</b>
<b>Other Programme Costs</b>							
1. GDA Feasibility Study of Integrated Development Project					900.0	0.0%	-
2. NE & SE Regional Development Options Study for Meghna					100.0	0.0%	-
3. NE & SE Feasibility Study of Integrated Development Project					350.0	0.0%	-
4. Brahmaputra Barrage study					325.0	0.0%	-
5. Review and update of Master Plan for major river training					150.0	0.0%	-
6. Hydropower Master Development Plan					75.0	0.0%	-
7.							
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>1,900.0</b>		<b>-</b>
<b>Overall Programme Costs</b>							
					<b>2,000.0</b>		<b>-</b>

**Provisional Breakdown of Costs**

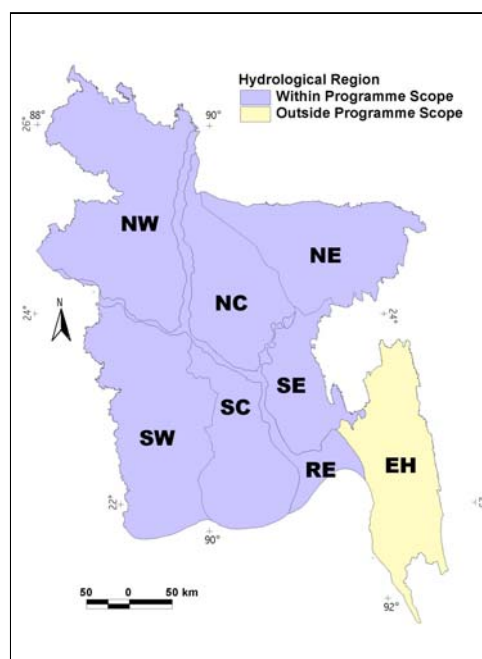
Item	Expat	Snr Nationa	Mid-Level	Other TA	Other Costs	Total
Rate	20,000	150	90	25%		
Unit	US\$/p-m	'000Tk/p-m	'000Tk/p-m	TkM	TkM	TkM
GDA Feasibility Study of Integrated Development Project	230.0	650.0	1,200.0	110.0	350.0	900.0
NE & SE Regional Development Options Study for Meghna	40.0	120.0	240.0	9.9	50.5	100.0
NE & SE Feasibility Study of Integrated Development Proj	120.0	360.0	733.0	30.0	200.0	350.0
Brahmaputra Barrage study	205.0	435.0	877.0	36.1	145.0	325.0
Review and update of Master Plan for major river training	50.0	150.0	284.0	12.0	90.0	150.0
Hydropower Master Development Plan	25.0	75.0	142.0	6.0	45.0	75.0
						<b>1,900.0</b>

**Main Rivers Abstraction Projects**Ref: **MR 002****Basic Data**NWMP Sub-sector      **Main River Development**Region(s)              **National coverage, except  
for Eastern Hills Region****Relevance to NWPo**

This Programme is covered by NWPo Articles 4.2(j) and (k), whereby GoB will undertake comprehensive development and management of the main rivers for multi-purpose use.

**Purpose of Programme**

The purpose of the Programme is to augment dry season surface water availability for multi-purpose use through abstraction from the main rivers by means other than barrages (barrages are covered in Programmes MR 003 to MR 005). The programme provides for the follow-on investments from the studies conducted under Programme MR 001, relating to activities on and adjacent to the main rivers themselves.



It is distinct from pumped and other abstraction for Programme AW 003: New Public Surface Water Irrigation Schemes, MR 011: River Dredging for Navigation and MR 006: Regional River Management and Improvement.

The options available are pumping, from fixed stations or floating pumps, and dredging of channels to encourage the natural bifurcation of river flows. River training works may be required as a complementary measure for the latter. Abstracted water would flow into the existing natural river network for use downstream. In some cases measures should be taken to improve the natural distribution system and these are covered in Programmes MR 006 to 009.

**Programme Outline**

There are four major pump stations on the Ganges and Meghna, but these are all serving adjacent irrigation schemes: Bheramara (GK Project), Pabna, Meghna – Dhonagodha and Chandpur. Only on the Gorai, which offtakes from the Ganges in SW Region, has dredging been undertaken for main river abstraction purposes.

The main opportunities identified so far as possibly being suitable for large-scale pumping abstraction are from the Chandpur Pump Station, in SE Region, and in the western part of the High Barind in NW Region. OGDAs study analyses indicate that pumped abstraction for the latter generally would not be economically feasible. In the SE Region, water can be abstracted at Chandpur, lifted 6m and then distributed via the New Dakatia River and four other watercourses between there and the coast. Since shallow tubewell (STW) irrigation is not feasible to the south of this river, the benefits from surface water augmentation may be substantial, due to increased irrigation intensities. FAP5 (SE Regional Study, 1992–3) estimated that an area of 237,000ha could be irrigated from the Chandpur pump station, compared with 92,000ha now being served.

The principal offtakes from the main rivers that could be developed through dredging and associated training works are the Gorai in the SW region, the Old Brahmaputra and Dhaleswari in NC Region and the Arial Khan and Tetulia Channel in SC Region. The Dhaleswari was relocated during the construction of the Bangabandhu Bridge, and its stability is a matter of some concern. Various proposals have been made in the past to develop these channels but, due to cost and other considerations, they were never taken up. Development of the Gorai river is considered under Programme MR 003.

From analyses conducted under NWMPP, pumping from fixed pump stations located adjacent to rivers is likely to be more cost-effective for flows in excess of 10m<sup>3</sup>/s than from barge-mounted floating pump stations. Nevertheless, erosion is a major risk to fixed pump stations along with migration of dry season flow channels to the opposite bank, which may be several kilometres away. Choice of pumping arrangements remains a site-specific consideration therefore. Opening up channels by dredging alone is likely to lead re-siltation and heavy O&M costs, unless the new channel configuration is in itself stable. Most probably, achieving this stability will require complementary river training works, as in the case of the Gorai. Economic returns to both types of augmentation are unlikely to be high, and any interventions of this nature will have to be considered very carefully.

## Financing Arrangements

Capital and recurrent funding would be by GoB, with the possibility for donor support of the former. Opportunities for cost recovery would be minimal.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Multi-purpose use of main river water	I1	• Pump stations and associated works completed • Offtakes successfully dredged • River training works work completed	2013
• Increased irrigated areas, environmental health, navigability and other conditions	K	• Number of low lift pumps in operation • Changes in dry season surface water flows and availability	2013
• Bangladesh's main and regional rivers comprehensively developed for sustainable multi-purpose use	D	• Returns per unit of water • River maintenance costs • Quality and Quantity of in-stream flows	2025

## Institutional Arrangements

Implementation would be by BWDB, with other GoB agency and NGO involvement to promote effective use of the additional water made available.

## Existing Documentation

DSR Section 6.7, the ESG Report 1984 and the NWRD (National Water Resources Database)

## Linkages

Implementation requirements for this programme would emerge from studies undertaken under Programme MR 001. There are also linkages with Programmes MR 003 to 005 and MR 007 to 009, concerning barrage development, MR 006: Regional River Management and Improvement, MR 011: River Dredging for Navigation and AW 003: New Public Surface Water Irrigation Schemes.

## **Risks and Assumptions**

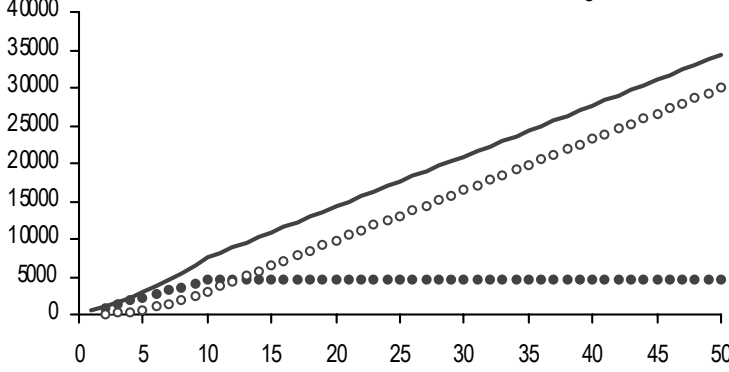
As noted above, this Programme has considerable risks. The most serious concerns are main river erosion and siltation. With the high O&M requirements there is also a major danger of inadequate Revenue Budget funding and maintenance standards. However, it is assumed that improved levels of feasibility analysis along with a systems or process approach to project planning will identify the risks at an early stage allowing mitigation measures to be introduced into the scheme formulation.



**Main Rivers Abstraction Projects**Ref : **MR 002**

Cluster :	Main Rivers	Region(s) :	NW, NC, NE, SW, SC, SE, RE			
Focus/Foci :	Abstraction from Major Rivers	Location :	RE region			
Start Year <sup>1</sup> :	2004	Duration <sup>2</sup> :	10 year(s)	Agency(s) :	BWDB	(Lead)
				Responsible :	None	(Supporting)
Short Description :	This Programme provides for investments in augmenting dry season surface water availability for multi-purpose use through abstraction from the main rivers by means other than barrages (barrages are covered in MR 003 to MR 005). The programme is conditional upon the outcome of the studies conducted under Programme MR 001. The principal options that this programme may take up are main river pump stations and dredging and associated works at distributary offtakes (works on the Gorai are considered under MR 003 however).					

<b>MIS Links</b>	Cost Calculation :	MR Programme costing.xls	Map :	MR 002 Map.jpg
	Disb't Schedule :	MR Programme costing.xls	Description :	MR 002 PgP.doc

Finance							
	Costs		Private	Funding (%)	Beneficiaries	Expected by	
				GoB		ProgrammeYear	
	Total Capital <sup>3</sup>		4,480.00 MTk	0%	100%	0%	10
	Ultimate Recurring		672.00 MTk/yr	n/a	100%	0%	11
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart			
	(dd)	(mm)	(yy)	Cost (MTk) ● Investment ○ Recurring — Total			
Status :	Identified						
Financial Base Year:	mid-2000						
Planned Expenditure (to date) :	0 MTk						
Actual Expenditure <sup>4</sup> (to date) :	0 MTk						

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Multi-purpose use of main river water	• Pump stations and associated completed • Offtakes successfully dredged • River training works work completed	NYD
• Increased irrigated areas, environmental health, navigability and other conditions	• Number of low lift pumps in operation • Changes in dry season surface water flows and availability	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	<b>MR 002</b>
Title	<b>Main Rivers Abstraction Projects</b>

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	10.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

### Technical Assistance

Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-		
Mid-level National consultants (all-in rate)	p-m	-		90	-		
Sub-totals					-		
Other general TA programme costs		25%			-		
Specific other TA programme costs					-		
<b>Total TA Costs</b>					-		

### Other Programme Costs

*Provisional on outcome of Programme MR 001*

1. Main river pump stations					3,300.0	15.0%	495.0
2. Dredging and river training works at distributary channel offtakes					1,180.0	15.0%	177.0
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>4,480.0</b>		<b>672.0</b>

<b>Overall Programme Costs</b>					<b>4,480.0</b>		<b>672.0</b>
--------------------------------	--	--	--	--	----------------	--	--------------

Notes *These are provisional amounts. The actual required investments to be determined under studies in Programme MR 001*

#### 1 Main river Pump Stations:

Chandpur: Incremental area of	145,000	ha at	Tk	17,240	/ha, or Tk	2,500.0	M
GK Project: Incremental area of	95,235	ha at	Tk	8,400	/ha, or Tk	800.0	M

#### 2 Dredging and training works

Brahmaputra offtakes capital dredg	5.00	Mm3 at	Tk	157.0	/m3, or Tk	785.0	M
Other offtakes elsewhere	2.52	Mm3 at	Tk	157.0	/m3, or Tk	395.0	M

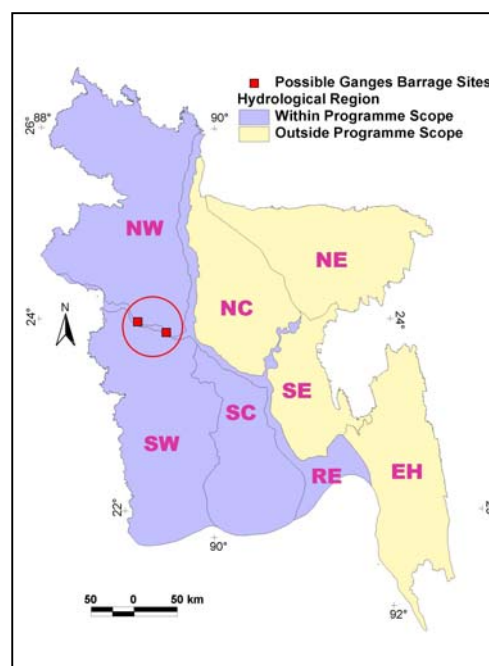
**Ganges Barrage and Ancillary Works**Ref: **MR 003****Basic Data**

NWMP Sub-sector      **Main River Development**

Region(s)              **RE, SW and nearby areas of NW and SC regions**

**Relevance to NWPo**

NWPo Articles 4.2(j) and (k) provide for development of the main rivers for multi-purpose use and Article 4.7 requires the promotion of conjunctive use of groundwater and surface water and encourages the continued expansion of minor irrigation. Articles 4.9 and 4.12 stress the need for water for fisheries and wildlife and for adequate upland flow in water channels to limit salinity intrusion and preserve estuary ecosystems.

**Purpose of Programme**

The Ganges Dependent Area covers a third of the country and has long been recognised as an area where improved water resources management is most needed. Over the last three decades, the water resource system has been in a process of degradation, principally due to a reduction of freshwater inflows from the Ganges, siltation of rivers following construction of the polder systems and increasing salinity intrusion from the Bay of Bengal. This has led to a down turn in agricultural production in the coastal areas, the main source of employment, reduced opportunities for navigation, a loss of biodiversity and reduction in wood production in the internationally recognised Sundarbans forest reserve, and increasing social conflict associated with changing land use. The area has more flooding than on average in the rest of Bangladesh, as well as the greatest extent of water shortages in the dry season. Arsenic contamination is widespread across much of region.

The strategy for the GDA must respond to the central issues of a widening gap between water demands and availability, increasing saline intrusion and worsening drainage congestion in a manner that fully recognises the dynamics of the resource system. These are particularly complex in the GDA, and especially so when considered in the context of climate change, projected sea-level rise, land subsidence and the observed rapid increase in tidal range.

The overall objectives for the GDA therefore are to manage the water resource system in a manner that promotes social and economic development in an equitable fashion, and to arrest and reverse the environmental degradation that has already set in. The main thrusts of the strategy are to relieve drainage congestion within the polder area through development of a sustainable river and drainage system, control salinity intrusion and relieve water shortages in the area. This is to be achieved by a combination of river and drainage improvement programmes, augmentation of dry season upland flows and improved management of trans-regional wet season flood flows. These will be complemented by measures to develop and improve local

management of water resources, optimise land use potential and enhance environmentally sound development.

Four main sub-programmes are to be taken up on an integrated basis: general sub-programmes, drainage relief sub-programmes, augmentation sub-programmes and institutional development.

This Programme MR 003 deals with the diversion works associated with the augmentation sub-programmes above. Other aspects of the GDA development are covered by MR 006: Regional River Management Improvement (which includes works on the coastal polders), MR 007: GDA Regional Surface Water Distribution Networks, AW 005: Improved Water Management at Local Government level, AW 006: Improved Water Management at Community level, EA 009: Improved Water Management and Salinity Control in the Sundarbans and ID 001 and ID 004 dealing with Local government and BWDB management. Provision for a feasibility study of the overall development is included under Programme MR 001. A feasibility study of the Gorai River Restoration Project (GRRP), an early component of the overall programme has recently been completed by BWDB.

### **Programme Outline**

This Programme 003 comprises the investment portion of the diversion works on the Ganges to augment dry season flows in the GDA. It has three main elements:

- (i) Dredging and training works at the Gorai offtake to secure the Gorai against dislocation from the Ganges, and to provide immediate additional flows for primarily for environmental restoration purposes;
- (ii) Construction of a barrage across the Ganges to gain control over the dry season Ganges flows, and substantially increase augmentation flows for multi-purpose use;
- (iii) Construction of a headworks structure at the Gorai offtake to gain control of both wet and dry season flows entering the GDA, enabling planned and manageable development of the river systems and associated land use activities.

After initial dredging, the first involves construction of a guide bank and revetment to encourage low Ganges flows into the Gorai whilst discouraging ingress of sediments. This is described in the GRRP feasibility study. The second has been designed to prefeasibility level and involves a structure approximately 1870m wide with 84 radial gates, each 18m wide, and fitted with fishpasses and a navigation lock. Two sites downstream of the Gorai offtake remain under consideration. Full details are given in the prefeasibility report prepared in July 2001 under the OGDAs studies for NWMP. This report also describes the Gorai Headworks structure, which would be positioned to take full advantage of preceding GRRP works. Works for the barrage would also include river training works, comprising two upstream hard points and guide bunds on each bank up- and downstream of the barrage.

If shown feasible, the GRRP would be constructed first, taking approximately three years to build. In parallel, a feasibility study of the integrated development programme for the GDA in Bangladesh would be taken up soonest including detailed designs of the Barrage, followed by preparation of bid documents, tendering and award of contract, which may take three years. Construction of the barrage would be expected to take 5 years.

## Financing Arrangements

Financing of all the above works would be by GoB, and would be suitable for donor support. Cost recovery is not thought to be practicable in view of the multi-purpose use of the water provided over such a large and diverse area.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Gorai river system restored	I1	• Physical progress of capital works • Year round flows in the Gorai river	2004
• Ganges barrage and Gorai offtake in place	I2	• Physical progress of capital works • Year round flows in the Gorai river	2015
• Increased dry season water availability in the GDA	K	• Dry season discharges	2015
• Bangladesh's main and regional rivers comprehensively developed for sustainable multi-purpose use	D	• Returns per unit of water • River maintenance costs • Quality and Quantity of in-stream flows	2025

## Institutional Arrangements

BWDB would be responsible for the diversion works programme. NGOs would assist in the limited land acquisition and resettlement required.

## Existing Documentation

OGDA Draft Final Report, July 2001, GRRP Feasibility Report, July 2001 and the NWRD (National Water Resources Database).

## Linkages

As stated above, this programme follows on from the studies to be made under Programme MR 001 and the feasibility study of the Gorai River Restoration Project (GRRP). Other aspects of the GDA development are covered by MR 006: Regional River Management Improvement (which includes works on the coastal polders), MR 007: GDA Regional Surface Water Distribution Networks, AW 005: Improved Water Management at Local Government level, AW 006: Improved Water Management at Community level, EA 009: Improved Water Management and Salinity Control in the Sundarbans and ID 001 and ID 004 dealing with Local government and BWDB management.

## Risks and Assumptions

The programme assumes that a fully viable integrated development solution will be developed out of the MR 001 studies. The main technical risk for the GRRP is that the project performs as designed and that substantial maintenance dredging is obviated. Construction of barrages is well understood and the main risk lies in avoiding the siltation problems that have beset Farraka Barrage upstream. Extensive modelling tests and proper operational practices should minimise this risk. In contrast to a dam, a barrage will displace few people, but there will be some environmental concerns, notably relating to migration of hilsa fish and perennial inundation of some charland. These will have to be looked into carefully during the study phase. Since there will be no cost recovery, the sustainability of the structure will be dependent upon long-term commitment to maintenance funding from central Government.

**Ganges Barrage and Ancillary Works**

Ref :

**MR 003**

Cluster :	<b>Main Rivers</b>	Region(s) :	<b>SW, NW, SC and RE</b>
Focus/Foci :	<b>Major River Barrages</b>	Location :	<b>On the Ganges River, Western B'desh</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>15 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) None (Supporting)
Short Description :	This Programme comprises the investment portion the diversion works associated with the integrated development of the water resource system in the GDA. Other aspects of the GDA development in Bangladesh are covered in other programmes under MR, AW, EA and ID. It has three main construction elements: (i) dredging and training works at the Gorai offtake to provide immediate additional flows for environmental purposes; (ii) a barrage across the Ganges to control dry season Ganges flows and provide substantially greater flows for multi-purpose use; and (iii) a Gorai headworks structure to control wet and dry season flows entering the GDA, enabling planned and manageable development to take place.		

<b>MIS Links</b>	Cost Calculation :	MR Programme costing.xls	Map :	MR 003 Map.jpg
	Disb't Schedule :	MR Programme costing.xls	Description :	MR 003 PgP.doc

<b>Finance</b>	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>50,858.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>15</b>
Ultimate Recurring	<b>1,394.00</b> MTk/yr	<b>n/a</b>	<b>100%</b>	<b>0%</b>	<b>16</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Gorai river system restored	• Physical progress of capital works • Year round flows in the Gorai river	NYD
• Ganges barrage and Gorai offtake in place	• Physical progress of capital works • Year round flows in the Gorai river	NYD
• Increased dry season water availability in the GDA	• Dry season discharges	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	MR 003
Title	Ganges Barrage and Ancillary Works

*Assumptions:*

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	15.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Gorai River Restoration Project, capital works at offtake and downstream training					4,900.0	5.0%	245.0
2. Ganges Barrage and training works					39,275.0	2.5%	981.9
3. Gorai River Headworks Structure *					6,683.0	2.5%	167.1
4. Ancillary works					-	3.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					50,858.0		1,394.0
<b>Overall Programme Costs</b>					<b>50,858.0</b>		<b>1,394.0</b>

Notes	TkM	Years		
		Starting	Ending	Total
Gorai River Restoration Project, capital works at offtake and downstream training	4,900	1	3	3
Ganges Barrage and training works	39,275	10	15	6
Gorai River Headworks Structure *	6,683	9	10	2
Ancillary works	-	9	15	7

Note: Headworks starts 6 years after GRRP completes and barrage takes 5 to complete  
Reference draft final Report, OGDAs Studies, WARPO, July 2001

\*The cost of the Gorai Offtake Structure is estimated at Tk7,018M with GRRP and at Tk7,926M without GRRP.

**Meghna Barrage and Ancillary Works**Ref: **MR 004****Basic Data**NWMP Sub-sector      **Main River Development**Region(s)              **NE, NC, SE and RE  
Regions****Relevance to NWPo**

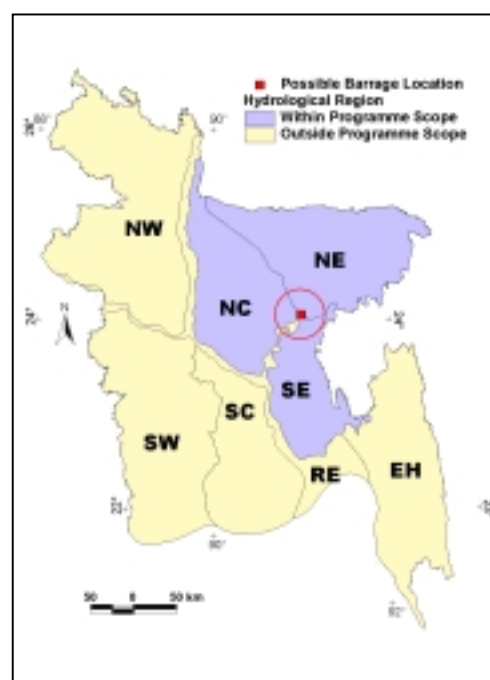
NWPo Articles 4.2(j) and (k) provide for development of the main rivers for multi-purpose use and Article 4.7 requires the promotion of conjunctive use of groundwater and surface water and encourages the continued expansion of minor irrigation. Articles 4.9 and 4.12 stress the need for water for fisheries and wildlife and for adequate upland flow in water channels to limit salinity intrusion and preserve estuary ecosystems.

**Purpose of Programme**

Development of surface water resources in NE and SE Regions may be considered as an important element of future plans, particularly given the limited groundwater irrigation potential and the prevalence of arsenic in the shallow groundwater of both regions and the water availability deficits identified in SE region. One of the studies to be taken up under Programme MR 001 will look into the potential for an integrated development of the Meghna River for the purposes of improved water management of these two regions.

The IECO Master Plan (1964) identified development of a barrage on the Meghna as a possible project. However, no detailed studies have since been taken up. A Meghna Barrage could be located near the existing Bhairab railway bridge (the Bhairab road bridge is now being built there), where the river has been relatively stable for many years. It could conserve water in NE Region and improve navigation. Groundwater exploitation is constrained in much of the region, and surface water is the main resource. A barrage pond level of around 3–4m would control drainage out of the beels, promote fisheries and bring navigation benefits that could extend back to the Indian border at the Surma – Kushiya divide. Particularly if augmented from the Brahmaputra or upstream on the Meghna, it could provide fresh water to the heavily arsenic-contaminated SE Region, supply irrigation water to the saline zone and newly reclaimed coastal areas. The impact of increased water levels and higher wave heights on the haors would need to be carefully checked however.

The purpose of this programme is to provide for a feasibility study and for investment in river control works as part of an integrated development programme for the NE and SE regions, assumed to be based on construction of a barrage at Bhairab on the Meghna river.





## Programme Outline

Provision is made under this programme for feasibility and detailed planning studies, leading to contract documentation, of the integrated development programme of the NE and SE regions on the basis of a development strategy established under Programme MR 001. Cost provisions are also made for construction of a barrage, headworks and ancillary works on the Meghna river. The studies are expected to take 4 years and construction of the works 5 years.

Other elements of the overall development programme for these two regions would be taken up under MR 006: Regional River Management Improvement (which includes works on the coastal polders), MR 008: NE and SE Regional Surface Water Distribution Networks, AW 005: Improved Water Management at Local Government level, AW 006: Improved Water Management at Community level and ID 001 and ID 004 dealing with Local government and BWDB management.

## Financing Arrangements

Financing would be by GoB, possibly with donor assistance. Cost recovery would probably be negligible, because of the practical difficulty of clearly identifying the beneficiaries in this type of large-scale intervention in which water is distributed to large numbers of people through khals and other existing natural channels.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Meghna barrage and offtake in place	I1	• Physical progress of capital works	2020
• Increased dry season water availability in the NE and SE regions	K	• Dry season discharges	2020
• Bangladesh's main and regional rivers comprehensively developed for sustainable multi-purpose use	D	• Returns per unit of water • River maintenance costs • Quality and Quantity of in-stream flows	2025

## Institutional Arrangements

BWDB would be responsible for the barrage programme as well as major water distribution downstream. NGOs would assist in the limited land acquisition and resettlement required.

## Existing Documentation

The only documentation found on the barrage is the IECO Master Plan and NWMP DSR 6.8. FAP5 and FAP6 Regional Studies provide information on the two regions as separate entities. The Kalni-Kushyara Project has investigated drainage improvements in the NE region. The NWRD (National Water Resources Database) has much useful information.

## Linkages

As stated above, this programme follows on from the studies to be made under Programme MR 001. Other aspects of this development are covered by MR 006: Regional River Management Improvement (which includes works on the coastal polders), MR 008: NE and SE Regional Surface Water Distribution Networks, AW 005: Improved Water Management at Local Government level, AW 006: Improved Water Management at Community level and ID 001 and ID 004 dealing with Local government and BWDB management.

## **Risks and Assumptions**

The programme assumes that a fully viable integrated development solution will be developed out of the MR 001 studies. Construction of barrages is well understood and the main risk lies in avoiding the siltation problems. Extensive modelling tests and proper operational practices should minimise this risk. In contrast to a dam, a barrage will displace few people, but there will be some environmental concerns, notably relating to both positive and negative impacts of backwater effects on the haor basin. These will have to be looked into carefully during the study phase. Since there will be no cost recovery, the sustainability of the structure will be dependent upon long-term commitment to maintenance funding from central Government.

**Meghna Barrage and Ancillary Works**

Ref :

**MR 004**

Cluster :	<b>Main Rivers</b>	Region(s) :	<b>NE, NC, SE</b>
Focus/Foci :	<b>Major River Barrages</b>	Location :	<b>RE region</b>
Start Year <sup>1</sup> :	<b>2012</b>	Duration <sup>2</sup> :	<b>9 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) None (Supporting)
Short Description :	This programme provides for a feasibility study and for investment in river control works as part of an integrated development programme for the NE and SE regions, assumed to be based on construction of a barrage at Bhairab on the Meghna river. The programme is conditional upon the development strategy for these regions to be established under Programme MR 001. Cost provisions are also made for construction of a barrage, headworks and ancillary works on the Meghna river. Other aspects of the overall development are covered in other programmes under MR, AW, EA and ID.		

<b>MIS Links</b>	Cost Calculation :	MR Programme costing.xls	Map :	MR 004 Map.jpg
	Disb't Schedule :	MR Programme costing.xls	Description :	MR 004 PgP.doc

<b>Finance</b>					
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>15,728.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>9</b>
Ultimate Recurring	<b>375.90</b> MTk/yr	<b>n/a</b>	<b>100%</b>	<b>0%</b>	<b>10</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Meghna barrage and offtake in place	• Physical progress of capital works	NYD
• Increased dry season water availability in the NE and SE regions	• Dry season discharges	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	<b>MR 004</b>
Title	<b>Meghna Barrage and Ancillary Works</b>

### Assumptions:

Taka/US\$	51.000	TA duration	4.0	years	All prices in mid-2000 values
		Investment duration	5.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Feasibility and planning studies at 5.0% of investment costs							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs		5.0%			750.0	0.0%	-
<b>Total TA Costs</b>					<b>750.0</b>		<b>-</b>
<b>Other Programme Costs</b>							
1. Barrage& training works					13,862.0	2.5%	346.6
2. Headworks Structure					827.0	2.5%	20.7
3. Ancillary works					289.0	3.0%	8.7
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>14,978.0</b>		<b>375.9</b>
<b>Overall Programme Costs</b>							
					<b>15,728.0</b>		<b>375.9</b>

Notes These are provisional amounts. The actual required investments to be determined under studies in Programme MR 001

	Ganges		Meghna	Ratio	<b>Comparison of sites</b>		Ganges	Meghna	Ratio
	TkM		TkM						
Barrage& training works	39,275		13,862	35%	Length	m	1,870	1,000	53%
Headworks Structure	6,683		827	12%	Diversion	m3/s	800	150	19%
Ancillary works	903		289	32%	Difficulty	%	100%	66%	66%
	46,861		14,978						

**Brahmaputra Barrage and Ancillary Works**Ref: **MR 005****Basic Data**NWMP Sub-sector      **Main River Development**Region(s)              **NW, NC, NE and RE  
Regions****Relevance to NWPo**

NWPo Articles 4.2 (j) and (k) provide for development of the main rivers for multi-purpose use and Article 4.7 requires the promotion of conjunctive use of groundwater and surface water and encourages the continued expansion of minor irrigation. Article 4.9 stresses the need for water for fisheries and wildlife.

**Purpose of Programme**

In addition to Ganges and Meghna barrages (Programmes MR 003 and MR 004), a barrage would be built on the Brahmaputra. Possibilities could be considered in detail following the studies and research in Programme MR 001.

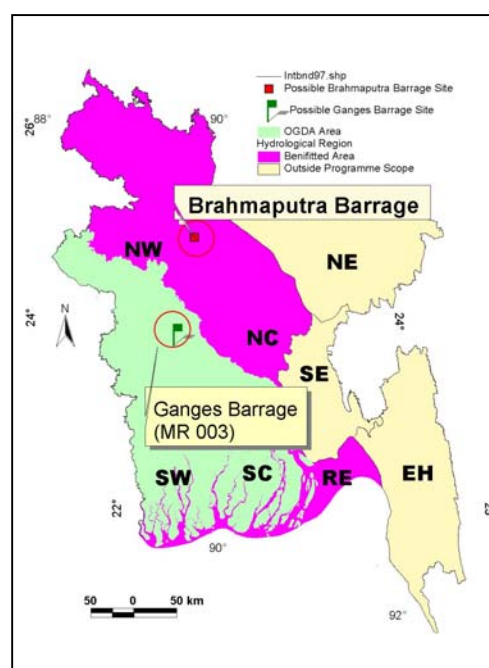
On the assumption that this leads to a decision to build a barrage to harness the Brahmaputra waters to meet long term national needs, this programme makes provision for a feasibility study and detailed engineering on the identified option(s) for the necessary investment in a barrage, headworks and ancillary works. The programme would be complemented by other programmes to develop the distribution systems and strengthen the capacity to implement and manage a project of this magnitude.

**Programme Outline**

The scope of the programme would be defined by the earlier research and planning studies. Provision is made for a five-year feasibility study and detailed engineering leading to contract documentation and subsequent construction of a barrage, headworks and ancillary works. It is assumed the latter would take 7 years to construct.

**Financing Arrangements**

Financing would be by GoB, possibly with donor assistance. Cost recovery would probably be negligible, because of the practical difficulty of clearly identifying the beneficiaries in this type of large-scale intervention in which water is distributed to large number of people through khals and other existing natural channels.



## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Barrage and offtake in place	I1	• Physical progress of capital works	2027
• Increased dry season water availability in the NW, NC and NE regions	K	• Dry season discharges	2027
• Bangladesh's main and regional rivers comprehensively developed for sustainable multi-purpose use	D	• Returns per unit of water • River maintenance costs • Quality and Quantity of in-stream flows	2027

## Institutional Arrangements

BWDB would be responsible for the barrage programme as well as the link channels and regional water distribution systems. NGOs would assist in the land acquisition and resettlement required.

## Existing Documentation

Documentation can be found on the Brahmaputra barrage in the IECO Master Plan, ESG reports of the mid-1980s and NWMP DSR 6.8. FAP2 and FAP3 Regional Studies provide information on the NW and NC regions and FAP4 and FAP6 on the SW/SC and NE regions. The NWRD (National Water Resources Database) has much useful information.

## Linkages

As stated above, this programme follows on from the studies to be made under Programme MR 001. Other aspects of this development are covered by MR 006: Regional River Management Improvement (which includes works on the coastal polders), MR 009: NW and NC Regional Surface Water Distribution Networks, AW 005: Improved Water Management at Local Government level, AW 006: Improved Water Management at Community level and ID 001 and ID 004 dealing with Local government and BWDB management.

## Risks and Assumptions

The programme assumes that a fully viable integrated development solution will be developed out of the MR 001 studies. Construction of barrages is well understood and the main risk lies in avoiding the siltation problems. Extensive modelling tests and proper operational practices should minimise this risk. In contrast to a dam, a barrage will displace relatively few people, but there will be concerns over impacts on char dwellers, who are numerous in the Brahmaputra. Environmental concerns will centre on interruption of fish migration and impacts of substantial construction works and land acquisition. These would have to be looked into carefully during the study phase. Since there will be no cost recovery, the sustainability of the structure will be dependent upon long-term commitment to maintenance funding from the Government.

**Brahmaputra Barrage and Ancillary Works**

Ref :

**MR 005**

Cluster :	Main Rivers		Region(s) :	NW, NC, NE, RE	
Focus/Foci :	Major River Barrages		Location :	Barrage on Brahmaputra River	
Start Year <sup>1</sup> :	2016	Duration <sup>2</sup> :	12 year(s)	Agency(s) Responsible :	BWDB (Lead) None (Supporting)
Short Description :	The outcome of the study in MR 001 will determine a course of action for further development of the main river systems of the country. On the assumption that this leads to a decision to build a barrage to harness the Brahmaputra waters to meet national needs, this programme makes provision for a feasibility study of the identified option(s), detailed engineering and for the necessary investment in a barrage, headworks and ancillary works. Other programmes to develop the distribution systems and management capacity would complement this programme.				

<b>MIS Links</b>	Cost Calculation :	MR Programme costing.xls	Map :	MR 005 Map.jpg
	Disb't Schedule :	MR Programme costing.xls	Description :	MR 005 PgP.doc

<b>Finance</b>					
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>86,973.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>12</b>
Ultimate Recurring	<b>2,078.80</b> MTk/yr	<b>n/a</b>	<b>100%</b>	<b>0%</b>	<b>13</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Barrage and offtake in place	• Physical progress of capital works	NYD
• Increased dry season water availability in the NW and NC regions (and potentially the NE and SW)	• Dry season discharges	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	<b>MR 005</b>
Title	<b>Brahmaputra Barrage and Ancillary Works</b>
	(including feasibility studies)

### Assumptions:

Taka/US\$	51.000	TA duration	5.0	years	All prices in mid-2000 values
		Investment duration	7.0	years	

Item	Unit	Quantity	Rate		Amount	O&M	O&M/yr
			US\$	Tk'000	TkM	%	TkM
<b>Technical Assistance</b>							
Feasibility and planning studies at 5.0% of investment costs							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs		5.0%			4,140.0	0.0%	-
<b>Total TA Costs</b>					<b>4,140.0</b>		<b>-</b>
<b>Other Programme Costs</b>							
1. Barrage& training works					62,349.0	2.5%	1,558.7
2. Headworks Structure					18,888.0	2.5%	472.2
3. Ancillary works					1,596.0	3.0%	47.9
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>82,833.0</b>		<b>2,078.8</b>
<b>Overall Programme Costs</b>					<b>86,973.0</b>		<b>2,078.8</b>

Notes These are provisional amounts. The actual required investments to be determined under studies in Programme MR 001

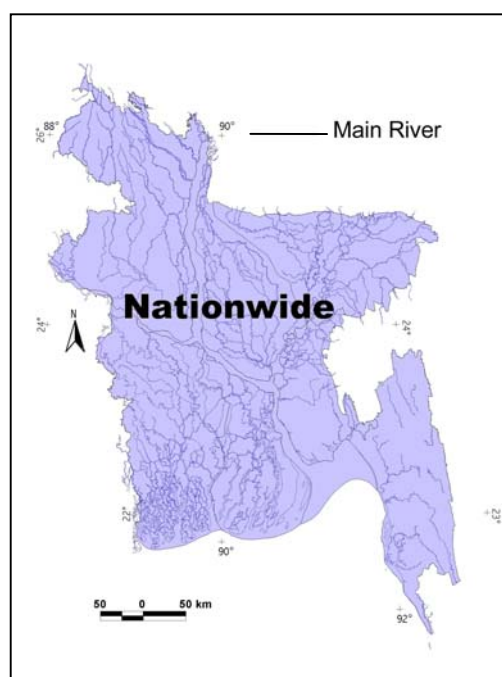
	Ganges	Brahmaputra	Ratio	<b>Comparison of sites</b>			
	TkM	TkM			Ganges	Brahmaputra	Ratio
Barrage& training works	39,275	62,349	159%	Length	m	1,870	2,232
Headworks Structure	6,683	18,888	283%	Diversion	m3/s	800	1,700
Ancillary works	903	1,596	177%	Difficulty	%	100%	133%
	46,861	82,833					

Assumed 1,000 m3/s for instream uses together with 700 m3/s for arsenic replacement and other uses in the NW and NC regions, but both figures subject to study under MR 001



**Regional River Management and Improvement**Ref: **MR 006****Basic Data**NWMP Sub-sector      **Main River Development**Region(s)              **National coverage****Relevance to NWPo**

NWPo Article 4.2 stresses the need for sound management of the nation's river systems and Articles 4.2(k) and (l) respectively call for development of the water resources of the major rivers for multi-purpose use and the desilting of watercourses to maintain navigation channels and proper drainage. Article 4.7 requires the promotion of conjunctive use of groundwater and surface water and encourages the continued expansion of minor irrigation. Articles 4.9 and 4.12 stress the need for water for fisheries and wildlife and for adequate upland flow in water channels to limit salinity intrusion and preserve estuary ecosystems.

**Purpose of Programme**

One of the main thrusts of Government's policy is development and management of the river systems to bring multi-purpose benefits. This is to be accomplished within a framework of decentralised and devolved management responsive to end-user needs. The strategy for this recognises three levels of system management as follows:

- BWDB retaining responsibility for main and regional rivers
- LGI's assuming responsibility for water resources management within their areas, and
- Communities assuming responsibility for field level systems and local channels.

This programme is targeted at the first level and provides the resources to plan, develop and maintain the regional river systems in an integrated manner, interfacing with Local Government in a manner that brings mutual benefit to their respective programmes.

The strategy further recognises the need for a holistic approach to river management that reflects the wide responsibilities already entrusted to BWDB. Thus a key aim of the programme is to ensure that river management plans are prepared and implemented in a comprehensive and cost-effective manner. Specific issues such as siltation, erosion, drainage, flooding, abstraction, pollution, obstruction and encroachment all need to be considered together, as solutions to one may affect solutions to another. Furthermore, absence of such plans in the past has led to an *ad hoc* approach to dealing with specific problems, which often may have been wasteful of resources.

This programme forms part of a comprehensive suite to improving the many facets of river management. In addition to the programmes for development of the main rivers, these include ID 004: BWDB Regional and Sub-Regional Management, ID 010: BWDB Capacity Building, EE 001 and EE 003 supporting new legislation, TR 007: Rural and Small Town Flood Protection, AW 007: Rationalisation of Existing Inland and Coastal FCD, EA 001: National Pollution Control Plan and EA 005: National Fishpass Programme. Other programmes of direct relevance are those connected with building up Local Government and Community level capacity for system management and those connected with revising and updating Guidelines.

### **Programme Outline**

The programme provides for the necessary investment in regional river system management, and acknowledges that a fully replicable approach will take a number of years to establish. It is envisaged that preparation of river management plans will involve:

- (i) A physical inventory of the whole river and the existing infrastructure and other developments along it;
- (ii) An assessment of the present condition of the river, existing and future trends. This will include physical parameters (river training and erosion, siltation, dry season and monsoon season discharges, pollution loads etc), environmental requirements (bio-diversity, fisheries, water quality standards etc) and socio-economic parameters (such as navigation requirements, future urban expansion, industrial growth, abstraction requirements and the risks of possible pollution and encroachment along the rivers);
- (iii) Extensive consultation with river users and Local Government entities to establish priorities and related development needs and plans;
- (iv) An appreciation of the main hydraulic, environmental and other water-related problems and challenges that will need to be addressed along the river in the future.
- (v) Preparation of a management plan for the river, in sufficient detail to enable specific interventions to be subsequently planned and implemented in an integrated manner, which would be periodically updated.

Initially sample plans will be prepared in each region as part of the learning and capacity building process. Thereafter, planning and management will continue as a long term process.

NWPo encourages use of private sector service providers, and accordingly provision is made for TA support throughout the programme. Allowance is also made for investments in dredging for both navigation and drainage purposes, erosion control measures and other miscellaneous works. All interventions will be subject to conditions laid down in the Government's Guidelines and will have to conform in particular to the requirements of Guidelines for Project Assessment, for Environmental Impact Assessment and Social Impact Assessment.

### **Financing Arrangements**

Financing would be by GoB, possibly with donor support. Cost recovery for river improvement works such as dredging and excavation is likely to be minimal, because of the difficulty of precisely identifying the beneficiaries of this type of "public good" intervention. However, where navigation is concerned BIWTA are already offsetting some of the costs through fees paid by boat operators. Flood control and erosion measures for towns should be progressively become financed through the concerned municipalities, although implementation of such works may be by BWDB, depending on the nature and size of works involved. The onus for paying for pollution control works lies with the polluter, and this issue will be addressed under Programmes EA 001, EA 002 and EE 012.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"> <li>Integrated river management plans</li> </ul>	I1	<ul style="list-style-type: none"> <li>Plan documents approved</li> </ul>	2006
<ul style="list-style-type: none"> <li>Sustainable river development and management works</li> </ul>	K	<ul style="list-style-type: none"> <li>Physical progress</li> <li>Effective operation and maintenance</li> <li>Independent surveys of end users</li> </ul>	2011
<ul style="list-style-type: none"> <li>Bangladesh's main and regional rivers comprehensively developed for sustainable multi-purpose use</li> </ul>	D	<ul style="list-style-type: none"> <li>Returns per unit of water</li> <li>River maintenance costs</li> <li>Quality and Quantity of in-stream flows</li> </ul>	2026

## Institutional Arrangements

BWDB would be the executing agency, but would be required to fully collaborate with BIWTA, Municipalities, Zila Parishads and their supporting agencies such as LGED. An early feature of the programme will be to delineate BWDB's limits of responsibility and the interface with Local Government. It is assumed that broad guidelines for this would be worked out between BWDB and LG during the piloting stage, but that precise definition will be done on a river by river basis. Similarly, BWDB will need to reach an understanding with BIWTA over the funding and implementation of dredging works.

## Existing Documentation

There is substantial technical information on the regional river systems available on the National Water Resources Database. Regional river hydrodynamic models, prepared by SWMC, are held by WARPO. BIWTA and BWDB both hold large amounts of information on river surveys and water level and discharge monitoring. Data on water quality are generally sparse, but some are held by BWDB and DoE. There are also a plethora of individual project reports and regional studies held by BWDB and WARPO. There is however little or no comprehensive documentation of river management plans or management processes, a gap which this programme is intended to fill.

## Linkages

As stated, there are many linkages between this and other programmes. The main ones are: Virtually all other programmes in the MR cluster; ID 004: BWDB Regional and Sub-Regional Management; ID 010: BWDB Capacity Building; EE 001 and EE 003 supporting new legislation; TR 007: Rural and Small Town Flood Protection; AW 005, AW 006 and AW 007 dealing with local system management and rationalisation of existing FCD infrastructure; EA 001: National Pollution Control Plan and EA 005: National Fishpass Programme. Other programmes of direct relevance are those connected with building up Local Government and Community level capacity for system management and those connected with revising and updating Guidelines.

## Risks and Assumptions

This Programme sets a new course in the approach to planning and managing river systems, and in doing so places a considerable burden of responsibility on BWDB. This responsibility manifests itself in requirements both to broaden BWDB's technical skill base and to collaborate with all stakeholders. The assumption is that with the support of the other capacity building programmes, over time BWDB will be able to re-orient its largely project-based way of working to a systems-based approach. Particular risks lie in persistent ad hoc demands distracting BWDB from the overall goal of comprehensive river plans and adequate financing of O&M. Both will be mitigated with political support.

**Regional River Management and Improvement**

Ref :

**MR 006**

Cluster :	<b>Main Rivers</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>In-stream Interests</b>	Location :	<b>Nationwide, in regional phases.</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>25 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>LGIs</b> (Supporting)
Short Description :	The aim of the programme is to ensure that river management plans are prepared and implemented in a comprehensive and cost-effective manner. It represents the upper tier of three levels of river system management, the other two being the responsibilities of Local Government and community groups. It provides the resources to plan, develop and maintain the regional river systems in an integrated manner, interfacing with these other institutions and responsive to stakeholder needs. The programme acknowledges that a fully replicable approach will take a number of years to establish and incorporates both technical support and investment capital on a long-term basis. It has many linkages with other programmes.		

<b>MIS Links</b>	Cost Calculation :	MR Programme costing.xls	Map :	MR 006 Map.jpg
	Disb't Schedule :	MR Programme costing.xls	Description :	MR 006 PgP.doc

<b>Finance</b>	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>16,200.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>25</b>
Ultimate Recurring	<b>1,256.60</b> MTk/yr	<b>n/a</b>	<b>75%</b>	<b>25%</b>	<b>26</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Integrated river management plans	• Plan documents approved	NYD
• Sustainable river development and management works	• Physical progress • Effective operation and maintenance • Independent surveys of end users	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	<b>MR 006</b>
Title	<b>Regional River Management and Improvement</b>

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-

### Other Programme Costs

1. Dredging requirements for navigation							
o Preliminary dredging					83.0	0.0%	-
o Capital dredging					975.0	8.5%	83.3
2. Dredging requirements for improved drainage (GDA)					4,900.0	9.0%	443.2
3. Dredging requirements for improved drainage (other areas)					6,280.0	9.0%	568.0
4. River Training and Erosion control measures					934.0	5.0%	46.7
5. Miscellaneous other river management measures (Dharla, Dudhkumar, Manu, Khowai, Gumuti, Matamuhury etc)					2,307.0	5.0%	115.4
6. Technical assistance support for design and supervision of works 2-5 above					721.0	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
<b>Total Other Programme Costs</b>					16,200.0		1,256.6

<b>Overall Programme Costs</b>					<b>16,200.0</b>		<b>1,256.6</b>
--------------------------------	--	--	--	--	-----------------	--	----------------

### Notes

- Dredging requirements for navigation*  
Balance of prelim dredging requirements of Prog MR 011 over 2 yrs 41.7% of total Tk83M  
Balance of capital dredging requirements of Prog MR 011 over 7 yrs 41.7% of total Tk975M  
Balance of maintenance dredging requirements of Prog MR 011 41.7% of total Tk83M
- Dredging requirements for improved drainage (GDA)*  
As per OGD final Report, allow for improvements to river systems within polders of GDA, Tk4,900M
- Dredging requirements for improved drainage (other areas)*  
Total estimate of BWDB (ref DSR MR 10.13.2) Tk41,740M Allow 20% of this as viable and adjust for GDA  
as above, net remaining in other regions equivalent to Tk6,280M
- River Training and Erosion control measures*  
Allow for 3.0% of rivers to be protected, equiv. 1,251km at average rate Tk 0.746 M/km incl. 25% contingencies 0.597 TkM/km
- Miscellaneous other river management measures*  
(Dharla, Dudhkumar, Manu, Khowai, Gumuti, Matamuhury etc)  
Allow 18% of total investments
- Technical assistance support for design and supervision of works 2-5 above*  
Allow 5% of total investments

## Ganges Dependent Area Regional Surface Water Distribution Networks

Ref: MR 007

### Basic Data

NWMP Sub-sector **Main River Development**

Region(s) **SW and nearby areas of NW and SC regions**

### Relevance to NWPo

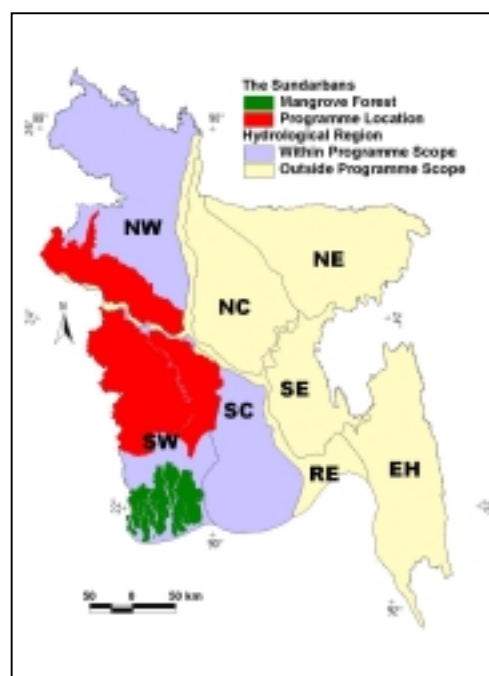
NWPo Articles 4.2(j) and (k) provide for development of the main rivers for multi-purpose use and Article 4.7 requires the promotion of conjunctive use of groundwater and surface water and encourages the continued expansion of minor irrigation. Articles 4.9 and 4.12 stress the need for water for fisheries and wildlife and for adequate upland flow in water channels to limit salinity intrusion and preserve estuary ecosystems.

### Purpose of Programme

The Ganges Dependent Area covers a third of the country and has long been recognised as an area where improved water resources management is most needed. Over the last three decades, the water resource system has been in a process of degradation, principally due to a reduction of freshwater inflows from the Ganges, siltation of rivers following construction of the polder systems and increasing salinity intrusion from the Bay of Bengal. This has led to a down turn in agricultural production in the coastal areas, the main source of employment, reduced opportunities for navigation, a loss of biodiversity and reduction in wood production in the internationally recognised Sundarbans forest reserve, and increasing social conflict associated with changing land use. The area has more flooding than on average in the rest of Bangladesh, as well as the greatest extent of water shortages in the dry season. Arsenic contamination is widespread across much of region.

The strategy for the GDA must respond to the central issues of a widening gap between water demands and availability, increasing saline intrusion and worsening drainage congestion in a manner that fully recognises the dynamics of the resource system. These are particularly complex in the GDA, and especially so when considered in the context of climate change, projected sea-level rise, land subsidence and the observed rapid increase in tidal range.

The overall objectives for the GDA therefore are to manage the water resource system in a manner that promotes social and economic development in an equitable fashion, and to arrest and reverse the environmental degradation that has already set in. The main thrusts of the strategy are to relieve drainage congestion within the polder area through development of a sustainable river and drainage system, control salinity intrusion and relieve water shortages in the area. This is to be achieved by a combination of river and drainage improvement programmes, augmentation of dry season upland flows and improved management of trans-regional wet



season flood flows. These will be complemented by measures to develop and improve local management of water resources, optimise land use potential and enhance environmentally sound development.

Four main sub-programmes are to be taken up on an integrated basis: general sub-programmes, drainage relief sub-programmes, augmentation sub-programmes and institutional development.

This Programme MR 007 deals with the development of the regional and local distribution networks that would be associated with the augmentation sub-programmes above. Other aspects of the GDA development are covered by MR 003: Ganges Barrage and Ancillary Works, MR 006: Regional River Management Improvement (which includes works on the coastal polders), AW 005: Improved Water Management at Local Government level, AW 006: Improved Water Management at Community level, EA 009: Improved Water Management and Salinity Control in the Sundarbans and ID 001 and ID 004 dealing with Local government and BWDB management. Provision for a feasibility study of the overall development is included under Programme MR 001.

### **Programme Outline**

A full description of the Programme is presented in the July 2001 OGDA Report. Three distribution systems have been identified in that report as follows. On the Ganges left bank in the NW three existing channels would be developed for abstraction from the Ganges, the Boral River, another opposite the Gorai river mouth and a third about 45km upstream. For augmentation of supplies to the Gorai Right Bank area of SW Region, Link Channel 1 would take off directly from the Ganges just downstream of Hardinge Bridge. It would link up with the existing river courses of the Hisna and Mathabanga, following a route outside the GK Irrigation Project, and would deliver flows to the existing Nabaganga–Chitra and Bhairab–Kobadak–Betna river networks. The location of the Ganges offtake for Link Channel 4, to serve the Gorai Left Bank, would depend on which of the two possible Ganges Barrage sites, Tagorbari or Pangsha, were selected. In either case the diverted flows would go into the existing Chandana River and the existing Madaripur Beel Route channel.

All distribution would be by gravity flow. There would be a limited number of structures on the main rivers forming the link channels. Land acquisition requirements would be minimal, because of the use made of existing channels. The structures would control water levels in the drainage network, facilitating development of surface water irrigation through farmer-owned LLP systems. Link 1 would be sized to provide additional flows for salinity control purposes to the western part of the Sundarbans (complementing augmented flows in the Gorai to provide salinity control in the eastern part).

This programme provides for the capital investments necessary to establish both the regional and local river system developments. The amount of this provision takes into account that part of these works will be developed under Programme AW 005.

### **Financing Arrangements**

Financing of all the above works would be by GoB, and would be suitable for donor support. Cost recovery for the regional systems is not thought to be practicable in view of the multi-purpose use of the water provided over such a large and diverse area. Funding of local networks maintenance would be considered under programmes EE 013 and AW 005.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Regional river link channels	I1	• Physical progress of capital works	2017
• Local link channels	I2	• Physical progress of capital works	2017
• Increased dry season water availability in the GDA	K	• Dry season discharges	2017
• Bangladesh's main and regional rivers comprehensively developed for sustainable multi-purpose use	D	• Returns per unit of water • River maintenance costs • Quality and Quantity of in-stream flows	2025

## Institutional Arrangements

BWDB would be responsible for the regional river systems and Local Government for the local systems. Community groups and individual pump operators would be involved in the final delivery of water. NGOs would assist in the limited land acquisition and resettlement required.

## Existing Documentation

OGDA Draft Final Report, July 2001, GRRP Feasibility Report, July 2001 and the NWRD (National Water Resources Database).

## Linkages

As stated above, this programme follows on from the studies to be made under Programme MR 001 and the feasibility study of the Gorai River Restoration Project (GRRP). Other aspects of the GDA development are covered by MR 003: Ganges Barrage and Ancillary Works, MR 006: Regional River Management Improvement (which includes works on the coastal polders), AW 005: Improved Water Management at Local Government level, AW 006: Improved Water Management at Community level, EA 009: Improved Water Management and Salinity Control in the Sundarbans and ID 001 and ID 004 dealing with Local government and BWDB management.

## Risks and Assumptions

The programme assumes that a fully viable integrated development solution will be developed out of the MR 001 studies. The main environmental risk is the interruption to fish migration that the regulating structures may cause. Whilst in some cases migration has already been interrupted by the diminution of dry season flows, this will nevertheless be a key issue to address properly in the design of the systems. Effective utilisation of water provided for consumptive use will depend upon both there being a demand for the water provided and that individuals and communities co-operate in rehabilitating and maintaining field channels and small khals. Whilst there is evidence to support that there will be demand, albeit with a modest growth rate, achieving sustainable maintenance has so far been illusive. Programme AW 006 is directed at resolving this.



## Ganges Dependent Area Regional Surface Water Distribution Networks

Ref : **MR 007**

Cluster :	<b>Main Rivers</b>	Region(s) :	<b>NW, SW, SC</b>
Focus/Foci :	<b>Surface Distribution Networks</b>	Location :	<b>Ganges Dependent Area</b>
Start Year <sup>1</sup> :	<b>2009</b>	Duration <sup>2</sup> :	<b>8 year(s)</b>
		Agency(s) Responsible :	<b>BWDB (Lead)</b> <b>LGED (Supporting)</b>
Short Description :	This programme provides for the capital investments necessary to develop both regional and local river distributary systems as part of the overall GDA development. This provision takes into account that part of these works will be developed under Programme AW 005. Three main link channels have been identified to serve both the Ganges left and right banks. The links would be sized to accommodate supplementary flows for salinity control, as well as for development of LLP irrigation and other consumptive needs.		

<b>MIS Links</b>	Cost Calculation :	MR Programme costing.xls	Map :	MR 007 Map.jpg
	Disb't Schedule :	MR Programme costing.xls	Description :	MR 007 PgP.doc

<b>Finance</b>					
	Costs	Private	Funding (%)	Expected by	
			GoB	Beneficiaries	ProgrammeYear
Total Capital <sup>3</sup>	<b>8,911.00</b> MTk	<b>0%</b>	<b>98%</b>	<b>2%</b>	<b>8</b>
Ultimate Recurring	<b>267.30</b> MTk/yr	<b>n/a</b>	<b>75%</b>	<b>25%</b>	<b>9</b>
Date of Data :	<b>31 07 01</b>	<b>Stacked Cumulative Cash Flow Chart</b>			
	(dd) (mm) (yy)				
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

## Monitoring

Objective	Indicator	Present Status <sup>5</sup>
• Regional river link channels	• Physical progress of capital works	NYD
• Local link channels	• Physical progress of capital works	NYD
• Increased dry season water availability in the GDA	• Dry season discharges	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	<b>MR 007</b>
Title	<b>Ganges Dependent Area Regional Surface Water Distribution Networks</b>

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	8.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. NW Link					1,086.0	3.0%	32.6
2. Link Channel 1					5,953.0	3.0%	178.6
3. Link Channel 4					1,872.0	3.0%	56.2
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					8,911.0		267.3
<b>Overall Programme Costs</b>					8,911.0		267.3

GDA Regional Surface Water Distribution System Costs *excluding cost of barrage, headworks and field networks*

	NCA km2	SW Irrig km2	Investment Costs (TkM)			Cost/ha Tk/ha	Less AW 005 costs	Net Invest TkM
			Regional	Local	Total			
NW Link	3,167	1,671	712	687	1,399	8,372	(313)	1,086
Link Channel 1	7,324	3,453	5,357	1,242	6,599	19,111	(646)	5,953
Link Channel 4	3,596	2,225	1,627	661	2,288	10,283	(416)	1,872
Totals	14,087	7,349	7,696	2,590	10,286	13,996	(1,375)	8,911

Note 520,000 ha developed under AW 005 nationally

Assume 75% of this is within GDA, remainder to be covered under GDA programme

Northwest Region 13.6%

Southwest Region 64.2%

Ref OGDAs Studies, Draft Final Report, July 2001

Southwest Region 22.2%

## North East and South East Regional Surface Water Distribution Networks

Ref: MR 008

### Basic Data

NWMP Sub-sector      **Main River Development**

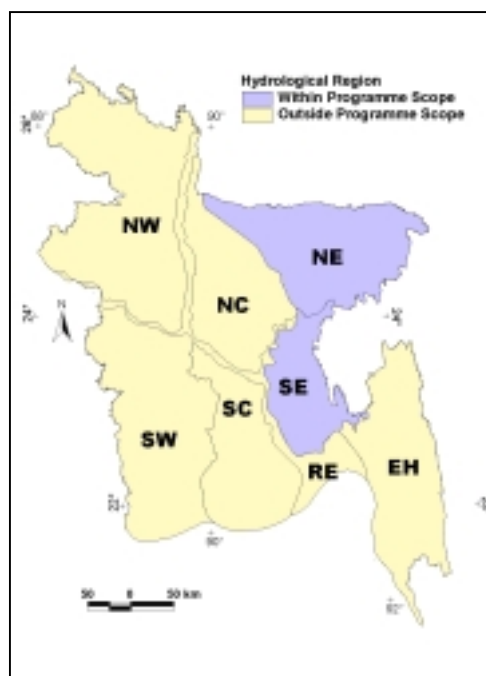
Region(s)              **NE and SE Regions**

### Relevance to NWPo

NWPo Articles 4.2(j) and (k) provide for development of the main rivers for multi-purpose use and Article 4.7 requires the promotion of conjunctive use of groundwater and surface water and encourages the continued expansion of minor irrigation. Articles 4.9 and 4.12 stress the need for water for fisheries and wildlife and for adequate upland flow in water channels to limit salinity intrusion and preserve estuary ecosystems.

### Purpose of Programme

Development of surface water resources in NE and SE Regions may be considered as an important element of future plans, particularly given the limited groundwater irrigation potential and the prevalence of arsenic in the shallow groundwater of both regions and the water availability deficits identified in SE region. This will be looked into under a trans-regional study of the Northeast and Southeast Regions under Programme MR 001



The purpose of this Programme would be to distribute water from a Meghna barrage, if this is selected as a preferred option under Programme MR 001 above. The feasibility of the barrage would be studied further in Programme MR 004, which also makes provision for the investment costs of a barrage and diversion works. This feasibility study would also confirm the scope of the distribution network required under this programme MR 008.

The barrage may be built near the existing Bhairab railway bridge (the Bhairab road bridge is now being built there). It would conserve water in NE Region and improve navigation. Groundwater exploitation is constrained by thick clay layers and well drilling difficulties in much of the region, and surface water is the main resource. A Meghna barrage could also provide arsenic-free water to the SE Region, either via an aqueduct for water supply to this heavily arsenic-contaminated zone or via a large canal for irrigation of the saline zone and newly reclaimed coastal areas. The impact of increased water levels and higher wave heights on the haors in NE Region would need to be checked.

### Programme Outline

There are no existing studies of a distribution system from a Meghna barrage. Provision has been made for the capital investment in both regional and local river system development, taking account of the works identified for the GDA (see Programme MR 007).

## Financing Arrangements

Financing of all the above works would be by GoB, and could be suitable for donor support. Cost recovery for the regional systems is not thought to be practicable in view of the multi-purpose use of the water provided over such a large and diverse area. Funding of local networks maintenance would be considered under programmes EE 013 and AW 005.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Regional river link channels	I1	• Physical progress of capital works	2020
• Local link channels	I2	• Physical progress of capital works	2020
• Increased dry season water availability in the Northeast and Southeast Regions	K	• Dry season discharges	2020
• Bangladesh's main and regional rivers comprehensively developed for sustainable multi-purpose use	D	• Returns per unit of water • River maintenance costs • Quality and Quantity of in-stream flows	2025

## Institutional Arrangements

BWDB would be responsible for the regional river systems and Local Government for the local systems. Community groups and individual pump operators would be involved in the final delivery of water. NGOs would assist in the limited land acquisition and resettlement required.

## Existing Documentation

NWMP DSR §6.8, the NWRD (National Water Resources Database) and NMIDP and SSWRDSP reports with regard to local water distribution.

## Linkages

The Programme is directly linked with MR 004: Meghna Barrage and Ancillary Works, and would go ahead only if a Meghna barrage were constructed. There is linkage with MR 006: Regional River Management and Improvement, AW 006, which involves khal re-excavation, and AW 005. The experience gained with the implementation of MR 007: Regional Surface Water Distribution Networks in the Ganges Dependent Area, would be directly relevant. Programme ID 010: BWDB Capacity Building, will enhance the Board's ability to plan and implement large-scale development such as this.

## Risks and Assumptions

The programme assumes that a fully viable integrated development solution will be developed out of the MR 001 studies and confirmed in MR 004 Feasibility Study. The main environmental risk is the interruption to fish migration that the regulating structures may cause. Whilst in some cases migration has already been interrupted by the diminution of dry season flows, this will nevertheless be a key issue to address properly in the design of the systems. Effective utilisation of water provided for consumptive use will depend upon both there being a demand for the water provided and that individuals and communities co-operate in rehabilitating and maintaining field channels and small khals. Whilst there is evidence to support that there will be demand, albeit with a modest growth rate, achieving sustainable maintenance has so far been illusive. Programme AW 006 is directed at resolving this.

## North East and South East Regional Surface Water Distribution Networks

Ref : **MR 008**

Cluster :	<b>Main Rivers</b>	Region(s) :	<b>NE, SE</b>
Focus/Foci :	<b>Surface Distribution Networks</b>	Location :	<b>NE &amp; SE regions</b>
Start Year <sup>1</sup> :	<b>2016</b>	Duration <sup>2</sup> :	<b>5 year(s)</b>
		Agency(s) Responsible :	<b>BWDB (Lead)</b> <b>LGED (Supporting)</b>
Short Description :	Provision is made in this programme for the capital investment in both regional and local river system development, based on augmentation of the surface water from a barrage on the Meghna, if this is selected as a preferred option under Programme MR 001. The feasibility of the barrage would be studied further in Programme MR 004, which would also determine the scope of the distribution network required.		

<b>MIS Links</b>	Cost Calculation :	MR Programme costing.xls	Map :	MR 008 Map.jpg
	Disb't Schedule :	MR Programme costing.xls	Description :	MR 008 PgP.doc

<b>Finance</b>					
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>2,576.00</b> MTk	<b>0%</b>	<b>98%</b>	<b>2%</b>	<b>5</b>
Ultimate Recurring	<b>77.30</b> MTk/yr	<b>n/a</b>	<b>75%</b>	<b>25%</b>	<b>6</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

## Monitoring

Objective	Indicator	Present Status <sup>5</sup>
• Regional river link channels	• Physical progress of capital works	NYD
• Local link channels	• Physical progress of capital works	NYD
• Increased dry season water availability in the Northeast and Southeast Regions	• Dry season discharges	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	<b>MR 008</b>
Title	<b>North East and South East Regional Surface Water Distribution Networks</b>

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	5.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Provision for distribution systems					2,576.0	3.0%	77.3
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					2,576.0		77.3
<b>Overall Programme Costs</b>							
					2,576.0		77.3

Regional Surface Water Distribution System Costs *excluding cost of barrage, headworks and field networks*

	NCA km2	SW Irrig km2	Investment Costs (TkM)			Cost/ha Tk/ha	Less AW 005 costs	Net Invest TkM
			Regional	Local	Total			
GDA (AW 007)	14,087	7,349	7,696	2,590	10,286	13,996	(1,375)	8,911
NE & SE	n/a	2,004	2,099	706	2,805	13,995	(229)	2,576

*Pro rata Meghna diversion to Ganges diversion (see AW 004) less 250m3/s for salinity control in GDA*

Note 520,000 ha developed under AW 005 nationally  
Assume 13% of this is within NE/SE, remainder to be covered under this programme

*Northeast Region 35.0%*

*Southeast Region 65.0%*

Ref OGDAs Studies, Draft Final Report, July 2001

<b>North Central and North West Regional Surface Water Distribution Networks</b>	<b>Ref: MR 009</b>
--	--------------------

### Basic Data

NWMP Sub-sector      **Main River Development**

Region(s)              **NW and NC Regions**

### Relevance to NWPo

NWPo Articles 4.2(j) and (k) provide for development of the main rivers for multi-purpose use and Article 4.7 requires the promotion of conjunctive use of groundwater and surface water and encourages the continued expansion of minor irrigation. Article 4.9 stresses the need for water for fisheries and wildlife.

### Purpose of Programme

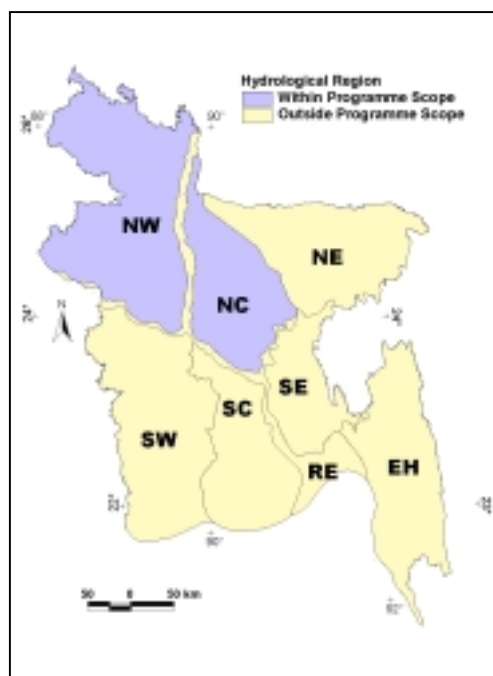
A Brahmaputra Barrage might be constructed some time in the future, if tubewell irrigation in the NW and NC Regions had to be cut back because of an arsenic risk to human health from tubewell-irrigated crops or if a major increase in conjunctive use in the presently tubewell irrigated areas were required on policy grounds. The existing river network is insufficient to enable the increased supplies to reach more than a limited proportion of the overall potential benefit area in the two regions. Justification of a Brahmaputra Barrage would therefore depend on a parallel development of a regional water distribution network to link existing rivers and channels and thereby substantially increase the benefit area. Low lift pump (LLP) irrigation would be the main beneficiary, but there would also be positive impacts on the environment, navigation and water supplies.

A large proportion of the benefit area already has shallow tubewell (STW) irrigation. However, by increasing dry season surface water availability the Programme would bring about an expansion of the irrigated area through LLPs (these are all farmer-owned and operated) and an increase in conjunctive use, with some substitution of STW pumping by the cheaper and less environmentally damaging LLP pumping. Present evidence indicates that the use of arsenic – contaminated STW irrigation water for crops is not a health risk. If, however, this were subsequently to prove not to be the case, STW irrigation would need to be reduced.

### Purpose of Programme

Development of the surface water resources of the Brahmaputra River may be considered as an important element of future plans. This will be looked into in the Long-term Risk Management Study under Programme MR 001.

The purpose of this Programme would be to distribute water from a barrage, if this is selected as a preferred option under Programme MR 001 above. The feasibility of the barrage would be studied further in Programme MR 005, which also makes provision for the investment costs of a



barrage and diversion works. This feasibility study would also confirm the scope of the distribution network required under this programme MR 009. The barrage may be built on the Brahmaputra. Flow could be diverted directly to the NW, NC and NE regions.

## Programme Outline

Outline studies of the Brahmaputra Barrage have been conducted, most recently in the 1980's by ESG. However, until MR 001 study is complete, the scope of works to be included in this programme cannot be defined. Nevertheless, provision has been made for the capital investment in both regional and local river system development, on a pro-rata basis taking account of the works identified for the GDA (see Programme MR 007).

## Financing Arrangements

Financing of these works would be by GoB, and could be suitable for donor support. Cost recovery for the regional systems is not thought to be practicable in view of the multi-purpose use of the water provided over such a large and diverse area. Funding of local networks maintenance would be considered under programmes EE 013 and AW 005.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Regional river link channels	I1	• Physical progress of capital works	2025
• Local link channels	I2	• Physical progress of capital works	2025
• Increased dry season water availability in the Regions	K	• Dry season discharges	2025
• Bangladesh's main and regional rivers comprehensively developed for sustainable multi-purpose use	D	• Returns per unit of water • River maintenance costs • Quality and Quantity of in-stream flows	2025

## Institutional Arrangements

BWDB would be responsible for the regional river systems and Local Government for the local systems. Community groups and individual pump operators would be involved in the final delivery of water. NGOs would assist in the limited land acquisition and resettlement required.

## Existing Documentation

ESG Studies, NWMP DSR Section 6.8, the NWRD (National Water Resources Database) and NMIDP and SSWRDSP reports with regard to local water distribution.

## Linkages

The Programme is directly linked with MR 005: There is also linkage with MR 006: Regional River Management and Improvement, AW 006, which involves khal re-excavation, and AW 005. The experience gained with the implementation of MR 007: Ganges Dependent Area Regional Surface Water Distribution Networks, would be directly relevant. Programme ID 010: BWDB Capacity Building, will enhance the Board's ability to plan and implement large-scale development such as this.



## **Risks and Assumptions**

The programme assumes that a fully viable integrated development solution will be developed out of the MR 001 studies and confirmed in MR 005 Feasibility Study. The main environmental risk is the interruption to fish migration that the regulating structures may cause. Whilst in some cases migration has already been interrupted by the diminution of dry season flows, this will nevertheless be a key issue to address properly in the design of the systems. Effective utilisation of water provided for consumptive use will depend upon both there being a demand for the water provided and that individuals and communities co-operate in rehabilitating and maintaining field channels and small khals. Whilst there is evidence to support that there will be demand, albeit with a modest growth rate, achieving sustainable maintenance has so far been illusive. Programme AW 006 is directed at resolving this.

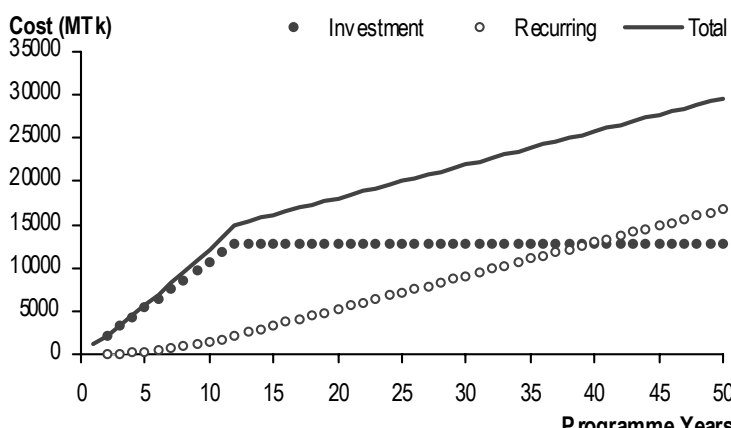
## North Central and North West Regional Surface Water Distribution Networks

Ref :

**MR 009**

Cluster :	Main Rivers	Region(s) :	NW, NC	
Focus/Foci :	Surface Distribution Networks	Location :	NW & NC Regions	
Start Year <sup>1</sup> :	2021	Duration <sup>2</sup> :	12 year(s)	Agency(s) : BWDB (Lead)
				Responsible : LGED (Supporting)
Short Description :	Provision is made in this programme for the capital investment in both regional and local river system development, based on augmentation of the surface water from a barrage on the Brahmaputra, if this is selected as a preferred option under Programme MR 001 above. The feasibility of the barrage would be studied further in Programme MR 005, which would also determine the scope of the distribution network required.			

<b>MIS Links</b>	Cost Calculation :	MR Programme costing.xls	Map :	MR 009 Map.jpg
	Disb't Schedule :	MR Programme costing.xls	Description :	MR 009 PgP.doc

Finance							
	Costs		Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear	
	Total Capital <sup>3</sup>		12,862.00 MTk	0%	98%	2%	12
	Ultimate Recurring		385.90 MTk/yr	n/a	75%	25%	13
	Date of Data :		31 07 01	Stacked Cumulative Cash Flow Chart			
	(dd) (mm) (yy)						
Status :	Identified						
Financial Base Year:	mid-2000						
Planned Expenditure (to date) :	0 MTk						
Actual Expenditure <sup>4</sup> (to date) :	0 MTk						

## Monitoring

Objective	Indicator	Present Status <sup>5</sup>
• Regional river link channels	• Physical progress of capital works	NYD
• Local link channels	• Physical progress of capital works	NYD
• Increased dry season water availability in the Regions	• Dry season discharges	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates

5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	<b>MR 009</b>
Title	<b>North Central and North West Regional Surface Water Distribution Networks</b>

*Assumptions:*

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	12.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Provision for distribution systems					12,862.0	3.0%	385.9
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					12,862.0		385.9
<b>Overall Programme Costs</b>							
					12,862.0		385.9

Regional Surface Water Distribution System Costs *excluding cost of barrage, headworks and field networks*

	NCA km2	SW Irrig km2	Investment Costs (TkM)			Cost/ha Tk/ha	Less AW 005 costs	Net Invest TkM
			Regional	Local	Total			
GDA (AW 007)	14,087	7,349	7,696	2,590	10,286	13,996	(1,375)	8,911
NE & SE	n/a	9,353	9,795	3,296	13,091	13,996	(229)	12,862

*Pro rata other barrage diversion for irrigation to Ganges diversion (see AW 005) less 250m3/s for salinity control in GDA*

Note 520,000 ha developed under AW 005 nationally  
 Assume 13% of this is within NW/NC, remainder to be covered under this programme

Ref OGDAs Studies, Draft Final Report, July 2001 and DSR Chap 6.8

Northwest Region 50.0%  
 North Central Region 50.0%

**Main Rivers Erosion Control at Selected Locations**Ref: **MR 010****Basic Data**

NWMP Sub-sector	<b>Main River Development</b>
Region(s)	<b>North West, North Central and South East</b>

**Relevance to NWPo**

Article 4.02(q) of the NWPo requires the Government via its responsible agencies to undertake surveys and investigations of the problem of river bank erosion and to develop and implement master plans for river training, erosion control works for the preservation of scarce land and the prevention of landlessness and pauperisation.

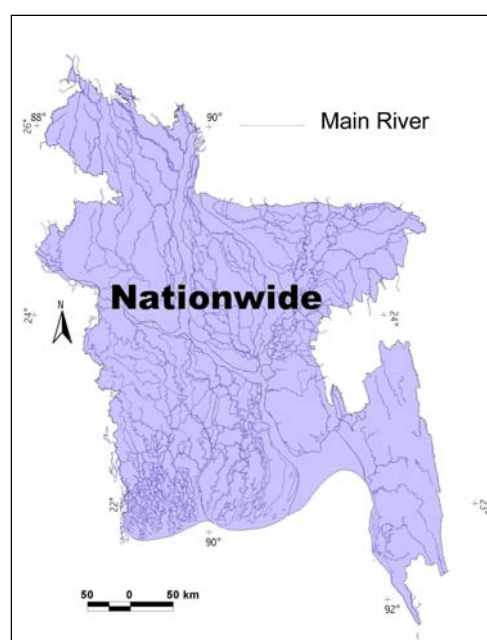
**Purpose of Programme**

Land loss due to river bank erosion is a major problem in Bangladesh. Over the period 1982-92, 106,300 ha were lost to erosion in the major river, with only 19,300 ha accreted— a net land loss of almost 10,000 ha per year. This process has significant economic and social implications, because the loss of land, crops and properties leads to landlessness and impoverishment for thousands of households.

A Brahmaputra River Training Study was undertaken as part of the Flood Action Plan (FAP) study programme. Its Master Plan (1994) proposed the construction of 27 hardpoints on the Brahmaputra Right Bank between its confluence with the Teesta and with the Atrai, at a total capital cost of Tk19,445M (1992 prices). Four of these hardpoints have been since constructed at Sirajganj, Sariatkandi, Kalitola and Mathurapara. The works at Sirajganj and Kalitola were damaged during 1998 and 1999 floods, necessitating substantial repairs. Experience has also been gained with construction of guide bunds for the Banghabandu Bridge across the Brahmaputra, which is also protected by two of the hard points against out-flanking. Pilot testing of lower cost training works has also been conducted under FAP21/22 since 1994.

A Chinese team (CBJET) also looked into training of the Brahmaputra, and their 1991 report suggests an alternative solution of canalising the river with works on both banks. Although very much more expensive, it secures a much greater land area against erosion (but not flooding).

Works of this nature are inherently risky and expensive, particularly on a river as powerful and aggressive as the Brahmaputra. They carry a high maintenance requirement, with potentially catastrophic results if the maintenance is not kept up. Evidence to date indicates that the works are costing more to build and more to maintain than was envisaged in the 1964 Master Plan, and a review is required to come up with a cost-effective and affordable strategy for managing erosion on all the rivers. This will be conducted under Programme MR 001, and will look into non-structural and structural approaches, including the results of pilot testing under FAP21/22.



This programme makes financial provision for future works erosion management measures on the major rivers, depending upon the confirmed strategy arising from the review conducted under programme MR 001.

## Programme Outline

Details of the programme cannot be specified until the review above is completed. Costs are provisionally based on completion of a further 23 hardpoints on the Brahmaputra with allowance for other works on the other major rivers. Such a programme is expected to take at least 25 years to complete.

## Financing Arrangements

Capital and recurrent funding of this Programme would be from GoB, possibly with donor assistance for the capital works and support for establishment of the major O&M infrastructure that would need to be established if the training works proceed.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Impacts of river erosion mitigated in the main rivers	I1	• Project reports	2025
• Socio-economic impacts of erosion minimised	K	• Visual evidence	2025
• Bangladesh's main and regional rivers comprehensively developed for sustainable multi-purpose use	D	• Independent surveys	2025
		• Returns per unit of water	2025
		• River maintenance costs	
		• Quality and Quantity of in-stream flows	

## Institutional Arrangements

Implementation of a structural training works programme would be by BWDB. Non-structural components would be undertaken principally through Local Government. NGOs may have a useful role to play in the promotion of community sensitisation and participation. Erosion forecasting and warning systems would be developed in BWDB under Programme ID 010, to complement the existing Flood Forecasting and Warning System (itself also being upgraded under ID 010).

## Existing Documentation

Relevant documents and data include NWMP DSR Section 6.9 the National Water Resources Database (NWRD). Other pertinent reports are: Master Plan for Brahmaputra River Bank Protection Works, Halcrow *et al* (1994); Study Report on Flood Control and River Training Projects on the Brahmaputra River in Bangladesh, CBJET, March 1991; Reports on River Bank Protection Project (Short-term Stage 1A Implementation Programme under the above Master Plan (Implementation period: 1996 – 1999)); and the River Bank Protection Pilot Projects (FAP 21/22).

## Linkages

For the reasons given above, this programme cannot begin until the completion of the erosion management master plan scheduled under MR 001. There will also be links with ID 010: BWDB Capacity Building and ID 005: Local Government Capacity Building; MR 002: Main River Abstraction Programmes; MR 003 to 005 and MR 007 to 009, concerning main river barrages and their distribution networks, MR 006: Regional River Management and Improvement; MR 011: River Dredging for Navigation; and ID 008: Disaster Management Bureau Capacity Building.

## **Risks and Assumptions**

This programme assumes that an agreed plan of action will emerge from Programme MR 001. Major works on rivers of the size of the Brahmaputra will be unavoidably subject to a high degree of risk, and the magnitude of such a task should not be under-estimated, for which inadequate GoB funding to undertake the necessary repairs and maintenance is also a major risk. Non-structural solutions also have significant risks of not bringing necessary relief to those who are most likely to be affected by erosion, due mainly to local political factors.

**Main Rivers Erosion Control at Selected Locations**

Ref :

**MR 010**

Cluster :	Main Rivers	Region(s) :	NW, NC, SE			
Focus/Foci :	Erosion Control	Location :	NW, NC and SE Regions			
Start Year <sup>1</sup> :	2006	Duration <sup>2</sup> :	25 year(s)	Agency(s) :	BWDB	(Lead)
				Responsible :	NGOs	(Supporting)
Short Description :	River bank erosion is a major problem in all the main rivers. A review will be conducted under MR 001 to assess the experience gained in implementing river training works over the last decade since preparation of a Master Plan under FAP1. This review will look at all possibilities of minimising the socio-economic impacts of erosion and will formulate an updated strategy for dealing with the problem. This programme MR 010 provides for the subsequent investments to be determined by that strategy.					

**MIS Links**

Cost Calculation :	MR Programme costing.xls	Map :	MR 010 Map.jpg
Disb't Schedule :	MR Programme costing.xls	Description :	MR 010 PgP.doc

**Finance**

	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by Programme Year
Total Capital <sup>3</sup>	<b>21,500.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>25</b>
Ultimate Recurring	<b>1,075.00</b> MTk/yr	<b>n/a</b>	<b>75%</b>	<b>25%</b>	<b>26</b>

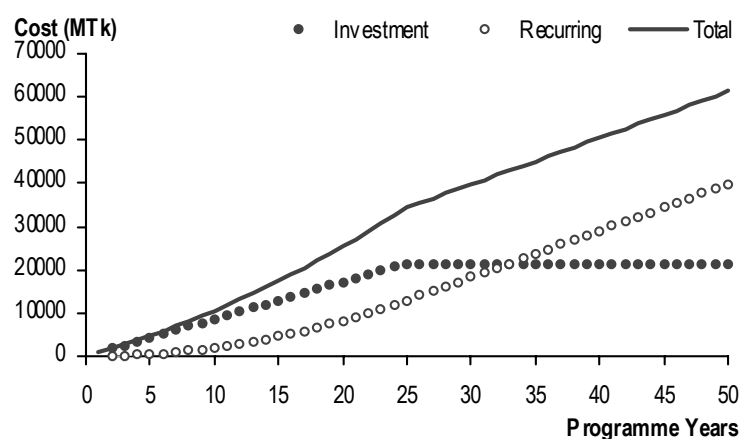
Date of Data : **31 07 01**  
(dd) (mm) (yy)

Status : **Identified**

Financial Base Year: **mid-2000**

Planned Expenditure (to date) : **0** MTk

Actual Expenditure<sup>4</sup> (to date) : **0** MTk

**Stacked Cumulative Cash Flow Chart****Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Impacts of river erosion mitigated in the main rivers	• Project reports • Visual evidence	NYD
• Socio-economic impacts of erosion minimised	• Independent surveys	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design, supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	<b>MR 010</b>
Title	<b>Main Rivers Erosion Control at Selected Locations</b>

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Provision for Brahmaputra river training works (inclusive of engineering and overheads)					18,696.0	5.0%	934.8
2. Provision for river training on other major rivers, allow fo	15%	extra			2,804.0	5.0%	140.2
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					21,500.0		1,075.0
<b>Overall Programme Costs</b>					21,500.0		1,075.0

### Notes:

Costs based on BRTS solution plus 25% addition for uncertainties and price escalation to mid-2000 values  
This solution is for 200km of the right embankment only

Original plan for 27 hard points, Tk 19,445 million, at current values as above 24,306 Tk million  
Allow for expenditure to date of Tk 5,610 million, inclusive of 10.0% price adjustment  
Net remaining expenditure Tk 18,696 million

Allow for higher O&M charges of 5% compared to original study allowance of 2%

Ref.: BrahmaputraRiver Training Study, FAP1 (1992)



**River Dredging for Navigation**Ref: **MR 011****Basic Data**NWMP Sub-sector      **Main River Development**Region(s)              **National coverage****Relevance to NWPo**

Article 4.2(l) states that GoB will de-silt watercourses to maintain navigation channels and proper drainage. Article 4.4.6 of the National Shipping Policy – 2000 states that the main part of the inland riverways will be kept navigable. To do this, a Five Year Dredging Plan will be prepared, to be implemented by BIWTA (Bangladesh Inland Water Transport Authority) using both public and private dredging capacity. Some new dredgers will be acquired.

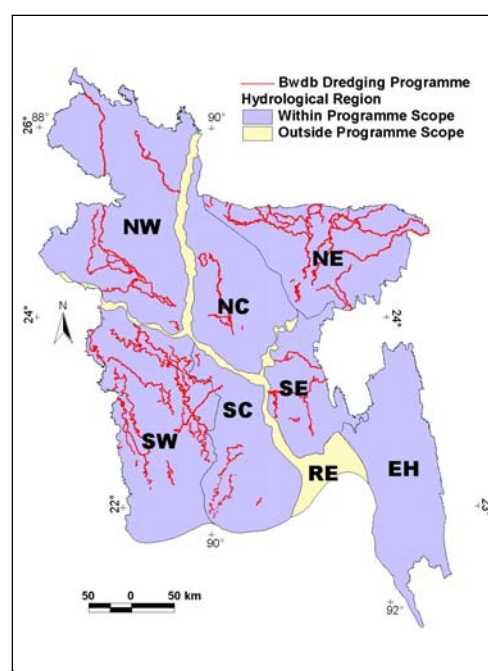
**Purpose of Programme**

This Programme MR 011 covers dredging for navigation purposes in the main rivers. It will complement the regional river improvement Programme MR 006. Other elements of dredging for navigation are provided for under MR 006: Regional River Management and Improvement.

Inland water transport (IWT) is an important transport mode, especially during the monsoon season. In 1997 it accounted for 17% of the total national passenger movements of 90 sector billion passenger – km and 28% of the total freight movement of 12 billion tonne – km. The sector comprises modern steel ships, launches, ferries and traditional country boats. There are five main transport corridors, of which the four radiating from Dhaka to Chittagong (EH Region), the NW, Khulna (SW Region) and Sylhet (NE Region) are considered important by BIWTA. Of these, the Dhaka-Khulna route (which continues to Calcutta) is the most important for passengers and freight combined, while that to Chittagong is the most important for freight. IWT is particularly important in the Meghna Basin extending up into NE Region, and in the SW and SC Regions.

Navigable routes (those maintained by BIWTA) total 5,968km in the wet season, but this shrinks to 3600km in the dry season, due to reduced draught. The wet season breakdown by navigation class is as follows:-

<b>Class and draught</b>	<b>Total km</b>
Trunk Route Class I (12 feet)	683
Transit Route Class II (6 feet)	1,000
Secondary Route Class III (3 feet)	1,885
Class IV (less than 3 feet)	2,400
<b>Total</b>	<b>5,968</b>



Maintenance of this network requires regular dredging, due to the huge sediment load coming into Bangladesh from upstream. Owing to Revenue Budget funding and other constraints, inadequate GoB dredging effort has resulted in a progressive reduction in the total length of navigable waterway. By the late 1980s/early 1990s BIWTA's annual dredging output had fallen from the mid-1980s level of about 3Mm<sup>3</sup> to around 2Mm<sup>3</sup>, although in the late 1990s it recovered to some 2.7Mm<sup>3</sup>.

Under Bangladesh conditions, especially in the monsoon season, IWT is a cost-effective and convenient form of transport for bulk goods and in those regions such as South Central where a dense network of river channels or other conditions make road transport more difficult. IWT development is an integral part of GoB's transport policy. Such development cannot be sustained without maintaining the IWT route network. Dredging is the principal means of achieving this aim.

However, with the recent completion of the World Bank IWT III Project and the postponement of the proposed World Bank IWT IV Project, little effort is going into capital dredging or other substantial IWT improvements at present, although the need is fully recognised in the National Shipping Policy.

No detailed plan has been prepared so far, although outline proposals (Nov 1999) set out a seven-year national programme involving the dredging of 363Mm<sup>3</sup>. This would require an average annual output of around 52Mm<sup>3</sup>, almost six times the existing national dredging capacity of 8.8Mm<sup>3</sup> and ten or more times the present annual output. The main rivers proposed for the IWT capital dredging include the Meghna, Padma, Brahmaputra, Kushiya (NE Region), Titas (SE), Madhumati (SW) Buriganga and Bhairab (NC), Arial Khan and Tetulia (SC) and various others.

### **Programme Outline**

This Programme seeks to restore the IWT waterways in a cost-effective manner, with a structured approach recognising both the technical and management issues that have to be overcome. A comprehensive national dredging management plan, covering both capital and maintenance dredging and with adequate Revenue Budget funding for the latter, is clearly essential if the existing IWT commercial route network is to be kept in full operation.

The programme therefore supports the preparation of the management plan and makes provision for both capital dredging of selected major waterways, much of it being deferred maintenance, as well as an adequate level of maintenance dredging thereafter.

Crucial institutional issues need also to be resolved in the management plan, particularly concerning the future role of the private sector and cost recovery from IWT users. Other important factors include the future role of IWT in an integrated national transport network and, in some locations, the disposal of dredge spoil. The plan will need to be well coordinated with BWDB's river development programmes.

### **Financing Arrangements**

Both capital and maintenance dredging would be funded by GoB. Private sector participation in dredging is being promoted under the World Bank Private Sector Infrastructure Development Project. Increased cost recovery from IWT users should receive emphasis as part of the overall institutional development of the IWT sector.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Comprehensive management plan for physical works and institutional measures	I1	• Physical programmes agreed with BWDB • Report agreed by GoB	2004
• Achievement of capital and annual maintenance plans	I2	• Audit reports • Evaluation reports	2011
• Cost effective maintenance of navigation routes	I3	• Records of length, draft and duration maintained vs. expenditure	2011
• Navigation traffic enabled	K	• Surveys and revenues	2025
• Bangladesh's main and regional rivers comprehensively developed for sustainable multi-purpose use	D	• Returns per unit of water • River maintenance costs • Quality and Quantity of in-stream flows	2025

## Institutional Arrangements

BIWTA would be the executing agency, but with increased private sector participation in dredging operations. Close liaison would be maintained with BWDB, as the manager of the nation's waterways.

## Existing Documentation

NWMP DSR §6.10, BIWTA data and reports, IWT III Project reports, the November 1999 inter-ministerial report on dredging, Dredging Programme Identification Final Report, December 1997, Bangladesh Transport Sector Study, December 1994, the BIWTA Master Plan (1989), the National Water Resources Database (NWRD).

## Linkages

There will be substantial linkages with any of the main river barrage developments which may go ahead (MR 003–005) and other main river interventions, with MR 006: Regional River Management and Improvement and with EE 011: Private Sector Participation (PSP) in Water Management, in this case with increased PSP in dredging operations.

## Risks and Assumptions

The key assumption is that the assumed major increase in GoB's capital and maintenance dredging will be achieved. Re-siltation of the dredged waterways and inadequate maintenance dredging by BIWTA to combat this are the main risks. GoB Revenue Budget constraints may depress maintenance dredging activity.

**River Dredging for Navigation**Ref : **MR 011**

Cluster :	<b>Main Rivers</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>In-stream Interests</b>	Location :	<b>Selected locations on the major rivers</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>10 year(s)</b>
		Agency(s) Responsible :	<b>IWTA (Lead)</b> <b>BWDB (Supporting)</b>
Short Description :	This Programme seeks to restore the IWT waterways in a cost-effective manner, with a structured approach recognising both the technical and management issues that have to be overcome. A comprehensive national dredging management plan would be prepared covering short to long-term dredging requirements, as well as dredger operations and the role of the private sector. The programme also makes provision for both capital dredging of the major rivers, much of it being deferred maintenance, and maintenance dredging thereafter. Dredging of other waterways is included in MR 006.		

<b>MIS Links</b>	Cost Calculation :	MR Programme costing.xls	Map :	MR 011 Map.jpg
	Disb't Schedule :	MR Programme costing.xls	Description :	MR 011 PgP.doc

<b>Finance</b>					
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>1,542.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>10</b>
Ultimate Recurring	<b>116.70</b> MTk/yr	<b>n/a</b>	<b>75%</b>	<b>25%</b>	<b>11</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Comprehensive management plan for physical works and institutional measures	• Physical programmes agreed with BWDB • Report agreed by GoB	NYD
• Achievement of capital and annual maintenance plans	• Audited reports • Evaluation reports	NYD
• Cost effective maintenance of navigation routes	• Records of length, draft and duration maintained vs expenditure	NYD
• Navigation traffic enabled	• Surveys and revenues	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	<b>MR 011</b>
Title	<b>River Dredging for Navigation Programme</b>

### Assumptions:

Taka/US\$	51.000	TA duration	2.0	years	All prices in mid-2000 values
		Investment duration	8.0	years	

Item	Unit	Quantity	Rate		Amount	O&M	O&M/yr
			US\$	Tk'000	TkM	%	TkM
<b>Technical Assistance</b>							
<i>Preparation of national dredging plan</i>							
Expatriate consultants (all-in rate)	p-m	24.0	20,000		24.5		
Senior National consultants (all-in rate)	p-m	48.0		150	7.2	0.0%	-
Mid-level National consultants (all-in rate)	p-m	92.0		90	8.3	0.0%	-
Sub-totals					40.0		-
Other general TA programme costs		25%			10.0		-
Specific other TA programme costs		Specialist advice			10.0	0.0%	-
<b>Total TA Costs</b>					<b>60.0</b>		<b>-</b>
<b>Other Programme Costs</b>							
1. Preliminary dredging programme in main rivers					117.0	0.0%	-
2. Capital dredging in main rivers					1,365.0	0.0%	-
3. Maintenance dredging in the main rivers (ultimate value)					-	0.0%	116.7
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>1,482.0</b>		<b>116.7</b>
<b>Overall Programme Costs</b>							
					<b>1,542.0</b>		<b>116.7</b>

### Notes:

<b>Assumed proportions</b> of the estimates below:					
		58.3%	in major rivers, and	41.7%	in regional rivers
Main Rivers	4,627 km2	58.3%			
Wide regional rivers	2,846 km2	35.9%			
Medium regional rivers	459 km2	5.8%			

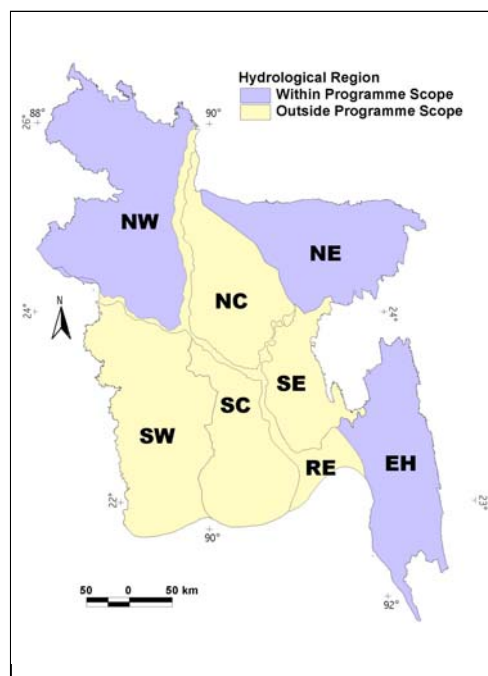
Dredging volumes and timing						Years		
						Starting	Ending	Total
Prelim dredging prog, assuming	2	Mm3 at Tk	100	per m3	200	2	3	2
Capital dredging prog, assuming	23.4	Mm3 at Tk	100	per m3	2,340	4	10	7
						Start	Full	
Maintenance dredging, assuming	2	Mm3 at Tk	100	per m3	200	2	8	7

Reference NWMP estimates based on BIWTA proposals

Reference DSR Main Report Chapter 6

**Hydropower Development and Upgrading**Ref: **MR 012****Basic Data**NWMP Sub-sector      **Main River Development**Region(s)              **Predominantly in EH Region, possibly in NE and NW Regions****Relevance to NWPo**

NWPo Article 4.11 recognises that Bangladesh has limited potential for hydropower (HEP), due to its flat terrain and lack of suitable reservoir sites, but identifies the possibility of mini-HEP plants at small dam and barrage sites. Such structures may, however, cause adverse downstream and fish migration impacts. Mini-HEP plants can be developed provided that they are economically viable and environmentally safe.

**Purpose of Programme**

Apart from generating electricity, mini or micro-HEP generation in the Eastern Hills (the Chittagong Hill Tracts (CHT)) and, possibly, NE and NW Regions, could bring substantial socio-economic benefits to the rural population, especially in the remoter areas of the CHT.

**Programme Outline**

HEP development opportunities are limited to upgrading existing facilities at Kaptai Dam in EH Region, the only major HEP plant in Bangladesh, incorporating generation facilities at barrages, and mini or micro-HEP in the Eastern Hills and, possibly, NE and NW Regions. At this stage the feasibility of such developments cannot be confirmed. An important factor is the relatively low cost of gas-fired thermal electricity generation in Bangladesh. Based on long-term contract prices agreed by independent power producers (IPPs) in Bangladesh, and other sources, the NWMP Project estimated the generation cost of gas-fired electricity to be only Tk1.71 (3.5 US cents) per Kwh at 1998/99 prices. This is well below the long-run marginal costs assumed in the past, before the technology improvements in gas-fired generation (e.g. combined cycle gas turbine (CCGT) plants) in recent years. Even though the prices of gas-fired electricity may increase as a result of the recent rise of world energy prices, they may still be too low for HEP generation to be economically competitive.

**1. Expansion of Kaptai generation capacity**

It may be possible to increase the generation capacity of the existing Kaptai Lake HEP plant on the Karnaphuli River in EH Region. The only on-going HEP project in the country is the rehabilitation of Kaptai Unit 3, due for completion in 2002 at a cost of Tk621M. In the 2000/01 Annual Development Programme, however, there is also an

“Unapproved” project, without an estimated cost or allocation of funds, for the expansion of Kaptai HEP station (Units 6 and 7).

Such developments are a matter for the Power Development Board (PDB). The aim would be to improve power output using existing storage facilities, with no increase in retention level. The only water management issue is the release pattern, to ensure that flows in the lower Karnaphuli River are maintained as required for water supply, salinity control and fisheries/environmental interests downstream. For Plan costing purposes a provision of Tk4,000M at mid – 2000 prices has been made for possible Kaptai HEP expansion, during Years 6 to 10. O&M costs would be recovered from consumers through the electricity tariff.

## **2. Integrated development of the Sangu and Mathamuhuri Rivers**

NW Hydraulic Consultants proposed in their 1983 report integrated development of the Sangu and Mathamuhuri Rivers, a theme first developed by in the 1960's when two dams were proposed at Tarasa Chara and at Champathali in the Eastern Hills Region. A more recent paper by SWMC (March 2000) reviewed and developed the concepts further. The GoB has already discussed with the Government of China taking up a feasibility study.

The study proposed by the GoB would look into the potential for developing each river from the perspective of hydropower, dry season flow augmentation for multi-purpose use and amelioration of flash floods. Earlier studies indicated that some 175MW of power could be generated and 48,000ha of irrigation taken up. Lessons learnt from the study would have useful application also for development of other hilly rivers and streams. Provision is made for these studies and subsequent developments of these two rivers.

## **3. Power generation at barrages**

Barrage studies by the ESG (Expert Studies Group) in the early 1980s considered the inclusion of low head, high volume turbine units in major barrages. Generation opportunities at river barrages are generally limited, as there is either little head (in the monsoon) or little through-flow (in the dry season). Generation would be possible at a Brahmaputra Barrage, but probably uneconomic, but on the Ganges could be based on flows diverted down the Gorai, and could be useful to supply a seasonal load, such as a pump station.

In the OGDA (Options for the Ganges Dependent Area) Draft Report of July 2001 an assessment was made of the feasibility of HEP generation from a Ganges barrage. Electricity could be generated both at the barrage and at the Gorai offtake headworks, using the high flow and low head at both structures. Power generation would be possible for 6 to 7 months of the year. Generation potential would depend upon ponding levels and flow. To estimate the benefits of possible power generation a pond level of 12.5m PWD and a flow of 300m<sup>3</sup>/s through the barrage power station and 200m<sup>3</sup>/s through the Gorai headworks was assumed. This would give a total generation capacity of 28 MW for the Tagorbari barrage and 34 MW for the Pangsha barrage.

The results of the OGDA economic analysis are shown below. With economic rates of return around 6% for both barrages, much below the GoB stipulated threshold rate of 12%, the value of the power generated would clearly be insufficient to pay for the

investment in plant and equipment required. Returns would be even less if flows dedicated to power generation were lower than assumed. The analysis also does not take into account the effect of flow variations.

#### **Estimated Ganges Barrage Hydropower Costs and Benefits (US\$M)**

<b>Item</b>	<b>Tagorbari site</b>	<b>Pangsha site</b>
Total cost (incl. Gorai works)	43.87	50.39
Annual value of output generated:		
- at US\$ 0.035/kWh	3.87	4.70
- at US\$20/tonne of CO <sub>2</sub> emissions saved	0.95	1.15
Economic internal rate of return (EIRR):		
- at US\$ 0.035/kWh	5.9%	6.6%
- at US\$20/tonne of CO <sub>2</sub> emissions saved	-6.6%	-6.2%

In view of these unfavourable economic results, no provision for barrage HEP development has been included in the Plan at this stage. At a later stage, if any barrage development goes ahead, the feasibility of HEP generation there should be assessed in detail. Social and environmental impacts are unlikely to be significant.

#### **4. Micro-HEP Development**

In 1980-81 BWDB and PDB set up a working committee to study mini-HEP generation in Bangladesh. Four areas were considered: Chittagong and the CHT, and the Sylhet (NE Region), Mymensingh – Jamalpur (NC Region) and Rangpur – Dinajpur (NW Region) areas. Some 20 potential sites were identified, mostly in the 10 to 50kW capacity range. Reconnaissance surveys were conducted at seven sites in EH Region, but no detailed studies or analyses were undertaken. As yet, none of these plants has been built.

Micro rather than mini-sized river schemes are the only ones which are likely to be viable. Availability of suitable sites, adequate dry season stream flows (with the pronounced seasonality of rainfall, stream base flows are low), and a local market for the electricity generated are the key factors. At present, no decision on the feasibility of any potential micro-HEP scheme can be made, but in the Plan a provision has been made for Tk1,000M (mid-2000 prices) to be spent on such schemes, this being spread over Years 3 to 15. O&M costs would be recovered through user charges, as in the on-going and successful nation-wide Rural Electrification Programme. Environmental impacts are unlikely to be significant. Social benefits in the remoter parts of the CHT could be substantial.

#### **Financing Arrangements**

Capital cost financing would be by GoB or possibly local government, major NGOs or the private sector. There would be full recovery of OMR (O&M and replacement) costs from the consumers.



## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Comprehensive management plan for physical works and institutional measures	I1	• Physical programmes agreed with BWDB	2003
• Cost-effective project implementation	I2	• Report agreed by GoB	2016
• Profitable hydropower generation	K	• Project reports	2025
• Bangladesh's main and regional rivers comprehensively developed for sustainable multi-purpose use	D	• Audit reports	2025
		• Project records	
		• Audit reports	
		• Returns per unit of water	
		• River maintenance costs	
		• Quality and Quantity of in-stream flows	

## Institutional Arrangements

Kaptai HEP expansion would be undertaken by the PDB. Integrated development of the Sangu and Mathamuhuri rivers could be carried out by PDB for hydropower and BWDB for other elements. Micro-HEP development could be carried out by local government, by major NGOs, as in Nepal, or by the private sector. If larger mini-HEP plants were developed, construction of civil works could be by BWDB.

## Existing Documentation

NWMP DSR Section 6.11; OGDA Draft Final Report; Mini-HEP Generation in Bangladesh: Report of the Working Committee, BWDB/PDB, 1981; Integrated Development of the Sangu and Matamuhuri River Basins, NW Hydraulic Consultants 1983 and SWMC 2000; ESG barrage studies, 1984.

## Linkages

The main linkage would be with Programmes MR 003 to MR 005, if main river barrages were to be built and HEP plants were to be installed.

## Risks and Assumptions

If an increase in Kaptai generating capacity were to involve a rise in Kaptai Lake levels or a substantial change in reservoir operating rules, there could be serious adverse environmental impacts. Similarly, development of storage on the Sangu and Mathamuhuri Rivers could cause significant social and environmental impacts in the reservoir area, requiring rigorous assessment. Micro-HEP is possible only where flows are reliable, and micro-HEP plants are at risk unless carefully designed to withstand flash floods and constructed in one dry season, to avoid flood damage to the works in progress. There may also be serious institutional risks, because of possible difficulties in organising the construction and O&M of a plant and ensuring its financial viability.

**Hydropower Development and Upgrading**

Ref :

**MR 012**

Cluster :	<b>Main Rivers</b>	Region(s) :	<b>EH, NE, NW</b>
Focus/Foci :	<b>Hydropower</b>	Location :	<b>EH, NE, and NW regions</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>15 year(s)</b>
		Agency(s) Responsible :	<b>PDB</b> (Lead) Private Sector (Supporting)
Short Description :	The purpose of this programme is to review in detail the potential for further investment in HEP, identify suitable modalities of development and provide for the necessary downstream investment. The study would focus on: expansion of Kaptai generation capacity; integrated development of the Sangu and Matamuhuri rivers for hydropower generation and other uses; power generation at barrages; and micro-HEP schemes. Micro-HEP appears particularly worthy of pursuit, especially in more remote areas, such as in the CHT, where early exploitation of local resources of power generation could bring high social benefit.		

<b>MIS Links</b>	Cost Calculation :	MR Programme costing.xls	Map :	MR 012 Map.jpg
	Disb't Schedule :	MR Programme costing.xls	Description :	MR 012 PgP.doc

<b>Finance</b>					
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>4,750.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>15</b>
Ultimate Recurring	<b>235.00</b> MTk/yr	<b>n/a</b>	<b>0%</b>	<b>100%</b>	<b>16</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Comprehensive management plan for physical works and institutional measures	• Physical programmes agreed with BWDB • Report agreed by GoB	NYD
• Cost-effective project implementation	• Project reports • Audit reports	NYD
• Profitable hydropower generation	• Project records • Audit reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	<b>MR 012</b>
Title	<b>Hydropower Development and Upgrading</b>

### Assumptions:

Taka/US\$	51.000	TA duration	2.0	years	All prices in mid-2000 values
		Investment duration	13.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Preparatory studies							
Expatriate consultants (all-in rate)	p-m	12.0	20,000		12.2		
Senior National consultants (all-in rate)	p-m	36.0		150	5.4	0.0%	-
Mid-level National consultants (all-in rate)	p-m	71.0		90	6.4	0.0%	-
Sub-totals					24.0		-
Other general TA programme costs		25%			6.0		-
Specific other TA programme costs					20.0	0.0%	-
<b>Total TA Costs</b>					<b>50.0</b>		<b>-</b>
<b>Other Programme Costs</b>							
1. Provision for upgrading Kaptai (subject to study and EIA)					2,700.0	5.0%	135.0
2. Provision for integrated development of the Sangu and Matamuhuri Rivers for hydropower					1,500.0	5.0%	75.0
3. Provision for hydroelectric plants in barrages			Contained in barrage estimates		-	0.0%	-
4. Provision for micro-hydroelectric plants					500.0	5.0%	25.0
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>4,700.0</b>		<b>235.0</b>
<b>Overall Programme Costs</b>							
					<b>4,750.0</b>		<b>235.0</b>

### Notes:

The above investment costs are provisional sums and include provisions for feasibility studies. Upgrading of Kaptai based on cost of Tk621M for one unit recently rehabilitated. Allowing for further new units at approximately two times the cost of rehabilitation. Estimates would be prepared of likely costs in the specified study.

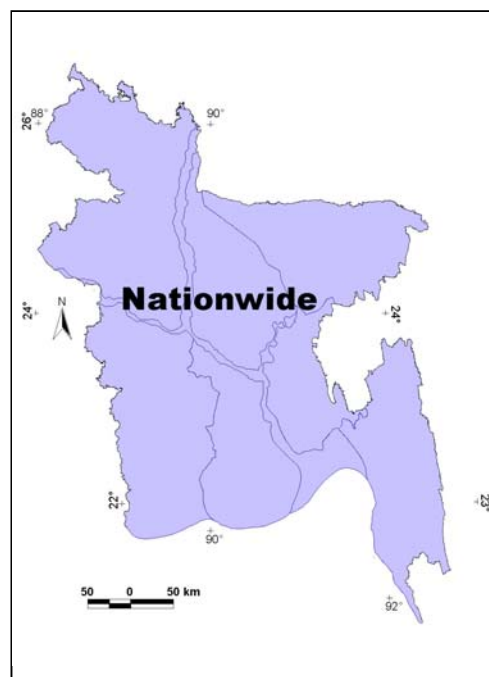
## **Towns and Rural Areas**

**Urban Arsenic Mitigation**

Ref: TR 001

**Basic Data**NWMP Sub-sector **Towns and Rural Areas**Region(s) **Nationwide significance****Relevance to NWPo**

Water allocation for domestic and municipal use is the first priority under the NWPo, and issues of public health and safety are paramount. Therefore, a programme to address the serious problem of high levels of arsenic in shallow groundwater which is used for drinking is a national imperative. The NWPo clearly states that the Plan must provide “....safe and affordable drinking water supplies through various means....” for all inhabitants, especially the urban poor. This commitment is also endorsed by the National Policy for Safe Water Supply and Sanitation (NPSWSS). With regard to the arsenic issue, policy also mandates that full stakeholder consultation and participation should be an integral part of the programme to raise public awareness and ensure full dissemination of information and choices, especially among women and the poor.

**Purpose of Programme**

There are 522 towns (1991 Census) throughout the country: 44 large towns (more than 50,000 people) with a total population of 9.8 million in 2000; and 478 small towns (less than 50,000 people) with a combined population of 4.2 million. The total population of all towns (large and small) is expected to increase five-fold in the next 50 years, from nearly 14 million in 2000 to 36 million in 2025 and 67 million by 2050. Current estimates indicate that 35% of town populations are classified as living in poverty.

The arsenic issue is a serious water problem which potentially affects the health and well being of millions. Estimates of the numbers at risk depend on the permissible level of arsenic in drinking water. The Bangladesh standard is less than 0.05 mg/l and the WHO standard is less than 0.01 mg/l. Based on current available data, the numbers at risk are estimated as follows:

- (a) Bangladesh standard - about 25% or 30 million of the total population; and
- (b) WHO standard - about 46% or 54 million.

The majority of those at risk are poor and live in the small towns and rural areas where there is greater dependence on shallow HTWs where high levels of arsenic occur. A wide range of investigations and initiatives, supported by GoB and the international donor community, are underway to find and implement practical solutions which meet the needs of the people, in terms of:

- (a) short term temporary solutions which alleviate the immediate problem; and
- (b) longer term solutions which offer a permanent source of arsenic free water.

In the Large and Small Towns, NWMP estimates indicate that about 3 to 3.5million or 20% to 25% of the urban population are at risk from high levels of naturally occurring arsenic in groundwater - based on the Bangladesh standard. The programme aims to provide a range of short-term solutions which will be available on demand to communities and households at risk.

The options include:

- (a) arsenic filters fitted to HTWs and mini Tara pumps;
- (b) arsenic removal kits which can be used in the household;
- (c) pond sand filters; and
- (d) re-excavation of wells.

Longer term solutions (e.g. DTWs and surface water development) are included in the main water supply programme for Large and Small Towns (TR 003).

It is important to emphasise that the proposed NWMP programme should be integrated with other ongoing projects and programmes which are already actively addressing the arsenic issue. These include, among others the Bangladesh Arsenic Mitigation Water Supply Project (BAMWSP) supported by the World Bank.

Finally, the programme should also highlight the need to raise public awareness, health education, basic training in arsenic mitigation techniques, and the importance of choice among the available solutions. The poor and women, as the main domestic water managers, will be the main targets of the programme.

## Programme Outline

Levels of risk due to naturally occurring arsenic in shallow groundwater are as follows:

High	Medium	Low
South West Region South Central Region South East Region	North East Region North West Region Rivers and Estuary Region	North Central Region Eastern Hills Region

The programme consists of short-term solutions for the provision of safe drinking water in arsenic affected areas will be implemented over the next three to five years. The general targets for the installation of arsenic filters on HTWs or Tara pumps, arsenic removal kits for use in households, and other options are summarised as follows:

Component	Year			
	2000	2005	2010	2025
<b>Large Towns (population greater than or equal to 50,000)</b>				
Population (million)	9.8	12.2	14.9	25
Water supply coverage (%)				
Arsenic filter on HTW/Tara pumps	0	10	5	0
Other non-contaminated supplies and systems	75	83	95	100
Total	75	93	100	100
<b>Small Towns (population less than 50,000)</b>				
Population (million)	4.2	5.2	6.4	10.7
Water supply coverage (%)				
Arsenic filter on deep HTW/Tara pumps	1	30	5	0
Arsenic removal in households	1	10	0	0
Other non-contaminated supplies and systems	81	60	95	100
Total	83	100	100	100

## Financing Arrangements

The proposed short term programme for arsenic mitigation in the Large and Small Towns is suitable for GoB funding with the support of the international donor community. It is also suggested that direct beneficiaries should be encouraged to contribute between 10% and 20% of the costs for the solutions selected by individual communities and households.

GoB and the implementing agencies will also be required to provide technical support and education campaigns to ensure that the target populations are fully aware of the arsenic problem and the available short term solutions, especially the poor and women. The programme should also provide a direct link with the longer-term permanent solutions under Programme TR 003.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Procurement and installation programmes prepared	I1	• Signed programme/project documents	2002
• Procurement and installation programmes complete	I2	• Programme/Project completion reports	2010
• Arsenic free potable water available to 100% of large and small town populations	K	• Household surveys	2025
• Demand for safe and reliable drinking water supplies satisfied in towns and rural areas	D	• Water quality	2025
		• Community health records	
		• % service coverage verified by surveys	

## Institutional Arrangements

The institutional arrangements for programme implementation are expected to comprise three components as defined by the NWPO and NPSWSS:

- (a) Public sector - under the policy of decentralisation, the local municipal authorities (e.g. Paurashavas and Upazilas) will have prime responsibility, with the technical support of DPHE and LGED.
- (b) Private sector participation - In partnership with community based organisations, the private sector will be expected to play a leading role in the development and operation of arsenic treatment options.
- (c) Community-based and NGO participation - in the peri-urban and disadvantaged areas, community-based water supply schemes will be encouraged with investment funds from GoB, and the collaboration of NGOs and the private sector. Prominence should also be given to the active participation of women.

The implementation of these institutional developments will need to be carefully formulated and programmed with the full political commitment of GoB and interested stakeholders. In the short to medium term, the Government will also establish an appropriate independent Regulatory Framework to supervise and monitor public and private sector performance in the provision of technical advice.

## References and Documentation

- (a) Chapters 3 and 7, Development Strategy Report, March 2001
- (b) Main references:
  - Bangladesh Arsenic Mitigation Water Supply Project (BAMWSP)
  - Ground Water Studies for Arsenic Contamination in Bangladesh, January 1999
- (c) National Water Resources Database in WARPO

## Linkages

The programme to address the problem of arsenic in groundwater used for drinking water in Large and Small Towns should be closely linked and co-ordinated with other NWMP programmes, namely:

- (a) Raising Public Awareness in the Wise Use and Management of Water (EE 010);
- (b) Private Sector Participation in Water Management (EE 011);
- (c) Alternative Financing Methods for Water Management (EE 013);
- (d) Large and Small Towns Water Supply and Distribution Systems (TR 003);
- (e) National Water Quality Monitoring (EA 003); and
- (f) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

Planning and implementation should be closely co-ordinated with other national and international arsenic mitigation programmes. Under the auspices of NWMP, appropriate collaboration should also take place with the respective Local Government authorities (District towns, Paurashavas (municipalities), Upazila headquarters and urban growth centres), Ministry of Local Government, Rural Development and Co-operatives (MoLGRDC), Department of Public Health Engineering (DPHE), Local Government Engineering Department (LGED), Ministry of Health (MoH), Department of Environment (DoE), WARPO, NGOs and other interested parties.

## Risks and Assumptions

### *Risks:*

The risks associated with the programme are mainly technical, institutional and environmental.

The technical risks concern the suitability and robustness of the identified short term solutions, some of which are still in the development stage while others have not been in operation for long. This situation may be compounded by operating and maintenance difficulties. To reduce these risks, the implementing agencies will need to monitor the performance of the short term solutions, react swiftly where difficulties arise, and ensure that adequate basic operational training is provided.

The institutional risks relate to the capacity of the executing agencies to implement the programme effectively and integrate constructively with other arsenic mitigation programmes which are already ongoing. However, because of the seriousness of the arsenic situation, GoB must ensure that these risks are minimised.

The environmental risks concern the longer term impact of remaining arsenic contamination in abandoned water sources. These will need to be monitored over time to assess whether any further remedial actions are required. The disposal of waste from treatment processes such as sludge is a potential hazard.

### *Assumptions:*

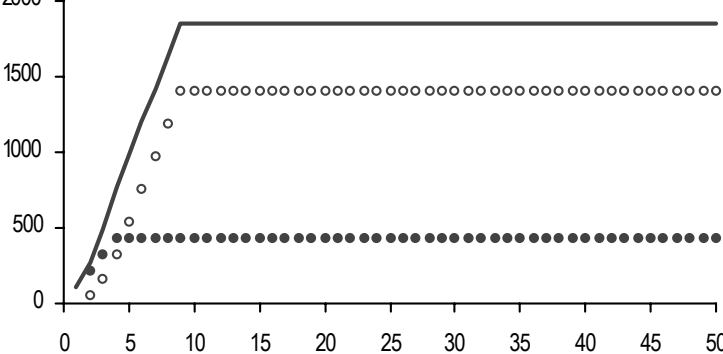
- Long-term monitoring is achievable, reliable and consistent
- A solution to the potential environmental problems can be found



**Urban Arsenic Mitigation**Ref : **TR 001**

Cluster :	<b>Towns and Rural Areas</b>	Region(s) :	<b>NW, NC, NE, SW, SC, SE, EH</b>
Focus/Foci :	<b>Arsenic Mitigation</b>	Location :	<b>NW, NC, NE, SW, SC, SE, &amp; EH regions</b>
Start Year <sup>1</sup> :	<b>2001</b>	Duration <sup>2</sup> :	<b>4 year(s)</b>
		Agency(s) Responsible :	<b>Paurashavas (Lead)</b> <b>CBOs (Supporting)</b>
Short Description :	Arsenic contamination of groundwater water supplies has become a serious health hazard in Bangladesh affecting some 30 million people. This is recognised by NWPo §4.06a of the NWPo which requires the Government to "facilitate availability of safe....drinking water through various means". This programme will provide short term arsenic mitigation measures for water supplies (such as arsenic filters and household removal facilities in all urban areas except those comprising the Statistical Metropolitan Areas (See the Major City cluster). More permanent measures will be introduced in the medium and long terms (see Programme TR 003).		

<b>MIS Links</b>	Cost Calculation :	TR Programme costing.xls	Map :	TR 001 Map.jpg
	Disb't Schedule :	TR Programme costing.xls	Description :	TR 001 PgP.doc

Finance	Costs		Private	Funding (%)		Expected by	
				GoB	Beneficiaries	ProgrammeYear	
	Total Capital <sup>3</sup>	439.00	MTk	0%	85%	15%	4
	Ultimate Recurring	216.90	MTk/yr	n/a	0%	100%	5
	Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart		
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring	— Total
Status :	Identified						
Financial Base Year:	mid-2000						
Planned Expenditure (to date) :	0			MTk			
Actual Expenditure <sup>4</sup> (to date) :	0			MTk			

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Procurement and installation programmes prepared	• Signed programme/project documents	NYD
• Procurement and installation programmes complete	• Programme/Project completion reports	NYD
	• Household surveys	
• Arsenic free potable water available to 100% of large and small town populations	• Water quality	NYD
	• Community health records	

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	TR 001
Title	Urban Arsenic Mitigation

*Assumptions:*

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	4.0	years	

Item	Unit	Quantity	Rate		Amount	O&M	O&M/yr
			US\$	Tk'000	TkM	%	TkM

**Technical Assistance**

Expatriate consultants (all-in rate)  
 Senior National consultants (all-in rate)  
 Mid-level National consultants (all-in rate)  
 Sub-totals  
 Other general TA programme costs  
 Specific other TA programme costs

TA costs for this programme are included in the capital costs

**Total TA Costs**

Lump Sum Costs  
 Large towns Small towns

**Investment items - short term**

Mini tara + arsenic filter in existing HTW	192.00	247.00	439.0	49.4%	216.9
Other non-contaminated supplies and systems	costed in programme TR 003				

**Investment items - term**

**Investment items - short term**

<b>Total Investment Items</b>	<b>439.0</b>	<b>49.4%</b>	<b>216.9</b>
-------------------------------	--------------	--------------	--------------

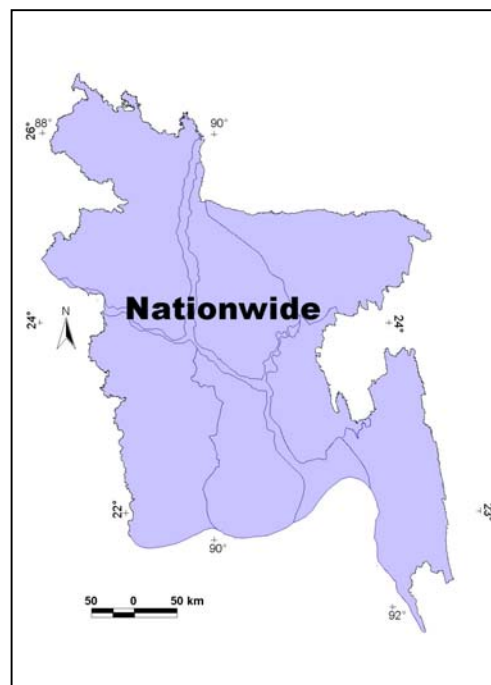
<b>Overall Programme Costs</b>	<b>439.0</b>	<b>216.9</b>
--------------------------------	--------------	--------------

**Rural Arsenic Mitigation**

Ref: TR 002

**Basic Data**NWMP Sub-sector      **Towns and Rural Areas**Region(s)              **Nationwide Significance****Relevance to NWPo**

Water allocation for domestic use is the first priority under the NWPo, and issues of public health and safety are paramount. Therefore, a programme to address the serious problem of high levels of naturally occurring arsenic in shallow groundwater which is used for drinking is a national imperative. The NWPo clearly states that the Plan must provide “....safe and affordable drinking water supplies through various means....” for all inhabitants, especially the urban poor. This commitment is also endorsed by the National Policy for Safe Water Supply and Sanitation (NPSWSS). With regard to the arsenic issue, policy also mandates that full stakeholder consultation and participation should be an integral part of the programme to raise public awareness and ensure full dissemination of information and choices, especially among women and the poor.

**Purpose of Programme**

The projections prepared for the NWMP indicate that the rural population is expected to stabilise in the medium term and decline in the much longer term (i.e. after 2025), based on a predicted acceleration in migration to the cities and towns, especially Dhaka. NWMP projections show a modest increase in the rural population from 102 million in 2000 to nearly 108 million in 2025, before falling steadily to 88 million by 2050. Current estimates indicate that 57% of the rural population is classified as living in poverty.

The arsenic issue is a serious water problem which potentially affects the health and wellbeing of millions. Estimates of the numbers at risk depend on the permissible level of arsenic in drinking water. The Bangladesh standard is less than 0.05 mg/l and the WHO standard is less than 0.01 mg/l. Based on current available data, the numbers at risk are estimated as follows:

- (a) Bangladesh standard - about 25% or 30 million of the total population; and
- (b) WHO standard - about 42% or 54 million.

The majority of those at risk are poor and live in the rural areas and small towns where there is greater dependence on shallow HTWs where high levels of arsenic occur. A wide range of investigations and initiatives, supported by GoB and the international donor community, are underway to find and implement practical solutions which meet the needs of the people, in terms of:

- (a) short term temporary solutions which alleviate the immediate problem; and
- (b) longer term solutions which offer a permanent source of arsenic free water.

NWMP estimates indicate that about 25 to 30 million or 25% to 30% of the rural population are at risk from high levels of naturally occurring arsenic in groundwater - based on the Bangladesh standard. The programme aims to provide a range of short term solutions which will be available on demand to communities and households at risk. The options include:

- (a) arsenic filters fitted to HTWs and mini Tara pumps;
- (b) arsenic removal kits which can be used in the household;
- (c) pond sand filters; and
- (d) re-excavation of wells.

Longer term solutions (e.g. DTWs and surface water development) are included in the main water supply programme for Rural Areas (TR 004).

It is important to emphasise that the proposed NWMP programme should be integrated with other ongoing projects and programmes which are already actively addressing the arsenic issue. These include, among others the Bangladesh Arsenic Mitigation Water Supply Project (BAMWSP) supported by the World Bank;

Finally, the programme should also highlight the need to raise public awareness, health education, basic training in arsenic mitigation techniques, and the importance of choice among the available solutions. The poor and women, as the main domestic water managers, will be the main targets of the programme.

## Programme Outline

Levels of risk due to naturally occurring arsenic in shallow groundwater are as follows:

High	Medium	Low
South West Region	North East Region	North Central Region
South Central Region	North West Region	Eastern Hills Region
South East Region	Rivers and Estuary Region	

The programme of short term solutions for the provision of safe drinking water in arsenic affected areas will be implemented over the next three to five years. The general targets for the installation of arsenic filters on HTWs or Tara pumps, arsenic removal kits for use in households, and other options are summarised as follows:

Component	Year			
	2000	2005	2010	2025
Population (million)	102.0	104.8	107.1	107.7
Water supply coverage (%)				
Arsenic filters on deep HTW/Tara pumps	1	5	8	5
Arsenic removal in households	0	20	5	1
Other non-contaminated supplies and systems	91	75	87	94
Total	92	100	100	100

## Financing Arrangements

The proposed short term programme for arsenic mitigation in the Rural Areas is suitable for GoB funding with the support of the international donor community. It is also suggested that direct beneficiaries should be encouraged to contribute between 10% and 20% of the costs for the solutions selected by individual communities and households.

GoB and the implementing agencies will also be required to provide technical support and education campaigns to ensure that the target populations are fully aware of the arsenic problem and the available short term solutions, especially the poor and women. The programme should also provide a direct link with the longer term permanent solutions under Programme TR 004.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Procurement and installation programmes prepared	I1	• Signed programme/project documents	2002
• Procurement and installation programmes complete	I2	• Programme/Project completion reports	2010
		• Household/community surveys	
• Arsenic free potable water available to 100% of rural population	K	• Water quality	2025
		• Community health records	
• Demand for safe and reliable drinking water supplies satisfied in towns and rural areas	D	• % service coverage verified by surveys	2025

## Institutional Arrangements

The institutional arrangements for programme implementation are expected to comprise three components as defined by the NWPo and NPSWSS:

- Public sector - under the policy of decentralisation, the local municipal authorities (e.g. Paurashavas and Upazilas) will have prime responsibility, with the technical support of DPHE and LGED.
- Private sector participation - In partnership with community based organisations, the private sector will be expected to play a leading role in the development and operation of arsenic treatment options.
- Community-based and NGO participation - in the peri-urban and disadvantaged areas, community-based water supply schemes will be encouraged with investment funds from GoB, and the collaboration of NGOs and the private sector. Prominence should also be given to the active participation of women.

The implementation of these institutional developments will need to be carefully formulated and programmed with the full political commitment of GoB and interested stakeholders. In the short to medium term, the Government will also establish an appropriate independent Regulatory Framework to supervise and monitor public and private sector performance in the provision of technical advice.

## References and Documentation

- Chapters 3 and 7, Development Strategy Report, March 2001
- Main references:
  - Bangladesh Arsenic Mitigation Water Supply Project (BAMWSP)
  - Ground Water Studies for Arsenic Contamination in Bangladesh, January 1999
- National Water Resources Database in WARPO

## Linkages

The programme to address the problem of arsenic contamination in groundwater used for drinking water in Rural Areas should be closely linked and co-ordinated with other NWMP programmes, namely:

- (a) Raising Public Awareness in the Wise Use and Management of Water (EE 010);
- (b) Private Sector Participation in Water Management (EE 011);
- (c) Alternative Financing Methods for Water Management (EE 013);
- (d) Rural Water Supply and Distribution Systems (TR 004);
- (e) National Water Quality Monitoring (EA 003); and
- (f) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

Planning and implementation should be closely co-ordinated with other national and international arsenic mitigation programmes. Under the auspices of NWMP, appropriate collaboration should also take place with the respective Local Government authorities (District towns, Paurashavas (municipalities), Upazila headquarters and urban growth centres), Ministry of Local Government, Rural Development and Co-operatives (MoLGRDC), Department of Public Health Engineering (DPHE), Local Government Engineering Department (LGED), Ministry of Health (MoH), Department of Environment (DoE), WARPO, NGOs and other interested parties.

## Risks and Assumptions

The risks associated with the programme are mainly technical, institutional and environmental.

The technical risks concern the suitability and robustness of the identified short term solutions, some of which are still in the development stage while others have not been in operation for long. This situation may be compounded by operating and maintenance difficulties. To reduce these risks, the implementing agencies will need to monitor the performance of the short term solutions, react swiftly where difficulties arise, and ensure that adequate basic operational training is provided.

The institutional risks relate to the capacity of the executing agencies to implement the programme effectively and integrate constructively with other arsenic mitigation programmes which are already ongoing. However, because of the seriousness of the arsenic situation, GoB must ensure that these risks are minimised.

The environmental risks concern the longer term impact of remaining arsenic contamination in abandoned water sources. These will need to be monitored over time to assess whether any further remedial actions are required. The disposal of waste from treatment processes such as sludge is a potential hazard.

Assumptions:

- Long-term monitoring is achievable, reliable and consistent
- A solution to the potential environmental problems can be found

**Rural Arsenic Mitigation**

Ref :

**TR 002**

Cluster :	<b>Towns and Rural Areas</b>	Region(s) :	<b>NW, NC, NE, SW, SC, SE, EH</b>
Focus/Foci :	<b>Arsenic Mitigation</b>	Location :	<b>NW, NC, NE, SW, SC, SE, &amp; EH regions</b>
Start Year <sup>1</sup> :	<b>2001</b>	Duration <sup>2</sup> :	<b>9 year(s)</b>
		Agency(s) :	<b>DPHE (Lead)</b>
		Responsible :	<b>CBOs (Supporting)</b>
Short Description :	Arsenic contamination of groundwater water supplies has become a serious health hazard in Bangladesh affecting some 30 million people. This is recognised by NWPo §4.06a of the NWPo which requires the Government to "facilitate availability of safe....drinking water through various means". This programme will provide short term and medium term arsenic mitigation measures for water supplies (such as arsenic filters and household removal facilities in all rural. More permanent measures will be introduced in the long term (See Programme TR 004) .		

<b>MIS Links</b>	Cost Calculation :	TR Programme costing.xls	Map :	TR 002 Map.jpg
	Disb't Schedule :	TR Programme costing.xls	Description :	TR 002 PgP.doc

<b>Finance</b>					
	Costs	Private	Funding (%)	Expected by	
			GoB	Beneficiaries	ProgrammeYear
Total Capital <sup>3</sup>	<b>1,185.00</b> MTk	<b>0%</b>	<b>85%</b>	<b>15%</b>	<b>9</b>
Ultimate Recurring	<b>585.40</b> MTk/yr	<b>n/a</b>	<b>0%</b>	<b>100%</b>	<b>10</b>
Date of Data :	<b>31 07 01</b>				
	(dd) (mm) (yy)				
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				
		<b>Stacked Cumulative Cash Flow Chart</b> 			

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Procurement and installation programmes prepared	• Signed programme/project documents	NYD
• Procurement and installation programmes complete	• Programme/Project completion reports	NYD
	• Household/community surveys	
• Arsenic free potable water available to 100% of rural population	• Water quality	NYD
	• Community health records	

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
 5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	TR 002
Title	Rural Arsenic Mitigation

*Assumptions:*

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	9.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

**Technical Assistance**

Expatriate consultants (all-in rate)  
 Senior National consultants (all-in rate)  
 Mid-level National consultants (all-in rate)  
 Sub-totals  
 Other general TA programme costs  
 Specific other TA programme costs

TA costs for this programme are included in the capital costs

**Total TA Costs**

**Investment items - short term**

Mini Tara + arsenic filter in existing HTW		663.0	49.4%	327.5
Other non-contaminated supplies and systems	costed in programme TR 004			

**Investment items - term**

Mini Tara + arsenic filter in existing HTW		522.0	49.4%	257.9
Other non-contaminated supplies and systems	costed in programme TR 004			

**Investment items - short term**

<b>Total Investment Items</b>		<b>1,185.0</b>	<b>49.4%</b>	<b>585.4</b>
-------------------------------	--	----------------	--------------	--------------

<b>Overall Programme Costs</b>		<b>1,185.0</b>		<b>585.4</b>
--------------------------------	--	----------------	--	--------------



## Large and Small Towns Water Supply and Distribution Systems

Ref: TR 003

### Basic Data

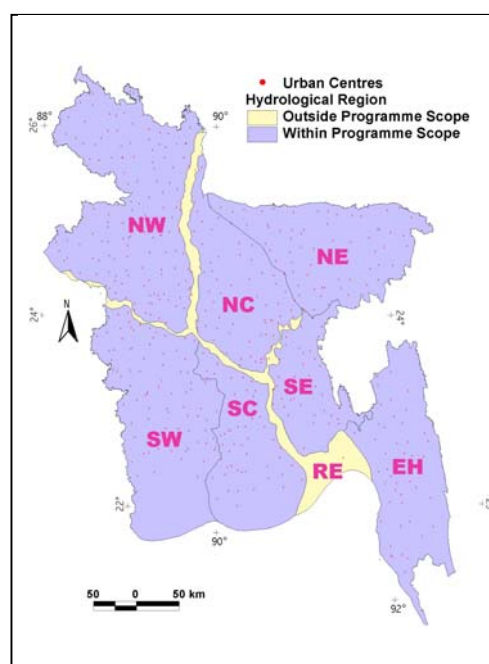
NWMP Sub-sector      **Towns and Rural Areas**

Region(s)              **Nationwide significance**

### Relevance to NWPo

Water allocation for domestic and municipal use is the first priority under the NWPo. The programme for Large and Small Towns, under both the NWPo and the National Policy for Safe Water Supply and Sanitation (NPSWSS), aims to address the need for “....safe and affordable drinking water supplies through various means....” for all inhabitants, especially the urban poor. Policy also mandates that investments to improve and extend water services in the urban areas should be paralleled by appropriate and substantive institutional and financial reforms to attain:

- (a) decentralisation and devolution of management authority to local government;
- (b) significant improvements in service efficiency and financial viability of existing institutions;
- (c) private sector participation;
- (d) stakeholder consultation, especially women and the poor; and
- (e) appropriate pricing structures to promote financial viability and effective cost recovery.



### Purpose of Programme

There are 522 towns (1991 Census) throughout the country: 44 large towns (more than 50,000 people) with a total population of 9.8 million in 2000; and 478 small towns (less than 50,000 people) with a combined population of 4.2 million. The total population of all towns (large and small) is expected to increase five-fold in the next 50 years, from nearly 14 million in 2000 to 36 million in 2025 and 67 million by 2050. All towns will experience increasing pressure to improve and extend their public services and infrastructure, especially the need for a safe and reliable water supply system for all inhabitants. Service coverage for potable water varies between towns and regions. NWMP estimates for the whole sector indicate the following present service coverage:

- (a) large towns - 75% of the total population is adequately served, with 40% served by HTWs, 25% by DTW based systems and 10% by a combination of small and community based systems; and
- (b) small towns - 82% of the total population is adequately served, with 80% served by shallow HTWs and the other 2% by other reliable sources.

The remaining population (25% in large towns and 18% in small towns), mainly poor and disadvantaged communities, are dependent on other local sources, many of which are unreliable, inadequate and often polluted. Current estimates indicate that 35% of town populations are classified as living in poverty.

The programme for large and small towns will require significant investment in rehabilitation, improvement and extension of urban water supply systems to raise and sustain service coverage levels at 100% by 2010. This will be accomplished through a combination of public/private sector initiatives to develop urban and community-based systems, largely based on groundwater sources with some surface water development in the large towns. Special attention will be given to peri-urban and poor communities who will be encouraged and supported to develop and install safe hand pumps and small DTW based systems.

The programme provides a general framework for the Large and Small Towns Sector, but final investment decisions will depend on the individual requirements and aspirations of each town.

## Programme Outline

Improvements and extensions of urban water supply systems will continue throughout the implementation of the NWMP. The coverage targets by service type are summarised as follows:

Component	Year			
	2000	2005	2010	2025
<b>Large Towns (population greater than or equal to 50,000)</b>				
Population (million)	9.8	12.2	14.9	25
Water supply coverage (%)				
HTW	40	25	5	0
Arsenic filter on HTW/Tara pump (1)	0	10	5	0
Small DTW based systems	1	6	30	35
Community level water supply system	5	15	15	10
Urban DTW based piped systems	25	30	30	45
Surface water sources with piped distribution	3	5	10	10
Other options	1	2	2	0
<b>Total</b>	<b>75</b>	<b>93</b>	<b>97</b>	<b>100</b>
<b>Small Towns (population less than 50,000)</b>				
Population (million)	4.2	5.2	6.4	10.7
Water supply coverage (%)				
Shallow HTW	80	35	25	5
Arsenic filter on Deep HTW/Tara pump (1)	0	30	5	0
Arsenic removal in households (1)	1	10	0	0
Small DTW based piped systems	0	5	30	60
Urban DTW based piped systems	1	15	30	25
Surface water sources with piped distribution	0	0	0	5
Other options	1	5	10	5
<b>Total</b>	<b>83</b>	<b>100</b>	<b>100</b>	<b>100</b>

Note: (1) Arsenic mitigation is addressed under Programme TR 001.

## Financing Arrangements

For effective sustained implementation, the investment programme will require the active and co-ordinated participation of the public sector (GoB and international development agencies), private sector (domestic and foreign, the latter in the medium to long term), and community based organisations with the support of NGOs. Indicative financing targets are presented below:

Sector	%
Public (GoB and international development agencies)	75
Private (domestic and foreign)	20
Local Communities	5
<b>Total</b>	<b>100</b>

The Government and the executing agencies (public and private) will need to ensure the availability of adequate funds for:

- (a) rehabilitation of existing water supply facilities;
- (b) capital replacement during and after the NWMP period; and
- (c) effective operations and maintenance.

In this context, the development of full cost recovery pricing will be important.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Town water supply programmes prepared	I1	• Signed programme/project documents	2006
• Sustainable operation and maintenance of town water supply systems	I2	• Frequency of pipe breaks	2011
• Town water supply programme completed	I3	• Response times	
		• Programme/project completion reports	2026
		• Household, district surveys	
• 100% of large and small town population have access to formal water supplies	K	• Survey reports	2026
• Demand for safe and reliable drinking water supplies satisfied in towns and rural areas	D	• % service coverage verified by surveys	2026

## Institutional Arrangements

The institutional arrangements for programme implementation are expected to comprise three components as defined by the NWPo and NPSWSS:

- (a) Public sector - under the policy of decentralisation, the local municipal authorities (e.g. Paurashavas and Upazilas) will have prime responsibility, with the technical support of DPHE and LGED. Much greater emphasis will be given to increased autonomy and management expertise, organisational reform, service coverage and efficiency, full cost recovery and financial viability.
- (b) Private sector participation - in the medium to longer term, the private sector is expected to play an increasing role in the provision of water services in the Large and Small Towns. This will include: contract services (e.g. operation and maintenance of specific facilities, revenue billing and collection, etc.); BOT/BOOT schemes where appropriate; and full private concessions for the main water supply system in a town or group of towns. In partnership with community based organisations, the private sector will also be expected to play a leading role in the development and operation of peri-urban water supply schemes.
- (c) Community-based and NGO participation - in the peri-urban and disadvantaged areas, community-based water supply schemes will be encouraged with investment funds from GoB, and the collaboration of NGOs and the private sector. Prominence should also be given to the active participation of women.

The implementation of these institutional developments will need to be carefully formulated and programmed with the full political commitment of GoB and interested stakeholders. In the short to medium term, the Government will also establish an appropriate independent Regulatory Framework to supervise and monitor public and private sector performance in the provision of water services.

## References and Documentation

- (a) Chapter 7, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

## Linkages

Note: The issue of arsenic contamination in town water supplies is addressed separately under Programme TR 001 - Arsenic Contamination in Town Water Supplies

The sustained development of water supply services for Large and Small Towns should be closely linked and co-ordinated with other NWMP programmes, namely:

- (a) Local Government Needs Assessment for Water Management (ID 001);
- (b) Local Government Capacity Building for Water Management (ID 005);
- (c) Independent Regulatory Bodies for the Water Supply and Sanitation Service Sector (ID 002);
- (d) Support to the Preparation of New Legislation (EE 001);
- (e) Field Testing of Participatory Management Models (EE 002);
- (f) Water Resources Legislation – Preparation of Supporting Ordinances (EE 003);
- (g) Project Preparation Procedures - Guidelines and Manuals (EE 004);
- (h) Regulatory and Economic Instruments (EE 005);
- (i) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (j) Raising Public Awareness in the Wise Use and Management of Water (EE 010);
- (k) Private Sector Participation in Water Management (EE 011);
- (l) Alternative Financing Methods for Water Management (EE 013);
- (m) Urban Arsenic Mitigation (TR 001);
- (n) Large and Small Towns Sanitation and Sewerage Systems (TR 005);
- (o) Large and Small Towns Flood Protection (TR 007);
- (p) Large and Small Towns Stormwater Drainage (TR 008);
- (q) National Clean-up of Existing Industrial Pollution (EA 002);
- (r) National Pollution Control Plan (EA 001);
- (s) National Water Quality Monitoring (EA 003); and
- (t) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

The Inventory and Asset Management Plan of the Water Supply and Sanitation Sector (MC 001) is also relevant here.

In addition, planning and implementation should be co-ordinated with the respective Local Government authorities (District towns, Paurashavas (municipalities), Upazila headquarters and urban growth centres), Ministry of Local Government, Rural Development and Co-operatives (MoLGRDC), Department of Public Health Engineering (DPHE), Local Government Engineering Department (LGED), Urban Development Directorate (UDD), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO, NGOs and other interested parties.

## **Risks and Assumptions**

There are a number of important risks associated with a sustained development programme for the provision of safe and reliable water services in Large and Small Towns. They fall into four main categories: technical, institutional; financial and environmental.

With the exception of the serious arsenic problem (see: TR 001 and TR 002), the technical risks associated with urban water supply systems are the current poor standards of operation and maintenance. These shortcomings can be mitigated if the institutional and financial issues are addressed in a constructive and comprehensive manner.

The institutional risks focus mainly on the political willingness and commitment to reform the organisation and management of urban water services through a concerted drive to improve efficiency, involve the private sector, and promote effective consumer participation. National policy statements (NWPo and NPSWSS) clearly indicate that Government is aware of the problems, but it will need real political commitment to create an independent structure which is solely dedicated to the provision of effective and efficient water services for all inhabitants.

The financial risks are that the necessary investment and maintenance resources for the Large and Small Towns will become increasingly constrained from international sources and the private sector, if the institutional and efficiency issues are not addressed in a constructive manner, and Government does not give sustained support for the policy of full cost recovery. Future Government investment budgets will be under increasing pressure from other public sectors; therefore, it is crucial that there is a phased introduction of private sector participation and effective promotion of community-based systems particularly for peri-urban and disadvantaged communities.

The environmental risks for water supply are mainly related to any waste product from the water treatment process and construction operations. These risks can be mitigated, together with a parallel programme to deal with municipal and industrial wastewater.

### **Assumptions:**

Materials used for construction of new systems will give the assumed working lives.

Construction of new systems is adequately supervised so as to minimise future operation and maintenance.

Technical skills will be adequate to enable the efficient and effective O & M of the water systems.

The operating utility will be able to run the water supply function without political interference.

Full cost recovery is affordable.

Environmental risks can be successfully mitigated.

**Large and Small Town Water Supply and Distribution Systems**

Ref :

**TR 003**

Cluster :	<b>Towns and Rural Areas</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Water Supplies</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>25 year(s)</b>
		Agency(s) Responsible :	<b>DPHE</b> (Lead) CBOs, Private Sector (Supporting)
Short Description :	The preamble to NWPo §4.6 of the NWPo highlights the water supply problems facing Bangladesh's urban areas (large and small). Water tables are receding due to heavy groundwater abstraction. Furthermore, saline intrusion in coastal aquifers and contamination elsewhere further compromises the drinking water supplies for urban inhabitants. In accordance with the Government's policy to "Facilitate availability of safe and affordable drinking water supplies." (NWPo §4.6.a), this programme is intended to provide resources for the implementation of piped water supply schemes fed from DTW or surface water sources in order to serve 100% of the population (of each town) with piped drinking water supplies by year 2010.		

<b>MIS Links</b>	Cost Calculation :	TR Programme costing.xls	Map :	TR 003 Map.jpg
	Disb't Schedule :	TR Programme costing.xls	Description :	TR 003 PgP.doc

<b>Finance</b>					
	Costs	Private	Funding (%)	Expected by	
			GoB	Beneficiaries	ProgrammeYear
Total Capital <sup>3</sup>	<b>44,055.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>25</b>
Ultimate Recurring	<b>7,820.80</b> MTk/yr	<b>n/a</b>	<b>0%</b>	<b>100%</b>	<b>26</b>
Date of Data :	<b>31 07 01</b>	<b>Stacked Cumulative Cash Flow Chart</b>			
	(dd) (mm) (yy)				
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Town water supply programmes prepared	• Signed programme/project documents	NYD
• Sustainable operation and maintenance of town water supply systems	• Frequency of pipe breaks • Response times	NYD
• Town water supply programme completed	• Programme/project completion reports • Household, district surveys	NYD
• 100% of large and small town population have access to formal water supplies	• Survey reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# **National Water Management Plan** **Programme Costing Sheet**

Programme Ref	TR 003
Title	Large and Small Town Water Supply and Distribution Systems

## *Assumptions:*

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years <sup>1</sup>	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

## **Technical Assistance**

Expatriate consultants (all-in rate)  
 Senior National consultants (all-in rate)  
 Mid-level National consultants (all-in rate)  
 Sub-totals  
 Other general TA programme costs  
 Specific other TA programme costs

TA costs for this programme are included in the capital costs

## **Total TA Costs**

	Lump Sum Costs				
	Large towns	Small towns			
<b>Investment items - short term</b>	costed in programme TR 001				
Mini tara + arsenic filter in existing HTW	22.00	28.00	50.0	13.5%	6.8
FM hand pump (local Tara) with new HTW	53.00	79.00	132.0	13.4%	17.7
Mini Tara in existing HTW	840.00	-	840.0	13.5%	113.4
Urban piped supply from SW	503.00	541.00	1,044.0	12.7%	132.6
Urban piped supply from DTW +IRP	1,055.00	566.00	1,621.0	14.8%	239.9
Urban piped supply from DTW	353.00	132.00	485.0	21.2%	102.8
Peri-urban mini DTW + IRP +Distribution	345.00	152.00	497.0	23.6%	117.3
Peri-urban mini DTW + Distribution	-	62.00	62.0	89.1%	55.2
Existing HTW +household arsenic removal	74.00	-	74.0	138.0%	102.1
Community level WS					
<b>Investment items - medium term</b>					
Mini Tara in existing HTW	19.00	136.00	155.0	13.4%	20.8
Urban piped supply from SW	2,327.00	-	2,327.0	13.5%	314.1
Urban piped supply from DTW +IRP	555.00	778.00	1,333.0	12.7%	169.3
Urban piped supply from DTW	581.00	814.00	1,395.0	14.8%	206.5
Peri-urban mini DTW + IRP +Distribution	1,477.00	702.00	2,179.0	21.2%	461.9
Peri-urban mini DTW + Distribution	2,529.00	1,084.00	3,613.0	23.6%	852.7
Community level WS	22.00	-	22.0	138.0%	30.4
<b>Investment items - long term</b>					
Urban piped supply from SW	2,663.00	1,416.00	4,079.0	13.5%	550.7
Urban piped supply from DTW +IRP	4,654.00	891.00	5,545.0	12.7%	704.2
Urban piped supply from DTW	4,873.00	355.00	5,228.0	14.6%	763.3
Peri-urban mini DTW + IRP +Distribution	1,323.00	1,975.00	3,298.0	21.2%	699.2
Peri-urban mini DTW + Distribution	3,155.00	2,907.00	6,062.0	23.6%	1,430.6
Community level WS	14.00		14.0	138.0%	19.3
<b>Total Investment Items</b>			<b>40,055.0</b>	<b>17.8%</b>	<b>7,110.7</b>

<b>Overall Costs of meeting demands accruing during NWMP timeframe</b>	<b>40,055.0</b>	<b>7,110.7</b>
<b>Additional NWMP provision to maintain capacity ahead of demand</b>	<b>4,000.0</b>	<b>710.1</b>
	<b>44,055.0</b>	<b>7,820.8</b>

Notes	1	The step-wise approach to investment necessary to achieve and maintain installed capacity ahead of demands may mean that the total investment against +25 year demand is disbursed within the 25 year horizon. However, an additional provision will also be disbursed before the end of the 25 year, in order again to keep capacity ahead of ongoing demand increases.
-------	---	--

Large Town Water Supplies (>50,000 in 2025 but not SMAs)			Coverage Targets (%)				
Option	Description	Total Annual Cost (Tk/m <sup>3</sup> )	2000	2005	2010	2025	2050
	Total population		9,780,000	12,220,000	14,910,000	24,980,000	46,900,000
	Existing HTWs		40%	25%	5%	0%	0%
N3.2.1	Mini Tara + arsenic filter in existing HTW	17.00	0%	10%	5%	0%	0%
N3.2.2	FM hand pump (local Tara) with new HTW	1.33	0%	0%	0%	0%	0%
N3.2.3	Mini Tara in existing HTW	2.65	1%	2%	2%	0%	0%
N3.9	Urban piped supply from SW	7.82	3%	5%	10%	10%	10%
N3.10.1	Urban piped supply from DTW + IRP	5.73	10%	10%	10%	15%	20%
N3.10.2	Urban piped supply from DTW	3.51	15%	20%	20%	30%	30%
N3.11.1	Peri urban mini DTW + IRP +distribution	6.11	1%	3%	10%	10%	5%
N3.11.2	Peri urban mini DTW + distribution	5.01	0%	3%	20%	25%	25%
N3.12	Community level WS (slum)	8.32	5%	15%	15%	10%	10%
			<b>75%</b>	<b>93%</b>	<b>97%</b>	<b>100%</b>	<b>100%</b>

Large Town Water Supplies (>50,000 in 2025 but not SMAs)			Coverage Targets - Number of Population				
Option	Description		2000	2005	2010	2025	2050
	Total population		9,780,000	12,220,000	14,910,000	24,980,000	46,900,000
	Existing HTWs		3,912,000	3,055,000	745,500	0	0
N3.2.1	Mini Tara + arsenic filter in existing HTW		0	1,222,000	745,500	0	0
N3.2.2	FM hand pump (local Tara) with new HTW		0	0	0	0	0
N3.2.3	Mini Tara in existing HTW		97,800	244,400	298,200	0	0
N3.9	Urban piped supply from SW		293,400	611,000	1,491,000	2,498,000	4,690,000
N3.10.1	Urban piped supply from DTW + IRP		978,000	1,222,000	1,491,000	3,747,000	9,380,000
N3.10.2	Urban piped supply from DTW		1,467,000	2,444,000	2,982,000	7,494,000	14,070,000
N3.11.1	Peri urban mini DTW + IRP +distribution		97,800	366,600	1,491,000	2,498,000	2,345,000
N3.11.2	Peri urban mini DTW + distribution		9,780	366,600	2,982,000	6,245,000	11,725,000
N3.12	Community level WS (slum)		489,000	1,833,000	2,236,500	2,498,000	4,690,000
			7,344,780	11,364,600	14,462,700	24,980,000	46,900,000

Large Town Water Supplies (>50,000 in 2025 but not SMAs)			Incremental Coverage Targets - Number of Population				
Option	Description		2000	2005	2010	2025	2050
	Total population		9,780,000	104,800,000	107,100,000	107,700,000	88,000,000
	Existing HTWs			-857,000	-2,309,500	-745,500	0
N3.2.1	Mini Tara + arsenic filter in existing HTW			1,222,000	-476,500	-745,500	0
N3.2.2	FM hand pump (local Tara) with new HTW			0	0	0	0
N3.2.3	Mini Tara in existing HTW			146,600	53,800	-298,200	0
N3.9	Urban piped supply from SW			317,600	880,000	1,007,000	2,192,000
N3.10.1	Urban piped supply from DTW + IRP			244,000	269,000	2,256,000	5,633,000
N3.10.2	Urban piped supply from DTW			977,000	538,000	4,512,000	6,576,000
N3.11.1	Peri urban mini DTW + IRP +distribution			268,800	1,124,400	1,007,000	-153,000
N3.11.2	Peri urban mini DTW + distribution			356,820	2,615,400	3,263,000	5,480,000
N3.12	Community level WS (slum)			1,344,000	403,500	261,500	2,192,000
				4,019,820	3,098,100	10,517,300	21,920,000

Large Town Water Supplies (>50,000 in 2025 but not SMAs)			Incremental Investment Requirements - Number of Population				
Option	Description		2000	2005	2010	2025	2050
	Total population		9,780,000	12,220,000	14,910,000	24,980,000	46,900,000
	Existing HTWs			0	0	0	0
N3.2.1	Mini Tara + arsenic filter in existing HTW			1,222,000	0	0	0
N3.2.2	FM hand pump (local Tara) with new HTW			0	0	0	0
N3.2.3	Mini Tara in existing HTW			146,600	53,800	0	0
N3.9	Urban piped supply from SW			317,600	880,000	1,007,000	2,192,000
N3.10.1	Urban piped supply from DTW + IRP			244,000	269,000	2,256,000	5,633,000
N3.10.2	Urban piped supply from DTW			977,000	538,000	4,512,000	6,576,000
N3.11.1	Peri urban mini DTW + IRP +distribution			268,800	1,124,400	1,007,000	0
N3.11.2	Peri urban mini DTW + distribution			356,820	2,615,400	3,263,000	5,480,000
N3.12	Community level WS (slum)			1,344,000	403,500	261,500	2,192,000
				4,876,820	5,884,100	12,306,500	22,073,000

Large Town Water Supplies (>50,000 in 2025 but not SMAs)			Incremental Investment Requirements - Capital Costs				
Option	Description	Unit Capital Cost Tk/capita	2000	2005	2010	2025	2050
	Total population		9,780,000	12,220,000	14,910,000	24,980,000	46,900,000
				<b>TkM</b>	<b>TkM</b>	<b>TkM</b>	<b>TkM</b>
N3.2.1	Mini Tara + arsenic filter in existing HTW	157		192	0	0	0
N3.2.2	FM hand pump (local Tara) with new HTW	180		22	0	0	0
N3.2.3	Mini Tara in existing HTW	360		53	19	0	0
N3.9	Urban piped supply from SW	2,644		840	2,327	2,663	5,796
N3.10.1	Urban piped supply from DTW + IRP	2,063		503	555	4,654	11,621
N3.10.2	Urban piped supply from DTW	1,080		1,055	581	4,873	7,102
N3.11.1	Peri urban mini DTW + IRP +distribution	1,314		353	1,477	1,323	0
N3.11.2	Peri urban mini DTW + distribution	967		345	2,529	3,155	5,299
N3.12	Community level WS (slum)	55		74	22	14	121
	<b>Total Incremental Capital Cost</b>			<b>3,437</b>	<b>7,511</b>	<b>16,682</b>	<b>29,938</b>
	<b>Total Cumulative Capital Cost</b>			<b>3,437</b>	<b>10,948</b>	<b>27,630</b>	<b>57,569</b>

**Note:** Considering that Option N3.2.1 provides water for drinking only in arsenic affected areas and an HTW may not be existing closeby to meet the other water needs, Option N3.2.2 is provided (equal to 10% (No.) of the N3.2.1 coverage) to take care of any shortfall.



**Small Town Water Supplies (<50,000 in 2025)**

Small Town Water Supplies (<50,000 in 2025)			Coverage Targets (%)				
Option	Description	Total Annual Cost (Tk/m³)	2000	2005	2010	2025	2050
	Total population		4,190,000	5,240,000	6,390,000	10,710,000	20,100,000
	Existing HTWs		80%	35%	25%	5%	0%
N3.2.1	Mini Tara + arsenic filter in existing HTW	17.00	0%	30%	5%	0%	0%
N3.2.2	FM hand pump (local Tara) with new HTW	1.33	0%	0%	0%	0%	0%
N3.2.3	Mini Tara in existing HTW	2.65	1%	5%	10%	5%	0%
N3.5	Existing HTW + Household arsenic removal	25.00	1%	10%	0%	0%	0%
N3.11.1	Peri urban mini DTW + IRP +distribution	6.11	0%	2%	10%	20%	10%
N3.11.2	Peri urban mini DTW + distribution	5.01	0%	3%	20%	40%	20%
N3.9	Urban piped supply from SW	7.82	0%	0%	0%	5%	15%
N3.10.1	Urban piped supply from DTW + IRP	5.73	0%	5%	10%	10%	20%
N3.10.2	Urban piped supply from DTW	3.51	0%	10%	20%	15%	35%
			82%	100%	100%	100%	100%

**Small Town Water Supplies (<50,000 in 2025)**

		Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	4,190,000	5,240,000	6,390,000	10,710,000	20,100,000
	Existing HTWs	3,352,000	1,834,000	1,597,500	535,500	0
N3.2.1	Mini Tara + arsenic filter in existing HTW	0	1,572,000	319,500	0	0
N3.2.2	FM hand pump (local Tara) with new HTW	0	0	0	0	0
N3.2.3	Mini Tara in existing HTW	41,900	262,000	639,000	535,500	0
N3.5	Existing HTW + Household arsenic removal	41,900	524,000	0	0	0
N3.11.1	Peri urban mini DTW + IRP +distribution	4,190	104,800	639,000	2,142,000	2,010,000
N3.11.2	Peri urban mini DTW + distribution	0	157,200	1,278,000	4,284,000	4,020,000
N3.9	Urban piped supply from SW	0	0	0	535,500	3,015,000
N3.10.1	Urban piped supply from DTW + IRP	0	262,000	639,000	1,071,000	4,020,000
N3.10.2	Urban piped supply from DTW	0	524,000	1,278,000	1,606,500	7,035,000
		3,439,990	5,240,000	6,390,000	10,710,000	20,100,000

**Small Town Water Supplies (<50,000 in 2025)**

		Incremental Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	4,190,000	104,800,000	107,100,000	107,700,000	88,000,000
	Existing HTWs		-1,518,000	-236,500	-1,062,000	-535,500
N3.2.1	Mini Tara + arsenic filter in existing HTW		1,572,000	-1,252,500	-319,500	0
N3.2.2	FM hand pump (local Tara) with new HTW		0	0	0	0
N3.2.3	Mini Tara in existing HTW		220,100	377,000	-103,500	-535,500
N3.5	Existing HTW + Household arsenic removal		482,100	-524,000	0	0
N3.11.1	Peri urban mini DTW + IRP +distribution		100,610	534,200	1,503,000	-132,000
N3.11.2	Peri urban mini DTW + distribution		157,200	1,120,800	3,006,000	-264,000
N3.9	Urban piped supply from SW		0	0	535,500	2,479,500
N3.10.1	Urban piped supply from DTW + IRP		262,000	377,000	432,000	2,949,000
N3.10.2	Urban piped supply from DTW		524,000	754,000	328,500	5,428,500
			1,800,010	1,150,000	4,320,000	9,390,000

**Small Town Water Supplies (<50,000 in 2025)**

		Incremental Investment Requirements - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	4,190,000	5,240,000	6,390,000	10,710,000	20,100,000
	Existing HTWs		0	0	0	0
N3.2.1	Mini Tara + arsenic filter in existing HTW		1,572,000	0	0	0
N3.2.2	FM hand pump (local Tara) with new HTW		0	0	0	0
N3.2.3	Mini Tara in existing HTW		220,100	377,000	0	0
N3.5	Existing HTW + Household arsenic removal		482,100	0	0	0
N3.11.1	Peri urban mini DTW + IRP +distribution		100,610	534,200	1,503,000	0
N3.11.2	Peri urban mini DTW + distribution		157,200	1,120,800	3,006,000	0
N3.9	Urban piped supply from SW		0	0	535,500	2,479,500
N3.10.1	Urban piped supply from DTW + IRP		262,000	377,000	432,000	2,949,000
N3.10.2	Urban piped supply from DTW		524,000	754,000	328,500	5,428,500
			3,318,010	3,163,000	5,805,000	10,857,000

**Small Town Water Supplies (<50,000 in 2025)**

Small Town Water Supplies (<50,000 in 2025)			Incremental Investment Requirements - Capital Costs				
Option	Description	Unit Capital Cost Tk/capita	2000	2005	2010	2025	2050
	Total population		4,190,000	5,240,000	6,390,000	10,710,000	20,100,000
				TkM	TkM	TkM	TkM
N3.2.1	Mini Tara + arsenic filter in existing HTW	157		247	0	0	0
N3.2.2	FM hand pump (local Tara) with new HTW	180		28	0	0	0
N3.2.3	Mini Tara in existing HTW	360		79	136	0	0
N3.5	Existing HTW + Household arsenic removal	128		62	0	0	0
N3.11.1	Peri urban mini DTW + IRP +distribution	1,314		132	702	1,975	0
N3.11.2	Peri urban mini DTW + distribution	967		152	1,084	2,907	0
N3.9	Urban piped supply from SW	2,644		0	0	1,416	6,556
N3.10.1	Urban piped supply from DTW + IRP	2,063		541	778	891	6,084
N3.10.2	Urban piped supply from DTW	1,080		566	814	355	5,863
	<b>Total Incremental Capital Cost</b>			<b>1,807</b>	<b>3,514</b>	<b>7,544</b>	<b>18,502</b>
	<b>Total Cumulative Capital Cost</b>			<b>1,807</b>	<b>5,320</b>	<b>12,864</b>	<b>31,366</b>

**Note:** Considering that Option N3.2.1 provides water for drinking only in arsenic affected areas and an HTW may not be existing closely to meet the other water needs, Option N3.2.2 is provided (equal to 10% (No.) of the N3.2.1 coverage) to take care of any shortfall.

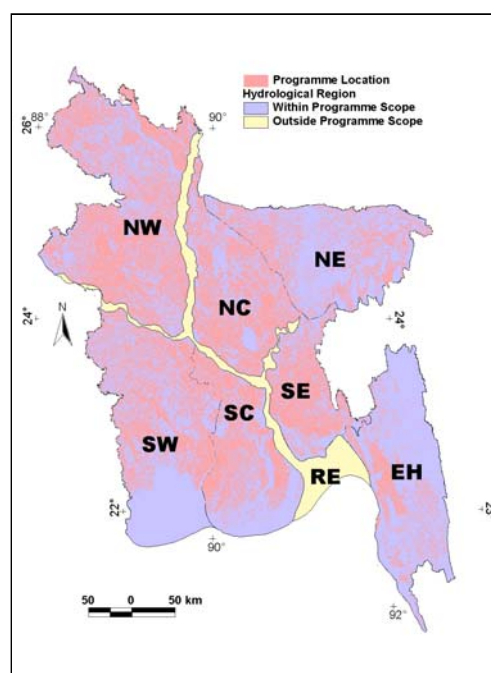
**Rural Water Supply and Distribution Systems**

Ref: TR 004

**Basic Data**NWMP Sub-sector **Towns and Rural Areas**Region(s) **National significance****Relevance to NWPo**

Water allocation for domestic use is the first priority under the NWPo. The programme for Rural Areas, under both the NWPo and the National Policy for Safe Water Supply and Sanitation (NPSWSS), aims to address the need for “....safe and affordable drinking water supplies through various means....” for all inhabitants, especially the poor. Policy also mandates that investments to improve and extend water services in the rural areas should be paralleled by continued encouragement of:

- (a) community participation, especially the empowerment of women;
- (b) private sector involvement; and
- (c) effective cost recovery mechanisms for appropriate operations and maintenance.

**Purpose of Programme**

The projections prepared for the NWMP indicate that the rural population is expected to stabilise in the medium term and decline in the much longer term (i.e. after 2025), based on a predicted acceleration in migration to the cities and towns, especially Dhaka. NWMP projections show a modest increase in the rural population from 102 million in 2000 to nearly 108 million in 2025, before falling steadily to 88 million by 2050. This trend will reduce the pressure for improved service coverage in terms of absolute numbers, but focus more attention on the demand for service quality in terms of improved reliability and direct household access to potable water. At present, service coverage and access to potable water can vary between Thanas and from region to region. NWMP estimates for the whole sector indicate that about 92% of the rural population normally have adequate access to potable water - apart from the very serious arsenic issue (see: Programme TR 002). Shallow HTWs are the dominant water source serving 85% of the rural population; while the other 7% are served by a combination of deep HTWs, Tara pumps and other sources. Current estimates indicate that 57% of the rural population is classified as living in poverty.

The programme for the rural areas assumes that in the medium to long term more communities will seek to improve their access to water services by progressing from shallow HTWs to small DTW based distribution systems with internal and external household connections. This significant development is based on the assumption that rural incomes will improve substantially in real terms and enable rural communities to plan, construct and operate their own systems with the support of the private sector. GoB will support this process through the establishment of an investment fund to provide capital contributions on a grant or soft loan basis.

## Programme Outline

Improvements and extensions of rural water services will continue throughout the implementation of the NWMP. The coverage targets by service type are summarised as follows:

Component	Year			
	2000	2005	2010	2025
Population (million)	102.0	104.8	107.1	107.7
Water supply coverage (%)				
Shallow HTW	85	50	15	2
Arsenic filter on HTW/Tara pumps (1)	1	5	8	5
Arsenic removal in households (1)	0	20	5	1
Small DTW based systems	0	10	40	60
Rainwater harvesting	0	2	1	0
Pond sand filters	0	4	2	0
Surface water sources with piped distribution	0	0	2	5
Other options	6	9	27	27
Total	92	100	100	100

Note: (1) Arsenic mitigation is addressed under Programme TR 002.

## Financing Arrangements

For effective sustained implementation, the investment programme will require the active and co-ordinated participation of rural community-based organisations with the support of NGOs and the domestic private sector. Indicative financing targets are presented below:

Sector	%
Public (GoB and international development agencies)	5
Private (domestic)	95
Total	100

Rural community organisations and the private sector will need to ensure the availability of adequate funds for:

- development of new small DTW based distribution systems;
- capital replacement during and after the NWMP period; and
- effective operations and maintenance.

In this context, rural communities will need to develop effective pricing and cost recovery mechanisms.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Rural water supply programmes prepared	I1	• Signed programme/project documents	2005
• Sustainable operation and maintenance of rural water supply systems	I2	• Frequency of pipe breaks	2010
• Rural water supply programmes completed	I3	• Response times	
		• Programme/project completion reports	2025
• 100% of rural population has access to formal water supplies	K	• Household, community surveys	
		• Survey reports	2025
• Demand for safe and reliable drinking water supplies satisfied in towns and rural areas	D	• % service coverage verified by surveys	2025

## **Institutional Arrangements**

The institutional arrangements for programme implementation are expected to comprise three components as defined by the NWPO and NPSWSS:

- (a) Public sector - following the successful engagement of the private sector in the 1990s, the future role for the public sector will largely be to:
  - (i) continue the development of a flexible enabling environment;
  - (ii) provide appropriate technical support through DPHE;
  - (iii) establish an independent monitoring and regulatory framework; (iv) promote education and awareness in the water sector; and
  - (iv) provide access to supporting capital funds.

It will be particularly important for the public sector to ensure that the rural poor and areas of water stress are adequately served.

- (b) Community-based participation, with or without NGO involvement - community participation and initiatives will be actively encouraged with investment funds from GoB and the promotion of partnership with the private sector.
- (c) Private sector participation - the private sector is expected to play an increasing role in the provision of water services in partnership with rural communities. This will include a full range of services, including: equipment provision; construction; and O&M. This implies that the beneficiaries are willing and able to pay.

The implementation of these institutional developments will need to be carefully formulated and programmed with the full political commitment of GoB and interested stakeholders. In the short to medium term, the Government will also establish an appropriate independent Regulatory Framework to supervise and monitor public and private sector performance in the provision of water services.

## **References and Documentation**

- (a) Chapter 7, Development Strategy Report, March 2001
- (b) Main references:
- (c) National Water Resources Database in WARPO

## **Linkages**

Note: The issue of arsenic contamination in rural water supplies is addressed separately under Programme TR 002 - Arsenic Contamination in Rural Water Supplies.

The sustained development of water supply services for Rural Areas should be closely linked and co-ordinated with other NWMP programmes, namely:

- (a) Local Government Needs Assessment for Water Management (ID 001);
- (b) Local Government Capacity Building for Water Management (ID 005);
- (c) Independent Regulatory Bodies for the Water Supply and Sanitation Service Sector (ID 002);
- (d) Support to the Preparation of New Legislation (EE 001);
- (e) Field Testing of Participatory Management Models (EE 002);
- (f) Water Resources Legislation – Preparation of Supporting Ordinances (EE 003);
- (g) Project Preparation Procedures - Guidelines and Manuals (EE 004);

- (h) Regulatory and Economic Instruments (EE 005);
- (i) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (j) Raising Public Awareness in the Wise Use and Management of Water (EE 010);
- (k) Private Sector Participation in Water Management (EE 011);
- (l) Alternative Financing Methods for Water Management (EE 013);
- (m) Rural Arsenic Mitigation (TR 002);
- (n) Rural Sanitation (TR 006);
- (o) National Clean-up of Existing Industrial Pollution (EA 002);
- (p) National Water Quality Monitoring (EA 003); and
- (q) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

The Inventory and Asset Management Plan of the Water and Sanitation Sector (MC 001) is also relevant here.

In addition, planning and implementation should be co-ordinated with the Ministry of Local Government, Rural Development and Co-operatives (MoLGRDC), Department of Public Health Engineering (DPHE), Local Government Engineering Department (LGED), Ministry of Health (MoH), Department of Environment (DoE), WARPO, NGOs and other interested parties.

### **Risks and Assumptions**

There are a number of risks associated with a sustained development programme to improve the provision of safe and reliable water services in Rural Areas. They fall into four categories: technical; institutional; financial; social and environmental.

With the exception of the serious arsenic problem (see: TR 001 and TR 002), the technical risks associated with improved water supply provision will be the increased resources and expertise required to ensure adequate standards of operation and maintenance. In the project preparation and participatory process, rural communities must be given realistic and pragmatic advice on real costs and charges before individual rural communities make a final decision.

The institutional risks mainly relate to the Government's willingness and commitment to provide a flexible environment in which the partnership between rural communities and the private sector can flourish. National policy statements (NWPO and NPSWSS) commit government to a role which is essentially focused on technical assistance, monitoring, independent regulation, and capital funding support.

The financial risks are that the necessary investment resources will not be forthcoming, because of rural income constraints and the possible reluctance of the private sector to support the financing of water distribution systems in rural communities. This situation can be mitigated by the establishment of a Water Fund which would assist rural communities with grants and soft loans, providing the recipient communities also make a specified capital contributions.

The environmental risks for water supply are mainly related to any waste product from the water treatment process and construction operations.. These risks can be mitigated together with a parallel programme to deal with hygienic sanitation facilities.

Assumptions:

- Materials used for construction of new systems will give the assumed working lives.
- Construction of new systems is adequately supervised so as to minimise future operation and maintenance.
- Technical skills will be adequate to enable the efficient and effective O & M of the water systems.
- The operating utility will be able to run the water supply function without political interference.
- Full cost recovery is affordable
- Environmental risks can be successfully mitigated.

**Rural Water Supply and Distribution Systems**

Ref :

**TR 004**

Cluster :	<b>Towns and Rural Areas</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Water Supplies</b>	Location :	<b>Rural Areas Nationwide</b>
Start Year <sup>1</sup> :	<b>2001</b>	Duration <sup>2</sup> :	<b>25 year(s)</b>
		Agency(s) Responsible :	<b>DPHE</b> (Lead) LGIs, DPHE, CBOs (Supporting)
Short Description :	The preamble to NWPo §4.6 of the NWPo recognises that "The rural areas of Bangladesh suffer from a lack of quality drinking water". This situation is worsening due to heavy withdrawals of groundwater (the principle source for most of the rural areas) for irrigation a trend which is exacerbated by agro-chemical and saline pollution of groundwater. Although the rural population is expected to increase relatively slowly over the next 25 years, from 102 million in 2000 to 108 million in 2025, it is nonetheless the GoB's intention to "facilitate the availability of safe and affordable drinking water supplies through various means" (NWPo §4.6.a). It is estimated that 92% of the rural population normally have access to potable water, mainly through shallow HTWs. The thrust of this programme is therefore to improve the quality of water supply services (reliability and access) in areas already served as well as extending the coverage to 100% by 2005.		

<b>MIS Links</b>	Cost Calculation :	TR Programme costing.xls	Map :	TR 004 Map.jpg
	Disb't Schedule :	TR Programme costing.xls	Description :	TR 004 PgP.doc

<b>Finance</b>					
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>74,234.00</b> MTk	<b>80%</b>	<b>20%</b>	<b>0%</b>	<b>25</b>
Ultimate Recurring	<b>12,884.30</b> MTk/yr	<b>n/a</b>	<b>0%</b>	<b>100%</b>	<b>25</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Rural water supply programmes prepared	• Signed programme/project documents	NYD
• Sustainable operation and maintenance of rural water supply systems	• Frequency of pipe breaks • Response times	NYD
• Rural water supply programmes completed	• Programme/project completion reports • Household, community surveys	NYD
• 100% of rural population has access to formal water supplies	• Survey reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	TR 004
Title	Rural Water Supply and Distribution Systems

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years <sup>1</sup>	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

### Technical Assistance

Expatriate consultants (all-in rate)  
 Senior National consultants (all-in rate)  
 Mid-level National consultants (all-in rate)  
 Sub-totals  
 Other general TA programme costs  
 Specific other TA programme costs

TA costs for this programme are included in the capital costs

### Total TA Costs

### Investment items - short term

Open well	ls	na		729.0	13.9%	101.3
Mini Tara + arsenic filter in existing HTW	ls	na	costed in programme TR 002			
FM hand pump (local Tara) with new HTW	ls	na		688.0	13.5%	92.9
Mini Tara in existing HTW	ls	na		1,152.0	13.4%	154.4
Pond sand filter (existing pond)	ls	na		172.0	26.1%	44.9
Rainwater harvesting	ls	na		1,614.0	12.4%	200.6
Existing HTW +household arsenic removal	ls	na		2,683.0	89.1%	2,390.6
Rural mini DTW +IRP+distribution	ls	na		1,654.0	17.8%	294.4
Rural mini DTW +distribution	ls	na		2,832.0	19.0%	538.1

### Investment items - term

Mini Tara + arsenic filter in existing HTW	ls	na	costed in programme TR 002			
FM hand pump (local Tara) with new HTW	ls	na		1,065.0	13.5%	143.8
Mini Tara in existing HTW	ls	na		3,897.0	13.4%	522.2
Pond sand filter (existing pond)	ls	na		199.0	26.1%	51.9
Rainwater harvesting	ls	na		35.0	12.4%	4.3
Rural mini DTW +IRP+distribution	ls	na		3,980.0	17.8%	708.4
Rural mini DTW +distribution	ls	na		9,570.0	19.0%	1,818.3
Rural piped distribution from SW	ls	na		7,739.0	11.1%	859.0

### Investment items - short term

FM hand pump (local Tara) with new HTW	ls	na		11.0	13.5%	1.5
Pond sand filter (existing pond)	ls	na		2.0	26.1%	0.5
Rainwater harvesting	ls	na		9.0	12.4%	1.1
Rural mini DTW +IRP+distribution	ls	na		2,864.0	17.8%	509.8
Rural mini DTW +distribution	ls	na		6,305.0	17.8%	1,122.3
Rural piped distribution from SW	ls	na		11,717.0	11.1%	1,300.6
Rural piped distribution from DTW	ls	na		10,317.0	11.2%	1,155.5

<b>Total Investment Items</b>				<b>69,234.0</b>	<b>17.4%</b>	<b>12,016.5</b>
-------------------------------	--	--	--	-----------------	--------------	-----------------

<b>Overall Costs of meeting demands accruing during NWMP timeframe</b>				<b>69,234.0</b>		<b>12,016.5</b>
<b>Additional NWMP provision to maintain capacity ahead of demand</b>				<b>5,000.0</b>		<b>867.8</b>
				<b>74,234.0</b>		<b>12,884.3</b>

Notes 1 The step-wise approach to investment necessary to achieve and maintain installed capacity ahead of demands may mean that the total investment against +25 year demand is disbursed within the 25 year horizon. However, an additional provision will also be disbursed before the end of the 25 year, in order again to keep capacity ahead of ongoing demand increases.



# Rural Water Supplies

Rural Water Supplies		Coverage Targets (%)					
Option	Description	Total Annual Cost (Tk/m³)	2000	2005	2010	2025	2050
	Total population		102,000,000	104,800,000	107,100,000	107,700,000	88,000,000
	Existing HTWs		85%	50%	15%	2%	0%
N3.1	Open well	5.04	2%	3%	2%	1%	0%
N3.2.1	Mini Tara + arsenic filter in existing HTW	17.00	1%	5%	8%	5%	0%
N3.2.2	FM hand pump (local Tara) with new HTW	1.33	2%	5%	10%	10%	10%
N3.2.3	Mini Tara in existing HTW	2.65	2%	5%	15%	10%	0%
N3.3.1	Pond sand filter (existing pond)	7.31	0%	1%	2%	2%	0%
N3.4	Rainwater harvesting	105.00	0%	1%	1%	1%	0%
N3.5	Existing HTW + Household arsenic removal	25.00	0%	20%	5%	1%	0%
N3.6.1	Rural mini DTW + IRP + distribution	5.12	0%	3%	10%	15%	15%
N3.6.2	Rural mini DTW + distribution	4.02	0%	7%	30%	45%	45%
N3.7	Rural piped distribution from SW	21.88			2%	5%	15%
N3.8	Rural piped distribution from DTW	19.61				3%	15%
			92%	100%	100%	100%	100%

# Rural Water Supplies

		Coverage Targets - Number of Population				
Option	Description					
		2000	2005	2010	2025	2050
	Total population	102,000,000	104,800,000	107,100,000	107,700,000	88,000,000
	Existing HTWs	86,700,000	52,400,000	16,065,000	2,154,000	0
N3.1	Open well	2,040,000	3,144,000	2,142,000	1,077,000	0
N3.2.1	Mini Tara + arsenic filter in existing HTW	1,020,000	5,240,000	8,568,000	5,385,000	0
N3.2.2	FM hand pump (local Tara) with new HTW	2,040,000	5,240,000	10,710,000	10,770,000	8,800,000
N3.2.3	Mini Tara in existing HTW	2,040,000	5,240,000	16,065,000	10,770,000	0
N3.3.1	Pond sand filter (existing pond)	102,000	1,048,000	2,142,000	2,154,000	0
N3.4	Rainwater harvesting	0	1,048,000	1,071,000	1,077,000	0
N3.5	Existing HTW + Household arsenic removal	0	20,960,000	5,355,000	1,077,000	0
N3.6.1	Rural mini DTW + IRP + distribution	0	3,144,000	10,710,000	16,155,000	13,200,000
N3.6.2	Rural mini DTW + distribution	0	7,336,000	32,130,000	48,465,000	39,600,000
N3.7	Rural piped distribution from SW	0	0	2,142,000	5,385,000	13,200,000
N3.8	Rural piped distribution from DTW	0	0	0	3,231,000	13,200,000
		93,942,000	104,800,000	107,100,000	107,700,000	88,000,000

# Rural Water Supplies

		Incremental Coverage Targets - Number of Population				
Option	Description					
		2000	2005	2010	2025	2050
	Total population	102,000,000	104,800,000	107,100,000	107,700,000	88,000,000
	Existing HTWs		-34,300,000	-36,335,000	-13,911,000	-2,154,000
N3.1	Open well		1,104,000	-1,002,000	-1,065,000	-1,077,000
N3.2.1	Mini Tara + arsenic filter in existing HTW		4,220,000	3,328,000	-3,183,000	-5,385,000
N3.2.2	FM hand pump (local Tara) with new HTW		3,200,000	5,470,000	60,000	-1,970,000
N3.2.3	Mini Tara in existing HTW		3,200,000	10,825,000	-5,295,000	-10,770,000
N3.3.1	Pond sand filter (existing pond)		946,000	1,094,000	12,000	-2,154,000
N3.4	Rainwater harvesting		1,048,000	23,000	6,000	-1,077,000
N3.5	Existing HTW + Household arsenic removal		20,960,000	-15,605,000	-4,278,000	-1,077,000
N3.6.1	Rural mini DTW + IRP + distribution		3,144,000	7,566,000	5,445,000	-2,955,000
N3.6.2	Rural mini DTW + distribution		7,336,000	24,794,000	16,335,000	-8,865,000
N3.7	Rural piped distribution from SW		0	2,142,000	3,243,000	7,815,000
N3.8	Rural piped distribution from DTW		0	0	3,231,000	9,969,000

# Rural Water Supplies

		Incremental Investment Requirements - Number of Population				
Option	Description					
		2000	2005	2010	2025	2050
	Total population	102,000,000	104,800,000	107,100,000	107,700,000	88,000,000
	Existing HTWs		0	0	0	0
N3.1	Open well		1,104,000	0	0	0
N3.2.1	Mini Tara + arsenic filter in existing HTW		4,220,000	3,328,000	0	0
N3.2.2	FM hand pump (local Tara) with new HTW		3,200,000	5,470,000	60,000	0
N3.2.3	Mini Tara in existing HTW		3,200,000	10,825,000	0	0
N3.3.1	Pond sand filter (existing pond)		946,000	1,094,000	12,000	0
N3.4	Rainwater harvesting		1,048,000	23,000	6,000	0
N3.5	Existing HTW + Household arsenic removal		20,960,000	0	0	0
N3.6.1	Rural mini DTW + IRP + distribution		3,144,000	7,566,000	5,445,000	0
N3.6.2	Rural mini DTW + distribution		7,336,000	24,794,000	16,335,000	0
N3.7	Rural piped distribution from SW		0	2,142,000	3,243,000	7,815,000
N3.8	Rural piped distribution from DTW		0	0	3,231,000	9,969,000
	Total		45,158,000	55,242,000	28,332,000	17,784,000

# Rural Water Supplies

Rural Water Supplies		Incremental Investment Requirements - Capital Costs					
Option	Description	Unit Capital Cost Tk/capita	2000	2005	2010	2025	2050
	Total population		102,000,000	104,800,000	107,100,000	107,700,000	88,000,000
				TkM	TkM	TkM	TkM
N3.1	Open well	660		729	0	0	0
N3.2.1	Mini Tara + arsenic filter in existing HTW	157		663	522	0	0
N3.2.2	FM hand pump (local Tara) with new HTW	180		688	1,065	11	0
N3.2.3	Mini Tara in existing HTW	360		1,152	3,897	0	0
N3.3.1	Pond sand filter (existing pond)	182		172	199	2	0
N3.4	Rainwater harvesting	1,540		1,614	35	9	0
N3.5	Existing HTW + Household arsenic removal	128		2,683	0	0	0
N3.6.1	Rural mini DTW + IRP + distribution	526		1,654	3,980	2,864	0
N3.6.2	Rural mini DTW + distribution	386		2,832	9,570	6,305	0
N3.7	Rural piped distribution from SW	3,613		0	7,739	11,717	28,236
N3.8	Rural piped distribution from DTW	3,193		0	0	10,317	31,831
	Total Incremental Capital Cost			12,185	27,008	31,225	60,067
	Total Cumulative Capital Cost			12,185	39,193	70,419	130,485

**Note:** Considering that Options N3.2.1, N3.3.1 and N3.4 provides water for drinking only in arsenic affected areas and an HTW may not be existing closely to meet the other water needs, extra number of Option N3.2.2 is provided (equal to 10% of the combined coverage of N3.2.1, N3.3.1 and N3.4) to take care of any shortfalls.

## Large and Small Town Sanitation and Sewerage Systems

Ref: TR 005

### Basic Data

NWMP Sub-sector      **Towns and Rural Areas**

Region(s)              **Nationwide significance**

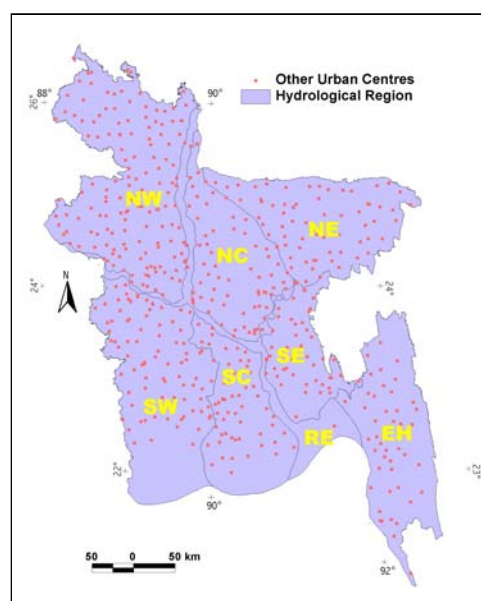
### Relevance to NWPo

The programme will address basic policy objectives to provide hygienic and affordable sanitation and sewerage services for all the inhabitants of Large and Small Towns, especially poor and disadvantaged communities. The NWPo “mandates relevant public water and sewerage institutions to provide necessary drainage and sanitation, including treatment of domestic wastewater and sewage and replacement of open drains and construction of sewers, in the interest of public health”, “...regulate the use of water for preventing wastage and pollution by human action”, and “...create awareness among people in checking water pollution and wastage.” The NPSWSS reinforces these aims by highlighting the need for basic sanitation facilities, public health implications, environmental impacts and the importance of promoting social awareness through behavioural development and hygiene education especially for women and children. Policy also mandates that investments to improve and extend sanitation and sewerage services should be paralleled by appropriate and substantive institutional and financial reform to attain:

- (a) significant improvements in service efficiency and financial viability of existing institutions;
- (b) private sector participation;
- (c) stakeholder consultation, particularly in peri-urban and poor communities; and
- (d) full cost recovery, particularly in the application of the “polluter-pays” principle.

### Purpose of Programme

There are 522 towns (1991 Census) throughout the country: 44 large towns (more than 50,000 people) with a total population of 9.8 million in 2000; and 478 small towns (less than 50,000 people) with a combined population of 4.2 million. The total population of all towns (large and small) is expected to increase five-fold in the next 50 years, from nearly 14 million in 2000 to 36 million in 2025 and 67 million by 2050. All towns will experience increasing pressure to improve and extend their public services and infrastructure, including the need for appropriate sanitation and sewerage services for all inhabitants. At present, NWMP estimates for the whole sector indicate that pit latrines (with or without a septic tank) are the predominant form of sanitation, serving 65% of the population in large towns and 55% in small towns. The rest of the urban population, mainly the poor and fringe communities, rely on “hanging latrines” (often over the nearest water course) or have no basic sanitation at all. Against this background, local pollution levels will continue to rise leading to serious public health problems and the increased likelihood of epidemic outbreaks of waterborne and water-related diseases. Current estimates indicate that 35% of town populations are classified as living in poverty.



The investment programme will require sustained commitment to provide appropriate sanitation facilities for all inhabitants to raise service coverage to 100% by 2010 in both large and small towns. The investment focus is expected to concentrate on raising the overall standards of basic sanitation, with campaigns for the construction of hygienic latrines (with and without septic tanks) and community sanitation facilities, especially for the urban poor. Development of waterborne sewerage systems (e.g. smallbore systems) is not generally foreseen until after 2025.

## Programme Outline

Improvements and extensions of appropriate and affordable sanitation and waterborne sewerage systems will continue throughout the implementation of the NWMP. The coverage targets by service type are summarised as follows:

Component	Year			
	2000	2005	2010	2025
<b>Large Towns (population greater than or equal to 50,000)</b>				
Population (million)	9.8	12.2	14.9	25.0
Sanitation coverage (%)				
Pit latrine	60	80	55	25
Household latrine with septic tank	5	10	30	30
Community sanitation facility	0	10	15	10
Smallbore sewerage system	0	0	0	35
Sewerage system with WWTP	0	0	0	0
Total	65	100	100	100
<b>Small Towns (population less than 50,000)</b>				
Population (million)	4.2	5.2	6.4	10.7
Sanitation coverage (%)				
Pit latrine	50	75	65	40
Household latrine with septic tank	5	10	25	40
Community sanitation facility	0	5	10	5
Smallbore sewerage system	0	0	0	15
Total	55	90	100	100

## Financing Arrangements

For effective sustained implementation, the investment programme will require the active and co-ordinated participation of the public sector (GoB and international development agencies), private sector (domestic and foreign, the latter in the medium to long term), and community based organisations with the support of NGOs. Indicative financing targets are presented below:

Sector	%
Public (GoB and international development agencies)	75
Private (domestic and foreign)	20
Local Communities	5
Total	100

The Government and the executing agencies will also need to ensure the availability of adequate funds for:

- rehabilitation of existing sanitation and sewerage facilities;
- capital replacement during and after the NWMP period; and
- effective operations and maintenance.

In this context, the establishment of full cost recovery pricing will be essential.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Sustainable operation and maintenance of town sanitation systems	I1	• Frequency of service break downs	2011
• Reduced environmental pollution	I2	• Response times	2016
• Improved public health	I3	• Fæcal coliform counts	2021
• 100% of large and small town populations have access to sanitation facilities	K	• Public health statistics	2026
• Demand for sanitation facilities and services created and satisfied in towns and rural areas	D	• Survey reports	2026
		• % service coverage verified by surveys	2026

## Institutional Arrangements

The institutional arrangements for programme implementation are expected to comprise three components as defined by the NWPO and NPSWSS:

- (a) Public sector - under the policy of decentralisation, the local municipal authorities (e.g. Paurashavas and Upazilas) will have prime responsibility, with the technical support of DPHE and LGED. Much greater emphasis will be given to increased autonomy and management expertise, organisational reform, service coverage and efficiency, full cost recovery and financial viability.
- (b) Private sector participation - in the medium to longer term, the private sector is expected to play an increasing role in the provision of sanitation and sewerage services in the Large and Small Towns. This will include: contract services (e.g. operation and maintenance of specific facilities, revenue billing and collection, etc.); and BOT/BOOT schemes for smallbore sewerage systems in a town or group of towns. The latter would also be developed in partnership with community based organisations.
- (c) Community-based and NGO participation - in the peri-urban and disadvantaged areas, community sanitation facilities will be encouraged with investment funds from GoB, and the collaboration of NGOs and the private sector. Prominence should also be give to the active participation of women.

The implementation of these institutional developments will need to be carefully formulated and programmed with the full political commitment of GoB and interested stakeholders. In the short to medium term, the Government will also establish an appropriate independent Regulatory Framework to supervise and monitor public and private sector performance in the provision of sanitation and sewerage services.

## References and Documentation

- (a) Chapter 7, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

## Linkages

The programme to improve and develop sanitation and sewerage facilities in the Large and Small Towns should be closely linked and co-ordinated with other NWMP programmes, namely:

- (a) Local Government Needs Assessment for Water Management (ID 001);
- (b) Local Government Capacity Building for Water Management (ID 005);
- (c) Independent Regulatory Bodies for the Water Supply and Sanitation Service Sector (ID 002);

- (d) Support to the Preparation of New Legislation (EE 001);
- (e) Field Testing of Participatory Management Models (EE 002);
- (f) Water Resources Legislation – Preparation of Supporting Ordinances (EE 003);
- (g) Project Preparation Procedures - Guidelines and Manuals (EE 004);
- (h) Regulatory and Economic Instruments (EE 005);
- (i) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (j) Raising Public Awareness in the Wise Use and Management of Water (EE 010);
- (k) Private Sector Participation in Water Management (EE 011);
- (l) Alternative Financing Methods for Water Management (EE 013);
- (m) Urban Arsenic Mitigation (TR 001);
- (n) Large and Small Towns Water Supply and Distribution Systems (TR 003);
- (o) Large and Small Towns Flood Protection (TR 007);
- (p) Large and Small Towns Stormwater Drainage (TR 008);
- (q) National Clean-up of Existing Industrial Pollution (EA 002);
- (r) National Pollution Control Plan (EA 001);
- (s) National Water Quality Monitoring (EA 003); and
- (t) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

The Inventory and Asset Management Plan of the Water and Sanitation Sector (MC 001) is also relevant here.

In addition, planning and implementation should be co-ordinated with the respective Local Government authorities (District towns, Paurashavas (municipalities), Upazila headquarters and urban growth centres), Ministry of Local Government, Rural Development and Co-operatives (MoLGRDC), Department of Public Health Engineering (DPHE), Local Government Engineering Department (LGED), Urban Development Directorate (UDD), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO, NGOs and other interested parties.

## **Risks and Assumptions**

The programme for the provision of hygienic sanitation and sewerage services in the Large and Small Towns has a number of important risks. They fall into four categories: technical; institutional; financial and environmental.

The technical risks are largely confined to the general poor standards of maintenance of public infrastructure. This limitation can be addressed if the related institutional and financial issues are addressed in a constructive and comprehensive manner.

The institutional risks focus mainly on the political willingness and commitment to reform the organisation and management of sanitation and services through a concerted drive to improve efficiency, involve the private sector, and promote effective user participation. National policy statements (NWPO and NPSWSS) clearly indicate that Government is aware of the problems, but it will need real political commitment to create an independent structure which is solely dedicated to the provision of effective and efficient sanitation services for all inhabitants.

The financial risks are that the necessary investment and maintenance resources for the Large and Small Towns will become increasingly constrained, especially from international sources, if the institutional and efficiency issues are not addressed in a constructive manner, and Government does not give sustained support for the policy of full cost recovery. Future Government investment budgets will be under increasing pressure from other public sectors;

therefore, it is crucial that there is a phased introduction of private sector participation and effective promotion of community-based systems particularly for peri-urban and disadvantaged communities.

The environmental risks are mainly related to the increasing volumes of untreated wastewater, associated public health risks and environmental degradation in the towns. There will be short term environmental impacts associated with construction activities.

Assumptions:

- Materials used for construction of new systems will give the assumed working lives.
- Construction of new systems is adequately supervised so as to minimise future operation and maintenance.
- Technical skills will be adequate to enable the efficient and effective O & M of the sewerage systems.
- The operating utility will be able to run the sewerage supply function without political interference.
- Full cost recovery is affordable.
- Environmental risks can be successfully mitigated.

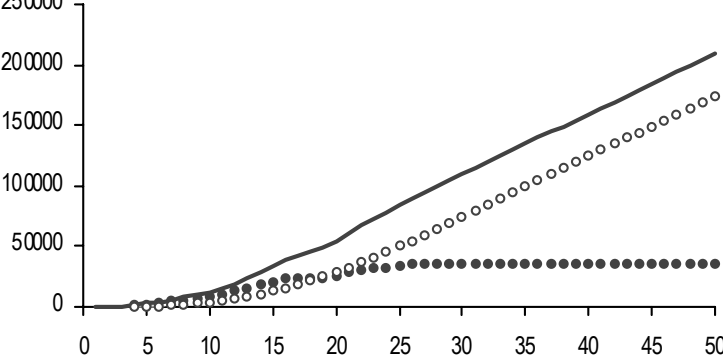
**Large and Small Town Sanitation and Sewerage Systems**

Ref :

**TR 005**

Cluster :	Towns and Rural Areas		Region(s) :	All	
Focus/Foci :	Sanitation		Location :	Nationwide	
Start Year <sup>1</sup> :	2002	Duration <sup>2</sup> : 25 year(s)	Agency(s) Responsible :	Paurashavas LGIs, LGED, DPHE, CBOs	(Lead) (Supporting)
Short Description :	§4.6.c of the NWPo "mandates relevant public water and sewerage institutions to provide necessary drainage and sanitation, including treatment of domestic wastewater and sewage and replacement of open drains and construction of sewers, in the interest of public health." The population of large (>50,000) and small towns is expected to more than double over the next 25 years, from 14 million in 2000 to 36 million in 2025. At present, between 55% (small towns) and 65% (large towns) of the population is adequately served by sanitation facilities, mainly by pit latrines with/without septic tanks. In the poor areas and fringe communities, people are dependant on 'hanging latrines' and open defecation which exacerbates pollution and public health problems and increases the likelihood of epidemic outbreaks of waterborne and water-related diseases. This programme aims to provide appropriate sanitation facilities and raise and sustain service coverage at 100% by 2010.				

<b>MIS Links</b>	Cost Calculation :	TR Programme costing.xls	Map :	TR 005 Map.jpg
	Disb't Schedule :	TR Programme costing.xls	Description :	TR 005 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme		Year	
	Total Capital <sup>3</sup>		34,894.00 MTk	0%	100%	0%	25		
	Ultimate Recurring		4,543.10 MTk/yr	n/a	0%	100%	26		
	Date of Data :		31 07 01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment ○ Recurring — Total				
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Sustainable operation and maintenance of town sanitation systems	• Frequency of service break downs • Response times	NYD
• Reduced environmental pollution	• Faecal coliform counts	NYD
• Improved public health	• Public health statistics	NYD
• 100% of large and small town populations have access to sanitation facilities	• Survey reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	TR 005
Title	Large and Small Town Sanitation and Sewerage Systems

*Assumptions:*

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years <sup>1</sup>	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

**Technical Assistance**

Expatriate consultants (all-in rate)  
 Senior National consultants (all-in rate)  
 Mid-level National consultants (all-in rate)  
 Sub-totals  
 Other general TA programme costs  
 Specific other TA programme costs

TA costs for this programme are included in the capital costs

**Total TA Costs**

**Investment items - short term**

Lump Sum Costs  
 Large towns Small towns

Standard single pit latrine	782.00	367.00	1,149.0	22.5%	258.5
Household latrine with septic tank and soakaway	312.00	134.00	446.0	18.8%	83.8
Community level sanitation facility	2,109.00	456.00	2,565.0	21.3%	546.3

**Investment items - medium term**

Standard single pit latrine		45.00	45.0	22.5%	10.1
Household latrine with septic tank and soakaway	1,385.00	457.00	1,842.0	18.8%	346.3
Community level sanitation facility	1,765.00	656.00	2,421.0	21.3%	515.7

**Investment items - long term**

Standard single pit latrine		26.00	26.0	22.5%	5.9
Household latrine with septic tank and soakaway	1,287.00	1,144.00	2,431.0	18.8%	457.0
Community level sanitation facility	455.00		455.0	21.3%	96.9
Small bore sewerage system with household septic tanks (urban)	8,393.00	1,200.00	9,593.0	11.1%	1,064.8
Small bore sewerage system with street-level septic tanks (urban)	8,993.00	1,928.00	10,921.0	10.6%	1,157.6

<b>Total Investment Items</b>			<b>31,894.0</b>	<b>14.2%</b>	<b>4,543.1</b>
-------------------------------	--	--	-----------------	--------------	----------------

<b>Overall Programme Costs</b>			<b>31,894.0</b>		<b>4,543.1</b>
<b>Additional NWMP provision to maintain capacity ahead of demand</b>			<b>3,000.0</b>		<b>427.3</b>
			<b>34,894.0</b>		<b>4,970.4</b>

Notes	1	The step-wise approach to investment necessary to achieve and maintain installed capacity ahead of demands may mean that the total investment against +25 year demand is disbursed within the 25 year horizon. However, an additional provision will also be disbursed before the end of the 25 year, in order again to keep capacity ahead of ongoing demand increases.			
-------	---	--	--	--	--



# Large Town Sanitation (>50,000 in 2025 but not SMAs)

Large Town Sanitation (>50,000 in 2025 but not SMAs)			Coverage Targets (%)				
Option	Description	Total Annual Cost (Tk/capita)	2000	2005	2010	2025	2050
	Total population		9,780,000	12,220,000	14,910,000	24,980,000	46,900,000
N4.1	Facility for Night-soil Collection and Treatment	109	0%	0%	0%	0%	0%
N4.2.1	Standard Single Pit Latrine	45	60%	80%	55%	25%	5%
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	80	5%	10%	30%	30%	20%
N4.3	Large Septic Tank + Soakaway	117	0%	0%	0%	0%	0%
N4.4	Community Level Sanitation Facility	370	0%	10%	15%	10%	5%
N4.5.1	Small Bore Sewerage System with Street-Level Septic Tanks (Urban)	140	0%	0%	0%	15%	25%
N4.6.1	Small Bore Sewerage System with Household Septic Tanks (Urban)	130	0%	0%	0%	20%	40%
N4.7.5	Main Sewerage System - Towns	600	0%	0%	0%	0%	5%
			65%	100%	100%	100%	100%

# Large Town Sanitation (>50,000 in 2025 but not SMAs)

		Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	9,780,000	12,220,000	14,910,000	24,980,000	46,900,000
N4.1	Facility for Night-soil Collection and Treatment	0	0	0	0	0
N4.2.1	Standard Single Pit Latrine	5,868,000	9,776,000	8,200,500	6,245,000	2,345,000
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	489,000	1,222,000	4,473,000	7,494,000	9,380,000
N4.3	Large Septic Tank + Soakaway	0	0	0	0	0
N4.4	Community Level Sanitation Facility	9,780	1,222,000	2,236,500	2,498,000	2,345,000
N4.5.1	Small Bore Sewerage System with Street-Level Septic Tanks (Urban)	0	0	0	3,747,000	11,725,000
N4.6.1	Small Bore Sewerage System with Household Septic Tanks (Urban)	0	0	0	4,996,000	18,760,000
N4.7.5	Main Sewerage System - Towns	0	0	0	0	2,345,000
		6,366,780	12,220,000	14,910,000	24,980,000	46,900,000

# Large Town Sanitation (>50,000 in 2025 but not SMAs)

		Incremental Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	9,780,000	104,800,000	107,100,000	107,700,000	88,000,000
N4.1	Facility for Night-soil Collection and Treatment		0	0	0	0
N4.2.1	Standard Single Pit Latrine		3,908,000	-1,575,500	-1,955,500	-3,900,000
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility		733,000	3,251,000	3,021,000	1,886,000
N4.3	Large Septic Tank + Soakaway		0	0	0	0
N4.4	Community Level Sanitation Facility		1,212,220	1,014,500	261,500	-153,000
N4.5.1	Small Bore Sewerage System with Street-Level Septic Tanks (Urban)		0	0	3,747,000	7,978,000
N4.6.1	Small Bore Sewerage System with Household Septic Tanks (Urban)		0	0	4,996,000	13,764,000
N4.7.5	Main Sewerage System - Towns		0	0	0	2,345,000

# Large Town Sanitation (>50,000 in 2025 but not SMAs)

		Incremental Investment Requirements - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	9,780,000	12,220,000	14,910,000	24,980,000	46,900,000
N4.1	Facility for Night-soil Collection and Treatment		0	0	0	0
N4.2.1	Standard Single Pit Latrine		3,908,000	0	0	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility		733,000	3,251,000	3,021,000	1,886,000
N4.3	Large Septic Tank + Soakaway		0	0	0	0
N4.4	Community Level Sanitation Facility		1,212,220	1,014,500	261,500	0
N4.5.1	Small Bore Sewerage System with Street-Level Septic Tanks (Urban)		0	0	3,747,000	7,978,000
N4.6.1	Small Bore Sewerage System with Household Septic Tanks (Urban)		0	0	4,996,000	13,764,000
N4.7.5	Main Sewerage System - Towns		0	0	0	2,345,000

# Large Town Sanitation (>50,000 in 2025 but not SMAs)

Large Town Sanitation (>50,000 in 2025 but not SMAs)			Incremental Investment Requirements - Capital Costs				
Option	Description	Unit Capital Cost Tk/capita	2000	2005	2010	2025	2050
	Total population		9,780,000	12,220,000	14,910,000	24,980,000	46,900,000
				TkM	TkM	TkM	TkM
N4.1	Facility for Night-soil Collection and Treatment	790		0	0	0	0
N4.2.1	Standard Single Pit Latrine	200		782	0	0	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	426		312	1,385	1,287	803
N4.3	Large Septic Tank + Soakaway	872		0	0	0	0
N4.4	Community Level Sanitation Facility	1740		2,109	1,765	455	0
N4.5.1	Small Bore Sewerage System with Street-Level Septic Tanks (Urban)	2240		0	0	8,393	17,871
N4.6.1	Small Bore Sewerage System with Household Septic Tanks (Urban)	1800		0	0	8,993	24,775
N4.7.5	Main Sewerage System - Towns	5390		0	0	0	12,640
	Total Incremental Capital Cost			3,203	3,150	19,128	56,089
	Total Cumulative Capital Cost			3,203	6,353	25,481	81,570

**Small Town Sanitation (<50,000 in 2025)**

Small Town Sanitation (<50,000 in 2025)			Coverage Targets (%)				
Option	Description	Total Annual Cost (Tk/capita)	2000	2005	2010	2025	2050
	Total population		4,190,000	5,240,000	6,390,000	10,710,000	20,100,000
N4.1	Facility for Night-soil Collection and Treatment	109	0%	0%	0%	0%	0%
N4.2.1	Standard Single Pit Latrine	45	50%	75%	65%	40%	10%
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	80	5%	10%	25%	40%	40%
N4.3	Large Septic Tank + Soakaway	117	0%	0%	0%	0%	0%
N4.4	Community Level Sanitation Facility	370	0%	5%	10%	5%	2%
N4.5.1	Small Bore Sewerage System with Street-Level Septic Tanks (Urban)	140	0%	0%	0%	5%	18%
N4.6.1	Small Bore Sewerage System with Household Septic Tanks (Urban)	130	0%	0%	0%	10%	30%
			55%	90%	100%	100%	100%

**Small Town Sanitation (<50,000 in 2025)**

		Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	4,190,000	5,240,000	6,390,000	10,710,000	20,100,000
		0	0	0	0	0
N4.1	Facility for Night-soil Collection and Treatment	0	0	0	0	0
N4.2.1	Standard Single Pit Latrine	2,095,000	3,930,000	4,153,500	4,284,000	2,010,000
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	209,500	524,000	1,597,500	4,284,000	8,040,000
N4.3	Large Septic Tank + Soakaway	0	0	0	0	0
N4.4	Community Level Sanitation Facility	0	262,000	639,000	535,500	402,000
N4.5.1	Small Bore Sewerage System with Street-Level Septic Tanks (Urban)	0	0	0	535,500	3,618,000
N4.6.1	Small Bore Sewerage System with Household Septic Tanks (Urban)	0	0	0	1,071,000	6,030,000
		2,304,500	4,716,000	6,390,000	10,710,000	20,100,000

**Small Town Sanitation (<50,000 in 2025)**

		Incremental Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	4,190,000	104,800,000	107,100,000	107,700,000	88,000,000
			0	0	0	0
N4.1	Facility for Night-soil Collection and Treatment		0	0	0	0
N4.2.1	Standard Single Pit Latrine		1,835,000	223,500	130,500	-2,274,000
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility		314,500	1,073,500	2,686,500	3,756,000
N4.3	Large Septic Tank + Soakaway		0	0	0	0
N4.4	Community Level Sanitation Facility		262,000	377,000	-103,500	-133,500
N4.5.1	Small Bore Sewerage System with Street-Level Septic Tanks (Urban)		0	0	535,500	3,082,500
N4.6.1	Small Bore Sewerage System with Household Septic Tanks (Urban)		0	0	1,071,000	4,959,000
			2,411,500	1,674,000	4,320,000	9,390,000

**Small Town Sanitation (<50,000 in 2025)**

		Incremental Investment Requirements - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	4,190,000	5,240,000	6,390,000	10,710,000	20,100,000
			0	0	0	0
N4.1	Facility for Night-soil Collection and Treatment		0	0	0	0
N4.2.1	Standard Single Pit Latrine		1,835,000	223,500	130,500	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility		314,500	1,073,500	2,686,500	3,756,000
N4.3	Large Septic Tank + Soakaway		0	0	0	0
N4.4	Community Level Sanitation Facility		262,000	377,000	0	0
N4.5.1	Small Bore Sewerage System with Street-Level Septic Tanks (Urban)		0	0	535,500	3,082,500
N4.6.1	Small Bore Sewerage System with Household Septic Tanks (Urban)		0	0	1,071,000	4,959,000
			2,411,500	1,674,000	4,423,500	11,797,500

**Small Town Sanitation (<50,000 in 2025)**

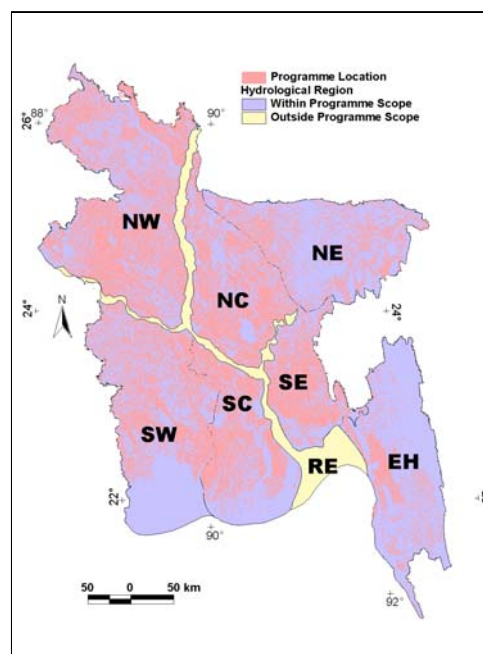
Small Town Sanitation (<50,000 in 2025)			Incremental Investment Requirements - Capital Costs				
Option	Description	Unit Capital Cost Tk/capita	2000	2005	2010	2025	2050
	Total population		4,190,000				
				TkM	TkM	TkM	TkM
N4.1	Facility for Night-soil Collection and Treatment	790		0	0	0	0
N4.2.1	Standard Single Pit Latrine	200		367	45	26	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	426		134	457	1,144	1,600
N4.3	Large Septic Tank + Soakaway	872		0	0	0	0
N4.4	Community Level Sanitation Facility	1740		456	656	0	0
N4.5.1	Small Bore Sewerage System with Street-Level Septic Tanks (Urban)	2240		0	0	1,200	6,905
N4.6.1	Small Bore Sewerage System with Household Septic Tanks (Urban)	1800		0	0	1,928	8,926
	<b>Total Incremental Capital Cost</b>			<b>957</b>	<b>1,158</b>	<b>4,298</b>	<b>17,431</b>
	<b>Total Cumulative Capital Cost</b>			<b>957</b>	<b>2,115</b>	<b>6,413</b>	<b>23,844</b>

**Rural Sanitation**

Ref: TR 006

**Basic Data**NWMP Sub-sector **Towns and Rural Areas**Region(s) **Nationwide****Relevance to NWPo**

The programme will address basic policy objectives to provide hygienic and affordable sanitation for all the Rural Areas. The NWPo “mandates relevant public water and sewerage institutions to provide necessary drainage and sanitation, including treatment of domestic wastewater and sewage and replacement of open drains and construction of sewers, in the interest of public health”, “...regulate the use of water for preventing wastage and pollution by human action”, and “...create awareness among people in checking water pollution and wastage.” The NPSWSS reinforces these aims by highlighting the need for basic sanitation facilities, public health implications, environmental impacts and the importance of promoting social awareness through behavioural development and hygiene education especially for women and children.

**Purpose of Programme**

The projections prepared for the NWMP indicate that the rural population is expected to stabilise in the medium term and decline in the much longer term (i.e. after 2025), based on a predicted acceleration in migration to the cities and towns, especially Dhaka. NWMP projections show a modest increase in the rural population from 102 million in 2000 to nearly 108 million in 2025, before falling steadily to 88 million by 2050. Despite this trend, the demand for basic hygienic sanitation facilities will be high because of the current low service coverage. At present, only 40% of the rural population has access to a pit latrine; while the other 60% rely on “hanging latrines” (often over the nearest water course) or have no basic sanitation at all. This situation will lead to increasing localised pollution and higher incidence of disease, especially among women and children. Current estimates indicate that 57% of the rural population is classified as living in poverty.

The investment programme will require sustained commitment to provide hygienic sanitation facilities for the whole rural population and raise service coverage to 100% by 2010. The main affordable investment choices are expected to be hygienic pit latrines and household latrines with septic tanks to provide an improved level of comfort and privacy.

## Programme Outline

Construction of appropriate and affordable sanitation facilities will continue throughout the implementation of the NWMP. The coverage targets by service type are summarised as follows:

Component	Year			
	2000	2005	2010	2025
Population (million)	102.0	104.8	107.1	107.7
Sanitation coverage (%)				
Pit latrine	40	75	75	60
Household latrine with septic tank	0	5	25	40
Total	40	80	100	100

## Financing Arrangements

The investment programme will require the active and co-ordinated participation of rural communities with the support of NGOs and the private sector. Public awareness and health education campaigns should be integral components of the programme. Indicative financing targets are presented below:

Sector	%
Public (GoB and international development agencies)	5
Private (domestic)	95
Total	100

As part of the programme, rural communities should also receive basic training in the maintenance and upkeep individual sanitation facilities.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Sustainable operation and maintenance of rural sanitation systems	I1	• Frequency of service break downs	2010
• Reduced environmental pollution	I2	• Response times	
• Improved public health	I3	• Faecal coliform counts	2015
• 100% of rural populations have access to sanitation facilities	K	• Public health statistics	2020
• Demand for sanitation facilities and services created and satisfied in towns and rural areas	D	• Survey reports	2025
		• % service coverage verified by surveys	2025

## Institutional Arrangements

The institutional arrangements for programme implementation are expected to comprise three components as defined by the NWPo and NPSWSS:

- (a) Public sector - the future role for the public sector will largely be to:
- continue the development of a flexible enabling environment;
  - provide appropriate technical support through DPHE;
  - establish an independent monitoring and regulatory framework;
  - promote education and awareness in the sanitation sector; and
  - provide access to supporting capital funds.

It will be particularly important for the public sector to ensure that the rural poor are adequately served.

- (b) Community-based participation, with or without NGO involvement - community participation and initiatives will be actively encouraged with investment funds from GoB and the promotion of partnership with the private sector.
- (c) Private sector participation - the private sector is expected to play an increasing role in the provision of sanitary equipment and services in partnership with rural communities. This implies that the beneficiaries are willing and able to pay.

The implementation of these institutional developments will need to be carefully formulated and programmed with the full political commitment of GoB and interested stakeholders. In the short to medium term, the Government will also establish an appropriate independent Regulatory Framework to supervise and monitor sector performance in the provision of sanitation services.

## **References and Documentation**

- (a) Chapter 7, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

## **Linkages**

The programme to improve and develop sanitation and sewerage facilities in the Large and Small Towns should be closely linked and co-ordinated with other NWMP programmes, namely:

- (a) Local Government Needs Assessment for Water Management (ID 001);
- (b) Local Government Capacity Building for Water Management (ID 005);
- (c) Independent Regulatory Bodies for the Water Supply and Sanitation Service Sector (ID 002);
- (d) Support to the Preparation of New Legislation (EE 001);
- (e) Field Testing of Participatory Management Models (EE 002);
- (f) Water Resources Legislation – Preparation of Supporting Ordinances (EE 003);
- (g) Project Preparation Procedures - Guidelines and Manuals (EE 004);
- (h) Regulatory and Economic Instruments (EE 005);
- (i) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (j) Raising Public Awareness in the Wise Use and Management of Water (EE 010);
- (k) Private Sector Participation in Water Management (EE 011);
- (l) Alternative Financing Methods for Water Management (EE 013);
- (m) Rural Arsenic Mitigation (TR 002);
- (n) Rural Areas Water Supply and Distribution Systems (TR 004);
- (o) National Pollution Control Plan (EA 001);
- (p) National Water Quality Monitoring (EA 003); and
- (q) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

In addition, planning and implementation should be co-ordinated with the Ministry of Local Government, Rural Development and Co-operatives (MoLGRDC), Department of Public Health Engineering (DPHE), Local Government Engineering Department (LGED), Ministry of Health (MoH), Department of Environment (DoE), WARPO, NGOs and other interested parties.

## **Risks and Assumptions**

In principal, the rural sanitation programme is relatively straightforward technically, providing sufficient investment resources are available and the rural population is fully sensitised to the need for hygienic sanitation facilities. Local government agencies (e.g. DPHE) and NGOs will play an important role in ensuring that the rural population, especially women, is fully aware of the needs and implications.

Assumptions:

- A good standard of maintenance can be achieved.
- The willingness to provide a good level of commitment is supported at all levels
- The benefits of an improved environment are understood by the stakeholders

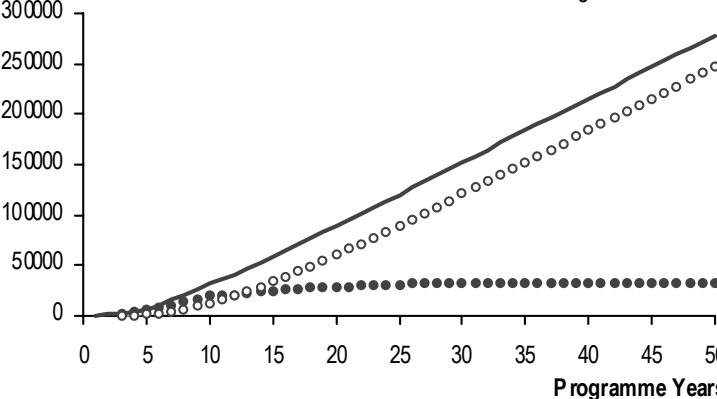
**Rural Sanitation**

Ref :

**TR 006**

Cluster :	<b>Towns and Rural Areas</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Sanitation</b>	Location :	<b>Rural Areas Nationwide</b>
Start Year <sup>1</sup> :	<b>2001</b>	Duration <sup>2</sup> :	<b>25 year(s)</b>
		Agency(s) Responsible :	<b>DPHE (Lead)</b> CBOs, Private sector, LGIs (Supporting)
Short Description :	<p>§4.6.c of the NWPo "mandates relevant public water and sewerage institutions to provide necessary drainage and sanitation, including treatment of domestic wastewater and sewage and replacement of open drains and construction of sewers, in the interest of public health." The population of rural areas is expected to increase slightly over the next 25 years, from 102 million in 2000 to 108 million in 2025. At present, only 40% of the population has access to pit latrine facilities, the other 60% relying on 'hanging latrines' and open defecation which exacerbates pollution and public health problems and increases the likelihood of epidemic outbreaks of waterborne and water-related diseases. This programme aims to provide appropriate sanitation facilities for the whole rural population and raise and sustain service coverage at 100% by 2010.</p>		

<b>MIS Links</b>	Cost Calculation :	TR Programme costing.xls	Map :	TR 006 Map.jpg
	Disb't Schedule :	TR Programme costing.xls	Description :	TR 006 PgP.doc

Finance					
	Costs	Private	Funding (%)	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	31,622.00 MTk	80%	20%	0%	25
Ultimate Recurring	5,901.00 MTk/yr	n/a	0%	100%	26
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart	
	(dd)	(mm)	(yy)	Cost (MTk)	
Status :	Identified		● Investment ○ Recurring — Total		
Financial Base Year:	mid-2000				
Planned Expenditure (to date) :	0 MTk				
Actual Expenditure <sup>4</sup> (to date) :	0 MTk				
					

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Sustainable operation and maintenance of rural sanitation systems	• Frequency of service break downs • Response times	NYD
• Reduced environmental pollution	• Faecal coliform counts	NYD
• Improved public health	• Public health statistics	NYD
• 100% of rural populations have access to sanitation facilities	• Survey reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# **National Water Management Plan** **Programme Costing Sheet**

Programme Ref	TR 006
Title	Rural Sanitation

## *Assumptions:*

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years <sup>1</sup>	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

## **Technical Assistance**

Expatriate consultants (all-in rate)	}	TA costs for this programme are included in the capital costs					
Senior National consultants (all-in rate)							
Mid-level National consultants (all-in rate)							
Sub-totals							
Other general TA programme costs							
Specific other TA programme costs							
<b>Total TA Costs</b>							

## **Investment items - short term**

Standard single pit latrine	ls	na			7,560.0	22.5%	1,701.0
Household latrine with septic tank & soakaway	ls	na			2,232.0	18.8%	419.6

## **Investment items - term**

Standard single pit latrine	ls	na			1,416.0	22.5%	318.6
Household latrine with septic tank & soakaway	ls	na			6,893.0	18.8%	1,295.9

## **Investment items - short term**

Household latrine with septic tank & soakaway	ls	na			11,521.0	18.8%	2,165.9
---	----	----	--	--	----------	-------	---------

<b>Total Investment Items</b>					<b>29,622.0</b>	<b>19.9%</b>	<b>5,901.0</b>
-------------------------------	--	--	--	--	-----------------	--------------	----------------

<b>Overall Programme Costs</b>					<b>29,622.0</b>		<b>5,901.0</b>
<b>Additional NWMP provision to maintain capacity ahead of demand</b>					<b>2,000.0</b>		<b>398.4</b>
					<b>31,622.0</b>		<b>6,299.5</b>

Notes	1	The step-wise approach to investment necessary to achieve and maintain installed capacity ahead of demands may mean that the total investment against +25 year demand is disbursed within the 25 year horizon. However, an additional provision will also be disbursed before the end of the 25 year, in order again to keep capacity ahead of ongoing demand increases.					
-------	---	--	--	--	--	--	--



Rural Sanitation			Coverage Targets (%)				
Option	Description	Total Annual Cost (Tk/capita)	2000	2005	2010	2025	2050
	Total population		102,000,000	104,800,000	107,100,000	107,700,000	88,000,000
N4.2.1	Standard Single Pit Latrine	45	40%	75%	80%	55%	25%
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	80	0%	5%	20%	45%	75%
N4.3	Large Septic Tank + Soakaway	117					
N4.4	Community Level Sanitation Facility	370					
			40%	80%	100%	100%	100%

Rural Sanitation		Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	102,000,000	104,800,000	107,100,000	107,700,000	88,000,000
N4.2.1	Standard Single Pit Latrine	40,800,000	78,600,000	85,680,000	59,235,000	22,000,000
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	0	5,240,000	21,420,000	48,465,000	66,000,000
N4.3	Large Septic Tank + Soakaway	0	0	0	0	0
N4.4	Community Level Sanitation Facility	0	0	0	0	0
		40,800,000	83,840,000	107,100,000	107,700,000	88,000,000

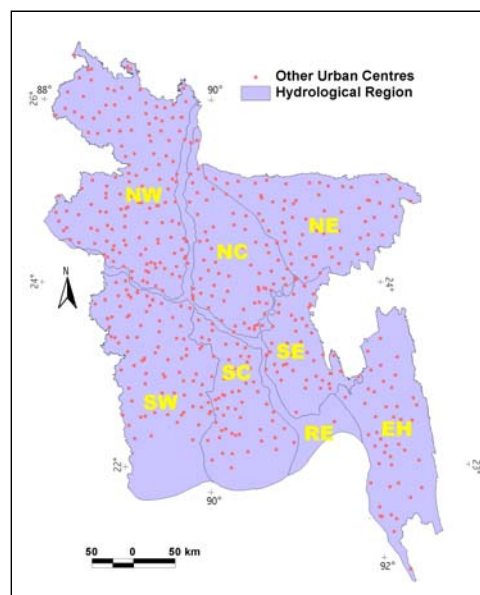
Rural Sanitation		Incremental Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	102,000,000	104,800,000	107,100,000	107,700,000	88,000,000
N4.2.1	Standard Single Pit Latrine		0	0	0	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility		37,800,000	7,080,000	-26,445,000	-37,235,000
N4.3	Large Septic Tank + Soakaway		5,240,000	16,180,000	27,045,000	17,535,000
N4.4	Community Level Sanitation Facility		0	0	0	0
			43,040,000	23,260,000	600,000	-19,700,000

Rural Sanitation		Incremental Investment Requirements - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	102,000,000	104,800,000	107,100,000	107,700,000	88,000,000
N4.2.1	Standard Single Pit Latrine		0	0	0	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility		37,800,000	7,080,000	0	0
N4.3	Large Septic Tank + Soakaway		5,240,000	16,180,000	27,045,000	17,535,000
N4.4	Community Level Sanitation Facility		0	0	0	0
			43,040,000	23,260,000	27,045,000	17,535,000

Rural Sanitation		Incremental Investment Requirements - Capital Costs					
Option	Description	Unit Capital Cost Tk/capita	2000	2005	2010	2025	2050
	Total population		102,000,000	104,800,000	107,100,000	107,700,000	88,000,000
				TkM	TkM	TkM	TkM
N4.2.1	Standard Single Pit Latrine	200		7,560	1,416	0	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	426		2,232	6,893	11,521	7,470
N4.3	Large Septic Tank + Soakaway	872		0	0	0	0
N4.4	Community Level Sanitation Facility	1740		0	0	0	0
	<b>Total Incremental Capital Cost</b>			<b>9,792</b>	<b>8,309</b>	<b>11,521</b>	<b>7,470</b>
	<b>Total Cumulative Capital Cost</b>			<b>9,792</b>	<b>18,101</b>	<b>29,622</b>	<b>37,092</b>

**Large and Small Town Flood Protection**Ref: **TR 007****Basic Data**NWMP Sub-sector **Towns and Rural Areas**Region(s) **Nationwide****Relevance to NWPo**

The programme is aimed at progressive development of appropriate flood protection works for selected Large and Small Towns. With regard to these urban centres, the NWPo states that “Other critical areas such as district and Upazila towns, important commercial centres, places of historical importance will be gradually provided reasonable degree of protection against flood.” The fulfilment of this objective will provide appropriate levels of protection for life, property, normal economic activity and public infrastructure. The Policy also states that all public buildings and infrastructure will be constructed above the highest ever-recorded flood level.

**Purpose of Programme**

There are 522 towns (1991 Census) throughout the country: 44 large towns (more than 50,000 people) with a total population of 9.8 million in 2000; and 478 small towns (less than 50,000 people) with a combined population of 4.2 million. The total population of all towns (large and small) is expected to increase five-fold in the next 50 years, from nearly 14 million in 2000 to 36 million in 2025 and 67 million by 2050. Current estimates indicate that 35% of town populations are classified as living in poverty. At present, NWMP data indicate that 140 towns (27% of the total) already have some form of flood or river bank erosion protection. Many of these structures are in fair to poor condition and will need upgrading. Other towns, which are currently unprotected, will need new flood protection facilities if NWPo objectives are to be achieved during the Plan period.

The programme for large and small towns will consist of two components:

- (a) upgrading existing flood protection facilities in 138 town (26% of the total); and
- (b) new flood protection works for 115 towns (22%) which are currently unprotected.

The general standard will be to protect urban areas against an acceptable flood return period. Many towns are expected to grow significantly over the next 25 years, so increased levels of security will be required to protect life, property and infrastructure, and limit the adverse impact on normal commercial activity. The poor will also benefit, but it is important that they are consulted during the planning and implementation process. Final decisions on the actual work required will depend on individual investigations for each town. In addition, the option of land

raising should be examined and encouraged wherever feasible in both existing and new urban areas.

## Programme Outline

The programme provides for a combination of upgrading and rehabilitation works in 138 towns and new works in a further 115 towns. The indicative breakdown by region is as follows:

Region	No of Towns	Towns with Flood Protection		Towns Requiring works			
		No	%	Upgrading		New Works	
		No	%	No	%	No	%
North East	66	15	23	16	24	23	35
North Central	67	17	25	17	25	19	28
North West	151	39	26	37	25	23	15
South West	86	21	24	20	23	13	15
South Central	53	22	42	22	42	17	32
South East	48	11	23	11	23	10	21
Eastern Hills	46	13	24	13	28	9	20
Rivers and Estuary	5	2	40	2	40	1	20
Total	522	140	27	138	26	115	22

For planning purposes, the NWMP assumes the following targets for the completion of the flood protection programme for Large and Small Towns: 50% by 2005; 75% by 2010; and 100% by 2025.

## Financing Arrangements

The investment requirements will be funded by GoB, possibly with international donor assistance.

Bangladesh Water Development Board (BWDB) is responsible for the repair and maintenance of flood protection facilities in the large and small towns. It is essential that this function is carried out diligently and with adequate funding support from GoB and the local municipal governments. In the past, many investments in urban flood protection have been jeopardised by inadequate funds for operation and maintenance.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Flood protection programmes prepared and agreed	I1	• Signed programme/project documents	2007
• Flood protection programmes implemented	I2	• Programme/project completion reports	2027
• All large and small towns protected from 1: 100 year floods	K	• Physical evidence and hydrological data	2027
• Large and small towns protected from flooding and stormwater run-off	D	• Duration of inundation	2027

## Institutional Arrangements

Under existing institutional arrangements, the Bangladesh Water Development Board (BWDB) will be responsible for the planning, construction and maintenance of flood protection works in large and small towns. In the planning and implementation stages, it is important that local

communities and other stakeholders are consulted; and that any population resettlement is properly planned and carried out in a fair and appropriate manner.

In future, it is essential that BWDB carry out effective and appropriate maintenance on all flood protection works in order to ensure the integrity and security of the individual facilities. GoB and the local municipal governments will need to guarantee that BWDB has adequate annual financial resources to carry out this task. There is an opportunity for community-based organisations in the vicinity of the main flood defences to participate in these activities, providing BWDB provides expert supervision.

## **References and Documentation**

- (a) Chapter 7, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

## **Linkages**

The continuing development of flood protection facilities in the Large and Small Towns should be linked and co-ordinated with other NWMP programmes, namely:

- (a) BWDB Capacity Building (ID 010);
- (b) Disaster Management Bureau Capacity Building (ID 008);
- (c) Capacity Building for Other Organisations (ID 009);
- (d) Support to the Preparation of New Legislation (EE 001);
- (e) Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);
- (f) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (g) Raising Public Awareness in the Wise Use and Management of Water (EE 010);
- (h) Large and Small Towns Water Supply and Distribution Systems (TR 003);
- (i) Large and Small Towns Sanitation and Sewerage Systems (TR 005);
- (j) Large and Small Towns Stormwater Drainage (TR 008);
- (k) National Clean-up of Existing Industrial Pollution (EA 002);
- (l) National Pollution Control Plan (EA 001);
- (m) National Water Quality Monitoring (EA 003); and
- (n) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

In addition, planning and implementation should be co-ordinated with the respective Local Government authorities (District towns, Paurashavas (municipalities), Upazila headquarters and urban growth centres), Ministry of Local Government, Rural Development and Co-operatives (MoLGRDC), Bangladesh Water Development Board (BWDB), Public Health Engineering Department (DPHE), Local Government Engineering Department (LGED), Urban Development Directorate (UDD), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO, NGOs and other interested parties.

## **Risks and Assumptions**

The main risks associated with the flood protection programme for the Large and Small Towns are institutional, financial and economic.

The institutional risks concern the ability of local government to ensure that flood protection facilities are regularly inspected and properly maintained. These issues can be addressed adequately if BWDB provide the technical support and carry out regular inspections; and local governments assign adequate funds to carry out annual maintenance work.

The financial risks are twofold: firstly, GoB and international donors will not support an extended flood protection programme for the Large and Small Towns; and secondly, local government will gradually ignore the funding requirements for regular maintenance. The first point can be dealt with if the Government prepares a well documented programme which integrates a broad range of municipal issues, including flood protection, in appropriate investment packages which will attract international support. The second point will require a legal obligation to be placed on all responsible local government agencies, plus appropriate training in infrastructure maintenance.

The economic risks relate to the damage which would occur in the short and medium term if the programme is not completed. The economic impact would be felt not only in the individual towns themselves, but also in the immediate hinterland with the subsequent disruption to normal administrative and commercial activities.

Assumptions:

- That support for maintenance is made available.(funds, staff and training)
- That enacted legislation will be implemented and followed through

**Large and Small Town Flood Protection**Ref : **TR 007**

Cluster :	<b>Towns and Rural Areas</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Flood Protection</b>	Location :	<b>Large and Small towns throughout the country</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>25 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>None</b> (Supporting)
Short Description :	§4.2.9.i of the NWPo states that "...critical areas such as district and Upazila towns, important commercial centres, and places of historical importance will be gradually provided reasonable degree of protection against flood". The low areas of many of the towns in Bangladesh are vulnerable to flooding during monsoon. Significant damage was caused during the 1988 and 1998 floods due either to absence of embankments, embankment failure or the inability of protected areas to drain during times of heavy rainfall because of high water levels outside. This programme will undertake measures such as: raising of existing embankment crest levels; repair of damaged embankments; and, provision of erosion protection works where necessary. New flood protection works will also be involved consisting mainly of constructing embankments on riverbanks with integral drainage sluices.		

<b>MIS Links</b>	Cost Calculation :	TR Programme costing.xls	Map :	TR 007 Map.jpg
	Disb't Schedule :	TR Programme costing.xls	Description :	TR 007 PgP.doc

<b>Finance</b>	<b>Funding (%)</b>				<b>Expected by Programme Year</b>
	<b>Costs</b>	<b>Private</b>	<b>GoB</b>	<b>Beneficiaries</b>	
Total Capital <sup>3</sup>	<b>14,460.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>25</b>
Ultimate Recurring	<b>1,301.40</b> MTk/yr	<b>n/a</b>	<b>50%</b>	<b>50%</b>	<b>26</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Flood protection programmes prepared and agreed	• Signed programme/project documents	NYD
• Flood protection programmes implemented	• Programme/project completion reports	NYD
• All large and small towns protected from 1: 100 year floods	• Physical evidence and hydrological data	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	TR 007
Title	Large and Small Town Flood Protection

*Assumptions:*

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

**Technical Assistance**

Expatriate consultants (all-in rate)  
 Senior National consultants (all-in rate)  
 Mid-level National consultants (all-in rate)  
 Sub-totals  
 Other general TA programme costs  
 Specific other TA programme costs  
**Total TA Costs**

TA costs for this programme are included in the capital costs

Lump Sum Costs

Investment items - short term	Large towns	Small towns			
Flood protection embankments	3,620.0	2,911.0	4,820.0	9.0%	433.8

**Investment items - term**

Flood protection embankments	3,620.0	2,911.0	4,820.0	9.0%	433.8
------------------------------	---------	---------	---------	------	-------

**Investment items - short term**

Flood protection embankments	4,525.0	2,911.0	4,820.0	9.0%	433.8
------------------------------	---------	---------	---------	------	-------

<b>Total Investment Items</b>			<b>14,460.0</b>	<b>9.0%</b>	<b>1,301.4</b>
-------------------------------	--	--	-----------------	-------------	----------------

<b>Overall Programme Costs</b>			<b>14,460.0</b>		<b>1,301.4</b>
--------------------------------	--	--	-----------------	--	----------------

**Large and Small Town Stormwater Drainage**

Ref: TR 008

**Basic Data**NWMP Sub-sector **Towns and Rural Areas**Region(s) **Nationwide****Relevance to NWPo**

There are no specific policy statements on stormwater drainage in the NWPo. However, there are subsidiary references which indicate that the NWMP should take full account of the need for efficient urban drainage networks to evacuate storm flows and reduce the impact of flood events.

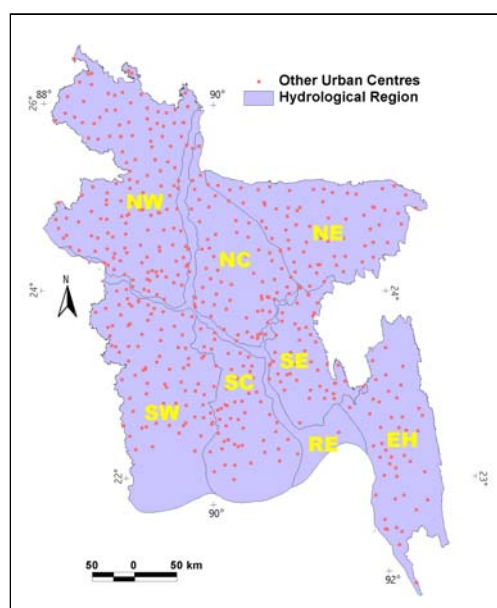
**Purpose of Programme**

There are 522 towns (1991 Census) throughout the country: 44 large towns (more than 50,000 people) with a total population of 9.8 million in 2000; and 478 small towns (less than 50,000 people) with a combined population of 4.2 million. The total population of all towns (large and small) is expected to increase five-fold in the next 50 years, from nearly 14 million in 2000 to 36 million in 2025 and 67 million by 2050. Current estimates indicate that 35% of town populations are classified as living in poverty. At present, NWMP data indicate that 134 towns (26% of the total) are served with some form of stormwater drainage facilities, but most are inadequate and in poor condition with little or no regular maintenance. Natural drainage watercourses, concrete open channels and culverts are frequently blocked due to poor management of municipal solid waste and other debris. In addition, many stormwater drainage networks need substantial upgrading and effective planning to cope with future growth in the Large and Small Towns.

The programme will consist of upgrading and new stormwater drainage facilities in 388 Large and Small Towns throughout the country. Final option selection will depend on local conditions and requirements in each town, including:

- (a) gravity or pumped systems;
- (b) open or covered drainage networks; and
- (c) need to set aside low lying areas for stormwater retention to reduce peak flows.

In all cases, it is envisaged that low cost and minimal maintenance solutions will be adopted. Many of the towns are expected to grow significantly over the next 25 years, so improved provision of stormwater drainage will be required. Effective urban planning should also take account of the needs and views of the poor who could be actively encouraged to participate in basic maintenance of the drainage networks.





## Programme Outline

The rehabilitation, improvement and extension of stormwater drainage systems in the Large and Small Towns will be a continuous programme throughout the 25 years of the NWMP. The indicative breakdown by region is as follows:

Region	No of Towns	Towns with Stormwater Drainage		Towns Requiring Stormwater Drainage	
		No	%	No	%
North East	66	15	23	51	77
North Central	67	15	22	52	78
North West	151	41	27	110	73
South West	86	27	31	59	69
South Central	53	16	30	37	70
South East	48	12	25	36	75
Eastern Hills	46	8	17	38	83
Rivers and Estuary	5	0	0	5	100
Total	522	134	26	388	74

For planning purposes, the NWMP assumes the following targets for the completion of the stormwater drainage programme for Large and Small Towns: 25% by 2005; 40% by 2010; and 75% by 2025.

## Financing Arrangements

The investment requirements will be funded by GoB, possibly with international donor assistance.

Local municipal authorities are responsible for the operation and maintenance of urban stormwater drainage facilities. It is essential that this function is carried out diligently and with adequate financial resources if the networks are to operate efficiently, especially in the wet season.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Stormwater drainage programme prepared and agree	I1	• Signed programme/project documents	2005
• Stormwater drainage programmes implemented	I2	• Programme/project completion reports	2025
• Stormwater drainage installed in all large and small towns	K	• Survey reports	2025
• Large and small towns protected from flooding and stormwater run-off	D	• Duration of inundation	2025

## Institutional Arrangements

Under existing institutional arrangements, the Bangladesh Water Development Board (BWDB) will be responsible for the planning, construction and maintenance of flood protection works in the large and small towns. In the planning and implementation stages, it is important that local communities and other stakeholders are consulted; and that any population resettlement is properly planned and carried out in a fair and appropriate manner.

In future, it is essential that BWDB carries out effective and appropriate maintenance on all flood protection works in order to ensure the integrity and security of the individual facilities. GoB and the local municipal governments will need to guarantee that BWDB has adequate annual financial resources to carry out this task. There is an opportunity for community-based organisations in the vicinity of the main flood defences to participate in these activities, providing BWDB provides expert supervision.

Local government will be the main agencies responsible for the implementation of the programme, with the support of the Ministry of Local Government, Rural Development and Co-operatives (MoLGRDC) and the Local Government Engineering Department (LGED). It is also important that local government inter-links the programme with its parallel responsibilities for supervision and enforcement of planning and building regulations to:

- (a) ensure that private developers and public agencies include appropriate drainage facilities;
- (b) prevent encroachment on open drains and water bodies, and infilling of natural water courses; and
- (c) improve municipal solid waste management, collection and disposal.

In the poorer urban areas, local government actively encourage the participation of community based organisations and NGOs to plan, construct and maintain local drainage facilities.

Adequate maintenance, including structural repairs and regular cleaning (especially before and during the rainy season), is essential if existing and future drainage systems are to work efficiently and effectively for all inhabitants, especially among the urban poor. Local government should actively develop a strategy which involves maintenance contracts with the private sector and community-based organisations.

## **References and Documentation**

- (a) Chapter 7, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

## **Linkages**

The development programme to augment and improve stormwater drainage systems in the Large and Small Towns should be linked and co-ordinated with other NWMP programmes, namely:

- (a) BWDB Capacity Building (ID 010);
- (b) Disaster Management Bureau Capacity Building (ID 008);
- (c) Capacity Building for Other Organisations (ID 009);
- (d) Support to the Preparation of New Legislation (EE 001);
- (e) Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);
- (a) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (b) Raising Public Awareness in the Wise Use and Management of Water (EE 010);
- (c) Large and Small Towns Water Supply and Distribution Systems (TR 003);
- (d) Large and Small Towns Sanitation and Sewerage Systems (TR 005);
- (e) Large and Small Towns Flood Protection (TR 007);
- (f) National Clean-up of Existing Industrial Pollution (EA 002);
- (g) National Pollution Control Plan (EA 001);
- (h) National Water Quality Monitoring (EA 003); and
- (i) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

The Inventory and Asset Management Plan of the Water and Sanitation Sector (MC 001) is also relevant here.

In addition, planning and implementation should be co-ordinated with the respective Local Government authorities (District towns, Paurashavas (municipalities), Upazila headquarters and urban growth centres), Ministry of Local Government, Rural Development and Co-operatives (MoLGRDC), Public Health Engineering Department (DPHE), Local Government Engineering Department (LGED), Urban Development Directorate (UDD), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO, NGOs and other interested parties.

## **Risks and Assumptions**

Risks associated with the implementation of the stormwater drainage programme are institutional, financial and social.

The institutional risks are that local government will continue to under-perform in this sector due to inadequate funding, lack of enforcement of planning regulations and poor management. These limitations can be overcome with:

- a secure pipeline of funds for capital works and maintenance;
- more effective commitment to and enforcement of planning regulations;
- effective solid waste management; and
- active involvement of community-based organisations.

Financial risks relate to the possibility that adequate funds will not be forthcoming for the programme itself and appropriate regular maintenance. Local government, in partnership with the responsible agencies, must address this issue to ensure that the necessary funds are committed in accordance with the NWMP strategy.

The social risks are that poor and disadvantaged groups in the large and small towns will be neglected not only in terms of adequate drainage but also the lack of planned settlement and slum upgrading schemes which will limit encroachment over drains and natural water courses. These risks can be mitigated by a more inclusive approach to planning and implementation of drainage facilities which involves consultation and active participation in both construction and maintenance.

### **Assumptions:**

Materials used for construction of new systems will give the assumed working lives.

Construction of new systems is adequately supervised so as to minimise future operation and maintenance.

Technical skills will be adequate to enable the efficient and effective O & M of the drainage systems.

The operating utility will be able to run the storm function without political interference.

Full cost recovery is affordable.

Environmental risks can be successfully mitigated.

**Large and Small Town Stormwater Drainage**Ref : **TR 008**

Cluster :	<b>Towns and Rural Areas</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Stormwater Drainage</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>25 year(s)</b>
		Agency(s) Responsible :	<b>Paurashavas</b> (Lead) <b>LGIs</b> (Supporting)
Short Description :	§4.6 says that "Lack of proper sanitation and drainage facilities, .... are the primary causes of diseases in the urban areas". Storm water drainage is an increasing problem in urban areas, as the construction of buildings and paved areas has progressively increased run-off. At the same time, pressures on land has caused natural drainage channels to be filled in and built upon. Encroachment on watercourses and water bodies has progressively reduced natural drainage. No urban areas have adequate storm drainage at present. This programme provides resources for a nationwide installation/upgrading and maintenance of stormwater drainage facilities in large and small towns. These will most probably be gravity systems which although cost-effective, will require regular adequate maintenance.		

<b>MIS Links</b>	Cost Calculation :	TR Programme costing.xls	Map :	TR 008 Map.jpg
	Disb't Schedule :	TR Programme costing.xls	Description :	TR 008 PgP.doc

<b>Finance</b>	<b>Funding (%)</b>				<b>Expected by</b>
	<b>Costs</b>	<b>Private</b>	<b>GoB</b>	<b>Beneficiaries</b>	<b>ProgrammeYear</b>
Total Capital <sup>3</sup>	<b>64,000.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>25</b>
Ultimate Recurring	<b>7,040.00</b> MTk/yr	<b>n/a</b>	<b>50%</b>	<b>50%</b>	<b>26</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Stormwater drainage programme prepared and agree	• Signed programme/project documents	NYD
• Stormwater drainage programmes implemented	• Programme/project completion reports	NYD
• Stormwater drainage installed in all large and small towns	• Survey reports	NYD

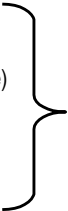
Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design ,supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	TR 008
Title	Large and Small Town Stormwater Drainage

*Assumptions:*

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years	

Item	Unit	Quantity	Rate		Amount	O&M	O&M/yr
			US\$	Tk'000	TkM	%	TkM
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)							
Senior National consultants (all-in rate)							
Mid-level National consultants (all-in rate)							
Sub-totals							
Other general TA programme costs							
Specific other TA programme costs							
<b>Total TA Costs</b>							
TA costs for this programme are included in the capital costs							
<b>Investment items - short term</b>							
Gravity and pumped drainage infrastructure					12,000.0	11.0%	1,320.0
<b>Investment items - term</b>							
Gravity and pumped drainage infrastructure					20,000.0	11.0%	2,200.0
<b>Investment items - short term</b>							
Gravity and pumped drainage infrastructure					32,000.0	11.0%	3,520.0
<b>Total Investment Items</b>					<b>64,000.0</b>	<b>11.0%</b>	<b>7,040.0</b>
<b>Overall Programme Costs</b>							
					<b>64,000.0</b>		<b>7,040.0</b>

## **Major Cities**

## Inventory and Asset Management Plan of the Water Supply and Sanitation Sector

Ref: MC 001

### Basic Data

NWMP Sub-sector      **Major Cities**

Region(s)              **National Coverage**

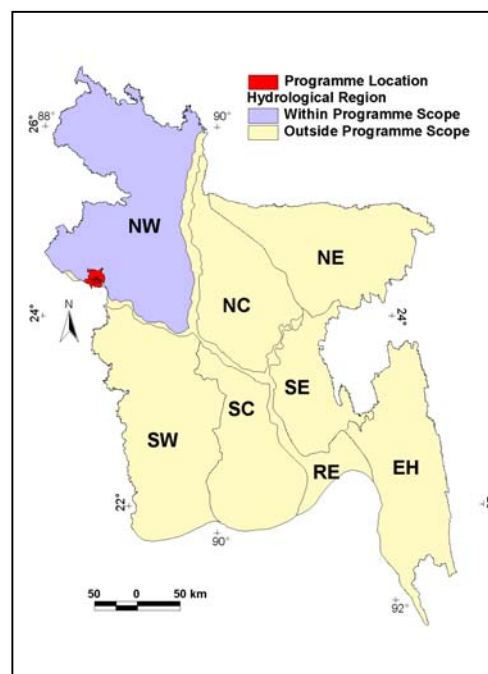
### Relevance to NWPo

Priorities under the NWPo are:

- Water allocation for domestic and municipal use
- Provision of hygienic and affordable sanitation and sewerage services.

There is also a secondary but important need to take account of the need for efficient urban storm drainage.

An objective of the policy is to improve water, sanitation and sewerage services in the major cities, urban and rural areas together with appropriate institutional and financial reform. A key part of this is to improve service efficiency and financial viability.



### Purpose of Programme

Much of the water supply and sanitation infrastructure in Bangladesh is either poorly maintained due to lack of investment in operation and maintenance or reaching the end of its useful life. Before any new investment is made on these systems it is essential that there is a better understanding of the condition and performance of the existing underground and above ground assets. This is commonly referred to as an asset management plan (AMP). The successful completion of the AMP will answer the question “where are we now”.

Water mains in the major cities have around 50% unaccounted for water whilst in Dhaka the sewerage system is functioning at a fraction of its capacity due to pipe blockages and breakage. In other cities and towns around the country the situation is no better and problems exist even in relatively new systems.

Without this AMP there is little point in carrying out major investment. Improvements to levels of unaccounted for water should mean a considerable deferment of investment in additional capacity for water resources and treatment.

The AMP must take account both of the existing assets and those that will be needed to meet forecast demands, new water quality and environmental standards and improved service to customers. The work and investment is therefore assigned to certain categories. The following categories have evolved on the basis of experience.

- Infrastructure renewal and capital maintenance of above and underground assets.
- Work required to meet growth in demand.
- Work required to meet new water quality and environmental obligations.
- Work required to achieve improved levels of service to customers.

In addition, a further category is required where there has been a deficit of investment which has resulted in asset deterioration to the extent that current standards and obligations can not be met such as in Bangladesh.

## **Programme Outline**

A formal approach to asset management planning is required in Bangladesh

The process should be carried out to a time horizon of 25 years with revisions at 5 yearly intervals.

To prepare an AMP, the following information is needed.

- Physical data for all existing assets (including age, condition and serviceability)
- Estimates of the cost of renewing or replacing the existing assets with their modern equivalent.
- Demand forecasts.
- Details of expected new water quality and environmental obligations including compliance dates.
- Details of planned improvements in customer service (including target dates).
- Details of current service deficits and compliance failure.
- Cost estimates for the new assets needed to meet forecast demands, new water quality and environmental standards and improved service to customers.
- Engineering estimates of the serviceable life of all asset types.

Data collection is the most time consuming and labour intensive element of asset management planning. The use of geographic information systems and computerised asset databases will be required for this stage of the work. Much of the knowledge of the underground and above ground networks are retained by operators based on their experience and remains unknown to management and these staff will be an important part of the data collection work.

Data processing and compilation of the plan can be achieved in a matter of weeks by suitably qualified and experienced staff. This can be done using either customised proprietary computer packages or spreadsheets produced for a particular undertaking.

## **Financing Arrangements**

For effective sustained implementation, the programme will require the active and co-ordinated participation of the public sector (GoB and international development agencies), private sector (domestic and foreign), and community based organisations with the support of NGO's.

Assistance in the early stages of planning may well attract technical assistance. Similar AMP programmes have been done in many parts of the world and there is much experience available to draw upon that will be equally applicable to suit the needs in Bangladesh. A start to the AMP process will indicate a commitment by the GoB to the medium to long term planning process.



Most of the work will need to be done by the people with the knowledge (the present operators) using in-house staff.

The Government and the executing agencies will need to ensure that funding is made available for any facilities and equipment that is required to do this work.

This work lends itself to a pilot study to test the suitability of chosen method of approach in a trial town or city.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Asset management study of the National water supply and sanitation sector	I1	• The study report	2004
• Technical inventory of the National water supply and sanitation sector	I2	• The study report	2004
• Detailed development plan for water supply and sanitation facilities in the SMA's	K	• The planning document	2004
• Demand for safe and reliable drinking water supplies and services satisfied in the Statistical Metropolitan Areas	D	• % service coverage verified by survey	2025

## Institutional Arrangements

3 components:

- Public sector – the current operator of the public utility will retain the prime responsibility with the support of the GoB and IDA's.
- Private sector – where involved in the provision of water and/or sewerage or sanitation services the private sector will be expected to play a part in the AMP process.
- Community based organisations and NGO participation – again where relevant they will also be expected to play a part in the AMP process.

The implementation of any AMP will need to be carefully formulated and programmed with the full political commitment of GoB and interested stakeholders. The Government should also ensure that an appropriate framework is established to set out responsibilities, supervise and monitor performance against programme.

## Existing Documentation

Any existing information on current water supply, sanitation and sewerage assets held by the current operator or related organisation.

## Linkages

This AMP is a vital first step to any investment programme. For water, sanitation and sewerage services there are close links with:

- ID 002 – Independent Regulatory Bodies for Water Supply and Sanitation Service Sector.
- All TR programmes but in particular TR 003– Large and Small Town Water Supply and Distribution Systems and TR 005 Large and Small Town Sanitation and Sewerage Systems
- All MC programmes except perhaps the Flood Protection Programmes but including the stormwater drainage programmes.

- EA 001 – National Pollution Control Plan, EA 002 – National Clean-up of Existing Industrial Pollution, EA 003 – National Water Quality Monitoring

## **Risks and Assumptions**

There are a number of risks associated with the successful implementation of an inventory and AMP.

Institutional/Political – A political willingness and commitment to reform the water, sanitation and sewerage sector, a lack of support to the AMP process by the management of the Operating Utilities, a failure in carrying out the training necessary for the work.

Financial – A failure to identify investment needs with a reasonable degree of accuracy will lead to poor budget estimates, failure to buy-in to the process will lead to wasted or inefficient investment.

Social – An unwillingness at operator level to participate in the data collection process because of fears of what may happen to their jobs in the future, failure to implement the AMP will lead to little or no real improvement to customer service (water quality and quantity), Trade Union resistance to change.

Environmental – Failure will lead to continued poor use of water resources, poor quality of wastewater discharges and no improvement in the incidence of water related diseases.

### **Assumptions**

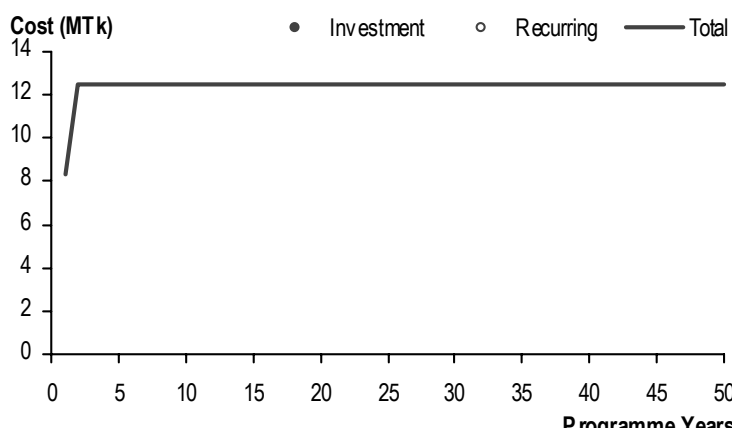
- That existing utility staff have the necessary knowledge and competence to do the work given the required training.
- That resistance to change can be overcome at all levels
- That top level political support will be obtained.

## Inventory and Asset Management Plan of the Water Supply and Sanitation Sector

Ref : **MC 001**

Cluster :	Major Cities	Region(s) :	All		
Focus/Foci :	Water Supplies, Sanitation	Location :	Nationwide		
Start Year <sup>1</sup> :	2001	Duration <sup>2</sup> :	2 year(s)	Agency(s) Responsible :	DPHE (Lead) None (Supporting)
Short Description :	Much of the water supply and sanitation infrastructure in Bangladesh is either poorly maintained due to lack of investment in operation and maintenance or reaching the end of its useful life. However, without a detailed and clear understanding of the existing situation there is little point in carrying out major investment. Before any new investment is made on these rapidly deteriorating systems it is essential to obtain a better understanding of the condition and performance of the existing underground and above ground assets. Such an exercise is commonly referred to as an asset management plan (AMP) and is the intention of this programme.				

<b>MIS Links</b>	Cost Calculation :	MC Programme costing.xls	Map :	MC 001 Map.jpg
	Disb't Schedule :	MC Programme costing.xls	Description :	MC 001 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme		Year	
	12.50 MTk		0%	100%	0%			2	
Total Capital <sup>3</sup>	0.00 MTk/yr		n/a	n/a	n/a			n/a	
Ultimate Recurring									
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)		● Investment	○ Recurring	— Total	
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

## Monitoring

Objective	Indicator	Present Status <sup>5</sup>
• Asset management study of the National water supply and sanitation sector	• The study report	NYD
• Technical inventory of the National water supply and sanitation sector	• The study report	NYD
• Detailed development plan for water supply and sanitation facilities in the SMA's	• The planning document	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	MC 001
Title	Inventory and Asset Management Plan of the Water Supply and Sanitation Sector

### Assumptions:

Taka/US\$	51.000	TA duration	1.5	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	3.0	20,000		3.1	0.0%	-
Senior National consultants (all-in rate)	p-m	6.0		150	0.9	0.0%	-
Mid-level National consultants (all-in rate)	p-m	5.0		90	0.5	0.0%	-
Sub-totals					4.4		-
Other general TA programme costs		25%			1.1		-
Specific other TA programme costs	Study tours	2		3,500	7.0	0.0%	-
<b>Total TA Costs</b>					<b>12.5</b>		-
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Investment Items</b>					-		-
<b>Overall Programme Costs</b>							
					<b>12.5</b>		-

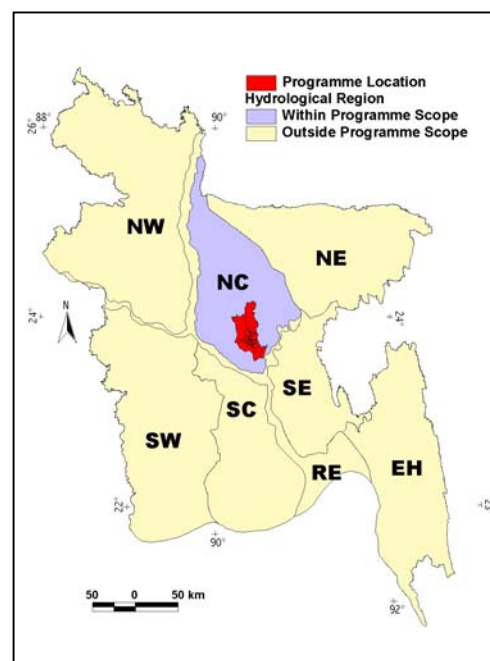
**Dhaka Bulk Water Supply and Distribution Systems**Ref: **MC 002****Basic Data**

NWMP Sub-sector     **Major Cities**

Region(s)             **North Central  
Dhaka SMA**

**Relevance to NWPo**

Water allocation for domestic and municipal use is the first priority under the NWPo. The programme for Dhaka, under both the NWPo and the National Policy for Safe Water Supply and Sanitation (NPSWSS), aims to address the need for “....safe and affordable drinking water supplies through various means....” for all inhabitants, especially the urban poor. Policy also mandates that investments to improve and extend water services in the major cities should be paralleled by appropriate and substantive institutional and financial reform to attain:



- (a) significant improvements in service efficiency and financial viability of existing institutions;
- (b) private sector participation;
- (c) stakeholder consultation, particularly in peri-urban and poor communities; and
- (d) full cost recovery.

**Purpose of Programme**

Dhaka is expected to become one of the world's megacities, with the population increasing five-fold in the next 50 years from nearly 9 million in 2000 to 27 million in 2025 and 50 million by 2050. The expansion will put immense pressure on all public services and infrastructure, especially the need for a safe and reliable water supply system for all inhabitants. At present, about 76% of Dhaka's population is served by the main public water supply system (around 370 DTW's plus 3 small surface water sources). In addition there are about 400 private DTW's serving mainly commercial users. The rest of the population, mainly poor and disadvantaged communities, are dependent on local sources, many of which are unreliable and increasingly polluted. About 33% of the city's inhabitants live in slums and up to 70% of the total consist of low-income households. The slum areas are served with water through arrangements via NGO's.

The programme for Dhaka will require substantial investment in rehabilitation, replacement, improvement and extension of the city's water supply systems to raise and sustain service coverage levels at 100% by 2010. This will be accomplished through a combination of public/private sector initiatives to develop major new surface water sources for bulk water supplies, coupled with improvement and expansion of the main water distribution system based on existing DTW's and new surface water sources. Peri-urban and poor communities will be encouraged and supported to develop and install safe hand pumps and small DTW based systems.

## Programme Outline

Improvements and extensions of the water supply systems will continue throughout the implementation of the NWMP. The coverage targets by service type are summarised as follows:

Component	Year			
	2000	2005	2010	2025
Population (million)	8.8	11.7	14.9	26.8
Water Supply Coverage (%)				
Hand pumps	0	5	5	0
Small DTW based systems	0	8	10	15
Large DTW based systems	73	50	30	30
Wellfields	1	0	5	5
Surface water (rivers)	2	20	50	50
Total	75	83	100	100

## Financing Arrangements

For effective sustained implementation, the investment programme will require the active and co-ordinated participation of the public sector (GoB and international development agencies), private sector (domestic and foreign, the latter in the medium to long term), and community based organisations with the support of NGOs. Indicative financing targets are presented below:

Sector	%
Public (GoB and international development agencies)	65
Private (domestic and foreign)	30
Local Communities	5
Total	100

The Government and the executing agencies will need to ensure the availability of adequate funds for:

- rehabilitation/replacement of existing water supply facilities;
- capital replacement during and after the NWMP period; and
- effective operations and maintenance. In this context, the establishment of full cost recovery pricing will be essential.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Uncollected water fees reduced to 10% of due	I1	• DWASA records	2011
• Sustainable operation and maintenance of city water supply systems	I2	• Frequency of service breaks	2016
• Reduced incidence of water borne or water related disease	I3	• Response times	2021
• 100% of Dhaka's population have access to reliable water supplies	K	• Public health records	2026
• Demand for safe and reliable drinking water supplies and services satisfied in the Statistical Metropolitan Areas	D	• Water quality	2026
		• Survey Reports	
		• % service coverage verified by survey	2026

## **Institutional Arrangements**

The institutional arrangements for programme implementation are expected to comprise three components:

- (a) Public sector - DWASA will retain prime responsibility in the short to medium term with the support of GoB and international development agencies. Much greater emphasis will be given to increased autonomy and management expertise, organisational reform, service coverage and efficiency, full cost recovery and financial viability.
- (b) Private sector participation - in the medium to longer term, the private sector is expected to play an increasing role in the provision of water services for Dhaka. This will include: contract services (e.g. operation and maintenance of specific facilities, revenue billing and collection, etc.); BOT/BOOT schemes (e.g. bulk water supplies and water treatment plants); and full private concessions for the main water supply system of the city. In partnership with community based organisations, the private sector will also be expected to play a leading role in the development and operation of peri-urban water supply schemes.
- (c) Community-based and NGO participation - in the peri-urban and disadvantaged areas, community-based water supply schemes will be encouraged with investment funds from GoB, and the collaboration of NGOs and the private sector.

The implementation of these institutional developments will need to be carefully formulated and programmed with the full political commitment of GoB and interested stakeholders. In the short to medium term, the Government will also establish an appropriate independent Regulatory Framework to supervise and monitor public and private sector performance in the provision of water services.

## **Existing Documentation**

- (a) Chapter 8, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

## **Linkages**

The sustained development of water supply services for Dhaka should be closely linked and co-ordinated with other NWMP programmes, namely:

- (a) Independent Regulatory Bodies for the Water Supply and Sanitation Service Sector (ID 002);
- (b) Support to the Preparation of New Legislation (EE 001);
- (c) Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);
- (d) Regulatory and Economic Instruments (EE 005);
- (e) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (f) Raising Public Awareness in the Wise Use and Management of Water (EE 010);
- (g) Private Sector Participation in Water Management (EE 011);
- (h) Alternative Financing Methods for Water Management (EE 013);
- (i) Dhaka Sanitation and Sewerage Systems (MC 006);
- (j) Dhaka Flood Protection (MC 010);
- (k) Dhaka Stormwater Drainage (MC 011);
- (l) National Clean-up of Existing Industrial Pollution (EA 002);
- (m) National Pollution Control Plan (EA 001);
- (n) National Water Quality Monitoring (EA 003); and
- (o) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

The Inventory and Asset Management Plan of the Water and Sanitation Sector (MC 001) is also relevant here.

In addition, planning and implementation should be co-ordinated with Dhaka City Corporation (DCC), Rajdhani Unnayan Karttripakkha (RAJUK) on city planning, Bangladesh Water Development Board (BWDB), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO and other interested parties.

## **Risks and Assumptions**

There are a number of important risks associated with a sustained development programme for the provision of safe and reliable water services in Dhaka. They fall into three main categories: institutional; financial and environmental.

The institutional risks focus mainly on the political willingness and commitment to reform the organisation and management of the City's water services through a concerted drive to improve efficiency, involve the private sector, and promote effective consumer participation. National policy statements (NWPo and NPSWSS) clearly indicate that Government is aware of the problems, but it will need real political commitment to create an independent structure which is solely dedicated to the provision of effective and efficient water services for all inhabitants.

The financial risks are that the necessary investment and maintenance resources for Dhaka will become increasingly constrained, especially from international sources, if the institutional and efficiency issues are not addressed in a constructive manner, and Government does not give sustained support for the policy of full cost recovery. Future Government investment budgets will be under increasing pressure from other public sectors; therefore, it is crucial that there is a phased introduction of private sector participation and effective promotion of community-based systems particularly for peri-urban and disadvantaged communities.

The environmental risks for water supply are mainly related to any waste product from the water treatment process and construction operations. These risks can be mitigated if there is an effective parallel programme to deal with municipal and industrial wastewater.

Dhaka is the capital city and should offer constructive leadership to the rest of the country. The risks of inaction are too great for the Government not to implement the mandates of its own policy statements.

### **Assumptions:**

- Materials used for construction of new systems will give the assumed working lives.
- Construction of new systems is adequately supervised so as to minimise future operation and maintenance.
- Technical skills will be adequate to enable the efficient and effective O & M of the water systems.
- The operating utility will be able to run the water supply function without political interference.
- Full cost recovery is affordable.
- Environmental risks can be successfully mitigated.



**Dhaka Bulk Water Supply and Distribution Systems**

Ref :

**MC 002**

Cluster :	<b>Major Cities</b>	Region(s) :	<b>NC</b>
Focus/Foci :	<b>Water Supplies</b>	Location :	<b>Dhaka City</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>24 year(s)</b>
		Agency(s) :	<b>DWASA</b> (Lead)
		Responsible :	None (Supporting)
Short Description :	Water allocation for domestic and municipal use is the first priority under the NWPo. This programme, which responds to both the NWPo and the National Policy for Safe Water Supply and Sanitation (NPSWSS), aims to address the need for "...safe and affordable drinking water supplies through various means..." for all inhabitants, especially the urban poor (NWPo \$4.6.a). The population of Dhaka is expected to treble over the next 25 years, from 9 million in 2000 to 27 million in 2025. At present, only 76% of the population is served by the main public water supply system, the rest being dependant on unreliable and increasingly polluted local sources. This programme deals with the massive task of rehabilitation, improvement and extension of the city's water supply systems in order to raise and sustain coverage levels at 100% by 2010. It will be accomplished through the development of new water sources, improvement and expansion of the existing DTW-fed system, and the introduction of safe hand-pumps fed by small DTW systems in peri-urban and poor communities.		

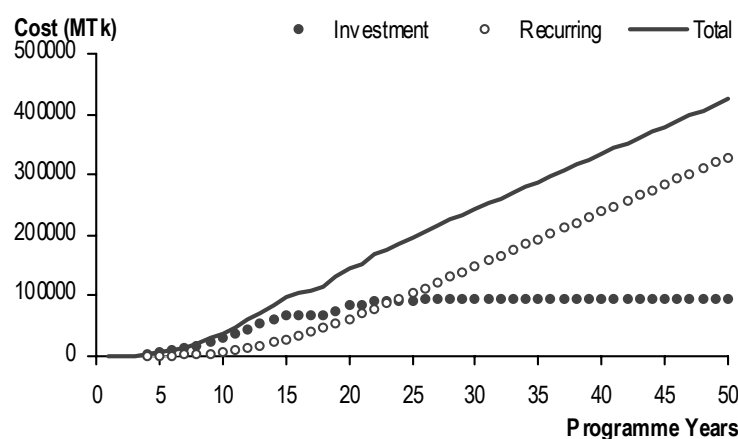
**MIS Links**

Cost Calculation :	MC Programme costing.xls	Map :	MC 002 Map.jpg
Disb't Schedule :	MC Programme costing.xls	Description :	MC 002 PgP.doc

**Finance**

	Costs	Private	Funding (%)	Expected by
			GoB	Beneficiaries
Total Capital <sup>3</sup>	<b>95,150.00</b> MTk	<b>30%</b>	<b>65%</b>	<b>5%</b>
Ultimate Recurring	<b>9,050.40</b> MTk/yr	<b>n/a</b>	<b>50%</b>	<b>50%</b>
				<b>24</b>
				<b>26</b>

Date of Data :

**31 07 01**  
 (dd) (mm) (yy)
**Stacked Cumulative Cash Flow Chart**

Status :

**Identified**

Financial Base Year:

**mid-2000**

Planned Expenditure (to date) :

**0** MTkActual Expenditure<sup>4</sup> (to date) :**0** MTk**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Uncollected water fees reduced to 10% of due	• DWASA records	NYD
• Sustainable operation and maintenance of city water supply systems	• Frequency of service breaks • Response times	NYD
• Reduced incidence of water borne or water related disease	• Public health records • Water quality	NYD
• 100% of Dhaka's population have access to reliable water supplies	• Survey Reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan Programme Costing Sheet

Programme Ref	MC 002
Title	Dhaka Bulk Water Supply and Distribution Systems

## Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years <sup>1</sup>	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

## Technical Assistance

Expatriate consultants (all-in rate)  
Senior National consultants (all-in rate)  
Mid-level National consultants (all-in rate)  
Sub-totals  
Other general TA programme costs  
Specific other TA programme costs  
**Total TA Costs**

TA costs for this programme are included in the capital costs

## Investment items - short term

FM hand pump (local Tara) with new HTW	ls	na		105.0	49.4%	51.9
Mini Tara in existing HTW	ls	na		211.0		
Urban piped supply from DTW	ls	na		2,037.0	21.2%	431.8
Peri-urban Mini DTW+IRP + pipes	ls	na		340.0		
DTW well field supply	ls	na		4,498.0	12.2%	548.8

## Investment items - term

FM hand pump (local Tara) with new HTW	ls	na		30.0	49.4%	14.8
SW Supply	ls	na		19,935.0		
Peri-urban Mini DTW+IRP + pipes	ls	na		1,156.0	21.2%	245.1
DTW well field supply	ls	na		2,722.0	12.2%	332.1

## Investment items - short term

SW Supply	ls	na		47,124.0	12.2%	5,749.1
Peri-urban Mini DTW+IRP + pipes	ls	na		2,752.0		
DTW field	ls	na		9,240.0	13.0%	1,201.2
<b>Total Investment Items</b>				<b>90,150.0</b>	<b>9.5%</b>	<b>8,574.8</b>

<b>Overall Costs of meeting demands accruing during NWMP timeframe</b>	<b>90,150.0</b>	<b>8,574.8</b>
<b>Additional NWMP provision to maintain capacity ahead of demand</b>	<b>5,000.0</b>	<b>475.6</b>
	<b>95,150.0</b>	<b>9,050.4</b>

Notes 1 The step-wise approach to investment necessary to achieve and maintain installed capacity ahead of demands may mean that the total investment against +25 year demand is disbursed within the 25 year horizon. However, an additional provision will also be disbursed before the end of the 25 year, in order again to keep capacity ahead of ongoing demand increases.

# Dhaka Water Supply

Option	Description	Total Annual Cost (Tk/m <sup>3</sup> )	Coverage Targets (%)				
			2000	2005	2010	2025	2050
	Total population		8,800,000	11,720,000	14,900,000	26,800,000	50,000,000
N3.2.2	FM hand pump (local Tara) with new HTW	1.33	0%	5%	5%	0%	0%
N3.2.3	Mini Tara in existing HTW	2.65	0%	5%	0%	0%	0%
N3.6.1	Rural mini DTW + IRP + distribution	5.12	0%	0%	0%	0%	0%
N3.6.2	Rural mini DTW + distribution	4.02	0%	0%	0%	0%	0%
N3.13.1	SW supply for Dhaka	9.26	2%	0%	23%	41%	67%
N3.10.1	Urban piped supply from DTW + IRP	5.73	0%	0%	0%	0%	0%
N3.10.2	Urban piped supply from DTW	3.51	73%	71%	46%	25%	12%
N3.11.2	Peri urban mini DTW + distribution	5.01	0%	3%	10%	15%	10%
N3.12	Community level WS (slum)	8.32	0%	0%	0%	0%	0%
N3.14	DTW wellfield supply for cities	5.47	0%	13%	16%	19%	11%
			75%	96%	100%	100%	100%

# Dhaka Water Supply

Option	Description	Coverage Targets - Number of Population				
		2000	2005	2010	2025	2050
	Total population	8,800,000	11,720,000	14,900,000	26,800,000	50,000,000
N3.2.2	FM hand pump (local Tara) with new HTW	0	586,000	745,000	0	0
N3.2.3	Mini Tara in existing HTW	0	586,000	0	0	0
N3.6.1	Rural mini DTW + IRP + distribution	0	0	0	0	0
N3.6.2	Rural mini DTW + distribution	0	0	0	0	0
N3.13.1	SW supply for Dhaka	176,000	0	3,427,000	10,988,000	33,500,000
N3.10.1	Urban piped supply from DTW + IRP	0	0	0	0	0
N3.10.2	Urban piped supply from DTW	6,424,000	8,310,249	6,887,052	6,775,833	5,855,658
N3.11.2	Peri urban mini DTW + distribution	0	351,600	1,490,000	4,020,000	5,000,000
N3.12	Community level WS (slum)	0	0	0	0	0
N3.14	DTW wellfield supply for cities	0	1,465,000	2,309,500	4,984,800	5,600,000
		6,600,000	11,298,849	14,858,552	26,768,633	49,955,658

# Dhaka Water Supply

Option	Description	Incremental Coverage Targets - Number of Population				
		2000	2005	2010	2025	2050
	Total population	8,800,000	11,720,000	14,900,000	26,800,000	50,000,000
N3.2.2	FM hand pump (local Tara) with new HTW		586,000	159,000	-745,000	0
N3.2.3	Mini Tara in existing HTW		586,000	-586,000	0	0
N3.6.1	Rural mini DTW + IRP + distribution		0	0	0	0
N3.6.2	Rural mini DTW + distribution		0	0	0	0
N3.13.1	SW supply for Dhaka		-176,000	3,427,000	7,561,000	22,512,000
N3.10.1	Urban piped supply from DTW + IRP		0	0	0	0
N3.10.2	Urban piped supply from DTW		1,886,249	-1,423,197	-111,219	-920,175
N3.11.2	Peri urban mini DTW + distribution		351,600	1,138,400	2,530,000	980,000
N3.12	Community level WS (slum)		0	0	0	0
N3.14	DTW wellfield supply for cities		1,465,000	844,500	2,675,300	615,200
			4,698,849	3,559,703	11,910,081	23,187,025

# Dhaka Water Supply

Option	Description	Incremental Investment Requirements - Number of Population				
		2000	2005	2010	2025	2050
	Total population	8,800,000	11,720,000	14,900,000	26,800,000	50,000,000
N3.2.2	FM hand pump (local Tara) with new HTW		586,000	159,000	0	0
N3.2.3	Mini Tara in existing HTW		586,000	0	0	0
N3.6.1	Rural mini DTW + IRP + distribution		0	0	0	0
N3.6.2	Rural mini DTW + distribution		0	0	0	0
N3.13.1	SW supply for Dhaka		0	3,427,000	7,561,000	22,512,000
N3.10.1	Urban piped supply from DTW + IRP		0	0	0	0
N3.10.2	Urban piped supply from DTW		1,886,249	0	0	0
N3.11.2	Peri urban mini DTW + distribution		351,600	1,138,400	2,530,000	980,000
N3.12	Community level WS (slum)		0	0	0	0
N3.14	DTW wellfield supply for cities		1,465,000	844,500	2,675,300	615,200
			4,874,849	5,568,900	12,766,300	24,107,200

# Dhaka Water Supply

Option	Description	Unit Capital Cost Tk/capita	Incremental Investment Requirements - Capital Costs				
			2000	2005	2010	2025	2050
	Total population		8,800,000	11,720,000	14,900,000	26,800,000	50,000,000
N3.2.2	FM hand pump (local Tara) with new HTW	180		105	30	0	0
N3.2.3	Mini Tara in existing HTW	360		211	0	0	0
N3.6.1	Rural mini DTW + IRP + distribution	526		0	0	0	0
N3.6.2	Rural mini DTW + distribution	386		0	0	0	0
N3.13.1	SW supply for Dhaka	5540		0	19,935	47,124	155,896
N3.10.1	Urban piped supply from DTW + IRP	2063		0	0	0	0
N3.10.2	Urban piped supply from DTW	1080		2,037	0	0	0
N3.11.2	Peri urban mini DTW + distribution	967		340	1,156	2,752	1,185
N3.12	Community level WS (slum)	55		0	0	0	0
N3.14	DTW wellfield supply for cities	3070		4,498	2,722	9,240	2,361
Total Incremental Capital Cost				7,191	23,843	59,116	159,441
Total Cumulative Capital Cost				7,191	31,034	90,150	249,591

**Chittagong Bulk Water Supply & Distribution Systems**

Ref: MC 003

**Basic Data**

NWMP Sub-sector      **Major Cities**

Region(s)              **Eastern Hills  
Chittagong SMA**

**Relevance to NWPo**

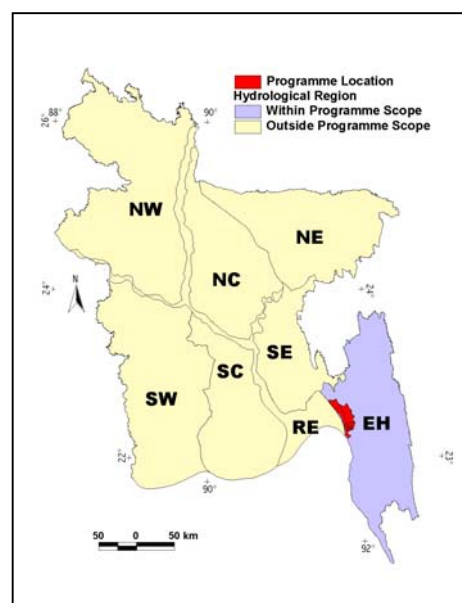
Water allocation for domestic and municipal use is the first priority under the NWPo. The programme for Chittagong, under both the NWPo and the National Policy for Safe Water Supply and Sanitation (NPSWSS), aims to address the need for “....safe and affordable drinking water supplies through various means....” for all inhabitants, especially the urban poor. Policy also mandates that investments to improve and extend water services in the major cities should be paralleled by appropriate and substantive institutional and financial reform to attain:

- (a) significant improvements in service efficiency and financial viability of existing institutions;
- (b) private sector participation;
- (c) stakeholder consultation, particularly in peri-urban and poor communities; and
- (d) full cost recovery.

**Purpose of Programme**

Chittagong is the second largest city, main commercial port and administrative centre of the eastern portion of the country. The population is projected to increase four-fold in the next 50 years, from 2.5million in 2000 to 6.1million in 2025 and 11million by 2050. The expansion will put increasing pressure on all public services and infrastructure, especially the need for a safe and reliable water supply system for all inhabitants. At present, about 55% of Chittagong’s population is served by the main public water supply system. The rest of the population, mainly poor and disadvantaged communities, is dependent on local sources, many of which are unreliable and increasingly polluted.

The programme for Chittagong will require significant investment in rehabilitation, improvement and extension of the city’s water supply systems to raise and sustain service coverage levels at 95% by 2010 and 100% by 2025. This will be accomplished through a combination of public/private sector initiatives to develop major new surface water sources for bulk water supplies, coupled with improvement and expansion of the main water distribution system based on existing DTWs and new surface sources. In the intermediate phases of the plan, peri-urban and poor communities will be encouraged and supported to develop and install safe hand pumps and small DTW based systems.



## Programme Outline

Improvements and extensions of the water supply systems will continue throughout the implementation of the NWMP. The coverage targets by service type are summarised as follows:

Component	2000	2005	2010	2025
Population (million)	2.5	3.1	3.7	6.1
Water supply coverage (%)				
Hand pumps	0	5	0	0
Small DTW based systems	0	10	10	5
Large DTW based systems	30	30	30	30
Wellfields	0	0	0	0
Surface water (rivers)	25	35	45	55
Total	55	85	95	100

## Financing Arrangements

For effective sustained implementation, the investment programme will require the active and co-ordinated participation of the public sector (GoB and international development agencies), private sector (domestic and foreign, the latter in the medium to long term), and community based organisations with the support of NGOs. Indicative financing targets are presented below:

Sector	%
Public (GoB and international development agencies)	65
Private (domestic and foreign)	30
Local Communities	5
Total	100

The Government and the executing agencies will need to ensure the availability of adequate funds for:

- (a) rehabilitation of existing water supply facilities;
- (b) capital replacement during and after the NWMP period; and
- (c) effective operations and maintenance.

In this context, the establishment of full cost recovery pricing will be essential.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Uncollected water fees reduced to 10% of due	I1	• CWASA records	2011
• Sustainable operation and maintenance of city water supply systems	I2	• Frequency of service breaks	2016
• Reduced incidence of water borne or water related disease	I3	• Response times	
• 100% of Chittagong's population have access to formal water supplies	K	• Public health records	2021
• Demand for safe and reliable drinking water supplies and services satisfied in the Statistical Metropolitan Areas	D	• Water quality	
		• Survey reports	2026
		• % service coverage verified by survey	2026

## **Institutional Arrangements**

The institutional arrangements for programme implementation are expected to comprise three components:

- (a) Public sector - CWASA will retain prime responsibility in the short to medium term with the support of GoB and international development agencies. Much greater emphasis will be given to increased autonomy and management expertise, organisational reform, service coverage and efficiency, full cost recovery and financial viability.
- (b) Private sector participation - in the medium to longer term, the private sector is expected to play an increasing role in the provision of water services for Chittagong. This will include: contract services (e.g. operation and maintenance of specific facilities, revenue billing and collection, etc.); BOT/BOOT schemes (e.g. bulk water supplies and water treatment plants); and full private concessions for the main water supply system of the city. In partnership with community based organisations, the private sector will also be expected to play a leading role in the development and operation of peri-urban water supply schemes.
- (c) Community-based and NGO participation - in the peri-urban and disadvantaged areas, community-based water supply schemes will be encouraged with investment funds from GoB, and the collaboration of NGOs and the private sector.

The implementation of these institutional developments will need to be carefully formulated and programmed with the full political commitment of GoB and interested stakeholders. In the short to medium term, the Government will also establish an appropriate independent Regulatory Framework to supervise and monitor public and private sector performance in the provision of water services.

## **Existing Documentation**

- (a) Chapter 8, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

## **Linkages**

The sustained development of water supply services for Chittagong should be closely linked and co-ordinated with other NWMP programmes, namely:

- (a) Independent Regulatory Bodies for the Water Supply and Sanitation Service Sector (ID 002);
- (b) Support to the Preparation of New Legislation (EE 001);
- (c) Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);
- (d) Regulatory and Economic Instruments (EE 005);
- (e) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (f) Raising Public Awareness in the Wise Use and Management of Water (EE 010);
- (g) Private Sector Participation in Water Management (EE 011);
- (h) Alternative Financing Methods for Water Management (EE 013);
- (i) Chittagong Sanitation and Sewerage Systems (MC 007);
- (j) Chittagong Flood Protection (MC 012);
- (k) Chittagong Stormwater Drainage (MC 013);
- (l) National Clean-up of Existing Industrial Pollution (EA 002);
- (m) National Pollution Control Plan (EA 001);
- (n) National Water Quality Monitoring (EA 003); and
- (o) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

The Inventory and Asset Management Plan of the Water and Sanitation Sector (MC 001) is also relevant here.

In addition, planning and implementation should be co-ordinated with Chittagong City Corporation (CCC), Chittagong Water and Sewerage Authority (CWASA), Bangladesh Water Development Board (BWDB), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO and other interested parties.

## **Risks and Assumptions**

There are a number of important risks associated with a sustained development programme for the provision of safe and reliable water services in Chittagong. They fall into three main categories: institutional; financial and environmental.

The institutional risks focus mainly on the political willingness and commitment to reform the organisation and management of the City's water services through a concerted drive to improve efficiency, involve the private sector, and promote effective consumer participation. National policy statements (NWPo and NPSWSS) clearly indicate that Government is aware of the problems, but it will need real political commitment to create an independent structure which is solely dedicated to the provision of effective and efficient water services for all inhabitants.

The financial risks are that the necessary investment and maintenance resources for Chittagong will become increasingly constrained, especially from international sources, if the institutional and efficiency issues are not addressed in a constructive manner, and Government does not give sustained support for the policy of full cost recovery. Future Government investment budgets will be under increasing pressure from other public sectors; therefore, it is crucial that there is a phased introduction of private sector participation and effective promotion of community-based systems particularly for peri-urban and disadvantaged communities.

The environmental risks for water supply are mainly related to any waste product from the water treatment process and construction operations. These risks can be mitigated if there is an effective parallel programme to deal with municipal and industrial wastewater.

### **Assumptions:**

- Materials used for construction of new systems will give the assumed working lives.
- Construction of new systems is adequately supervised so as to minimise future operation and maintenance.
- Technical skills will be adequate to enable the efficient and effective O & M of the water systems.
- The operating utility will be able to run the water supply function without political interference.
- Full cost recovery is affordable.
- Environmental risks can be successfully mitigated.

**Chittagong Bulk Water Supply and Distribution Systems**

Ref :

**MC 003**

Cluster :	<b>Major Cities</b>	Region(s) :	<b>EH</b>
Focus/Foci :	<b>Water Supplies</b>	Location :	<b>Chittagong City</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>24 year(s)</b>
		Agency(s) :	<b>CWASA</b>
		Responsible :	<b>None</b>
Short Description :	Water allocation for domestic and municipal use is the first priority under the NWPo. This programme, which responds to both the NWPo and the National Policy for Safe Water Supply and Sanitation (NPSWSS), aims to address the need for "...safe and affordable drinking water supplies through various means..." for all inhabitants, especially the urban poor (NWPo \$4.6.a). The population of Chittagong is expected to more than double over the next 25 years, from 2.5 million in 2000 to 6.1 million in 2025. At present, only 55% of the population is served by the main public water supply system, the rest being dependant on unreliable and increasingly polluted local sources. This programme deals with the massive task of rehabilitation, improvement and extension of the city's water supply systems in order to raise coverage levels to 95% by 2010, and then to sustain it at 100% beyond that date. It will be accomplished through the development of new water sources, improvement and expansion of the existing DTW-fed system, and the introduction of safe hand-pumps fed by small DTW systems		

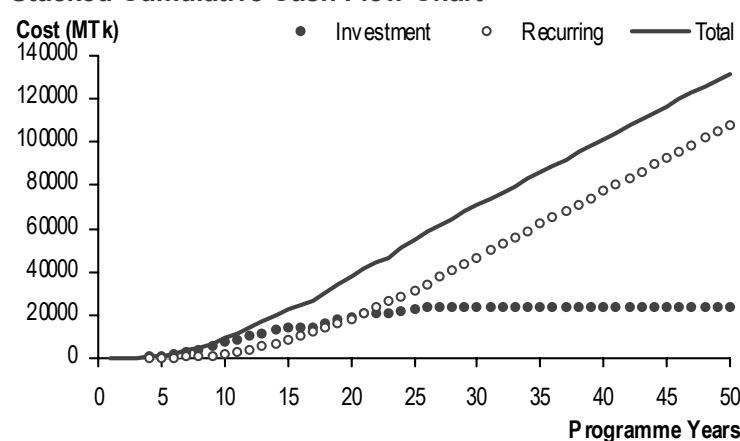
**MIS Links**

Cost Calculation :	MC Programme costing.xls	Map :	MC 003 Map.jpg
Disb't Schedule :	MC Programme costing.xls	Description :	MC 003 PgP.doc

**Finance**

	Costs	Private	Funding (%)	Expected by
			GoB	Beneficiaries
Total Capital <sup>3</sup>	<b>24,017.00</b> MTk	<b>30%</b>	<b>65%</b>	<b>5%</b>
Ultimate Recurring	<b>3,059.20</b> MTk/yr	<b>n/a</b>	<b>50%</b>	<b>50%</b>

Date of Data :

**31 07 01**  
 (dd) (mm) (yy)
**Stacked Cumulative Cash Flow Chart**

Status :

**Identified**

Financial Base Year:

**mid-2000**Planned Expenditure  
(to date) :**0** MTkActual Expenditure<sup>4</sup>  
(to date) :**0** MTk**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Uncollected water fees reduced to 10% of due	• CWASA records	NYD
• Sustainable operation and maintenance of city water supply systems	• Frequency of service breaks • Response times	NYD
• Reduced incidence of water borne or water related disease	• Public health records • Water quality	NYD
• 100% of Chittagong's population have access to formal water supplies	• Survey Reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done



# National Water Management Plan Programme Costing Sheet

Programme Ref	MC 003
Title	Chittagong Bulk Water Supply and Distribution Systems

## Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years <sup>1</sup>	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

## Technical Assistance

Expatriate consultants (all-in rate)  
Senior National consultants (all-in rate)  
Mid-level National consultants (all-in rate)  
Sub-totals  
Other general TA programme costs  
Specific other TA programme costs  
**Total TA Costs**

TA costs for this programme are included in the capital costs

## Investment items - short term

FM hand pump (local Tara) with new HTW	ls	na			27.0	13.5%	3.6
SW supply	ls	na			2,159.0	12.2%	263.4
Urban piped supply from DTW	ls	na			30.0	14.8%	4.4
Peri-urban Mini DTW+IRP + pipes	ls	na			601.0	21.2%	127.4

## Investment items - term

SW supply	ls	na			3,062.0	12.2%	373.6
Urban piped supply from DTW	ls	na			37.0	14.8%	5.5
Peri-urban Mini DTW+IRP + pipes	ls	na			390.0	21.2%	82.7

## Investment items - short term

SW supply	ls	na			15,306.0	12.2%	1,867.3
Urban piped supply from DTW	ls	na			146.0	14.8%	21.6
Peri-urban Mini DTW+IRP + pipes	ls	na			259.0	21.2%	54.9

<b>Total Investment Items</b>					<b>22,017.0</b>	<b>12.7%</b>	<b>2,804.5</b>
-------------------------------	--	--	--	--	-----------------	--------------	----------------

<b>Overall Costs of meeting demands accruing during NWMP timeframe</b>	<b>22,017.0</b>	<b>2,804.5</b>
<b>Additional NWMP provision to maintain capacity ahead of demand</b>	<b>2,000.0</b>	<b>254.8</b>
	<b>24,017.0</b>	<b>3,059.2</b>

Notes 1 The step-wise approach to investment necessary to achieve and maintain installed capacity ahead of demands may mean that the total investment against +25 year demand is disbursed within the 25 year horizon. However, an additional provision will also be disbursed before the end of the 25 year, in order again to keep capacity ahead of ongoing demand increases.

Chittagong Water Supply			Coverage Targets (%)				
Option	Description	Total Annual Cost (Tk/m <sup>3</sup> )	2000	2005	2010	2025	2050
	Total population		2,500,000	3,050,000	3,700,000	6,100,000	11,000,000
N3.2.2	FM hand pump (local Tara) with new HTW	1.33	0%	5%	0%	0%	0%
N3.2.3	Mini Tara in existing HTW	2.65	0%	0%	0%	0%	0%
N3.6.1	Rural mini DTW + IRP + distribution	5.12	0%	0%	0%	0%	0%
N3.6.2	Rural mini DTW + distribution	4.02	0%	0%	0%	0%	0%
N3.13.2	SW supply for Chittagong	9.26	25%	35%	45%	73%	81%
N3.10.1	Urban piped supply from DTW + IRP	5.73	22%	18%	12%	7%	4%
N3.10.2	Urban piped supply from DTW	3.51	5%	5%	5%	5%	3%
N3.11.1	Peri urban mini DTW + IRP +distribution	6.11	0%	15%	20%	15%	12%
N3.12	Community level WS (slum)	8.32	0%	0%	0%	0%	0%
N3.14	DTW wellfield supply for cities	5.47	0%	0%	0%	0%	0%
			52%	78%	82%	100%	100%

Chittagong Water Supply			Coverage Targets - Number of Population				
Option	Description		2000	2005	2010	2025	2050
	Total population		2,500,000	3,050,000	3,700,000	6,100,000	11,000,000
N3.2.2	FM hand pump (local Tara) with new HTW		0	152,500	0	0	0
N3.2.3	Mini Tara in existing HTW		0	0	0	0	0
N3.6.1	Rural mini DTW + IRP + distribution		0	0	0	0	0
N3.6.2	Rural mini DTW + distribution		0	0	0	0	0
N3.13.2	SW supply for Chittagong		625,000	1,067,500	1,665,000	4,453,000	8,910,000
N3.10.1	Urban piped supply from DTW + IRP		555,556	554,017	459,137	451,722	390,377
N3.10.2	Urban piped supply from DTW		125,000	152,500	185,000	305,000	330,000
N3.11.1	Peri urban mini DTW + IRP +distribution		0	457,500	740,000	915,000	1,320,000
N3.12	Community level WS (slum)		0	0	0	0	0
N3.14	DTW wellfield supply for cities		0	0	0	0	0
			1,305,556	2,384,017	3,049,137	6,124,722	10,950,377

Chittagong Water Supply			Incremental Coverage Targets - Number of Population				
Option	Description		2000	2005	2010	2025	2050
	Total population		2,500,000	3,050,000	3,700,000	6,100,000	11,000,000
N3.2.2	FM hand pump (local Tara) with new HTW			152,500	-152,500	0	0
N3.2.3	Mini Tara in existing HTW			0	0	0	0
N3.6.1	Rural mini DTW + IRP + distribution			0	0	0	0
N3.6.2	Rural mini DTW + distribution			0	0	0	0
N3.13.2	SW supply for Chittagong			442,500	597,500	2,788,000	4,457,000
N3.10.1	Urban piped supply from DTW + IRP			-1,539	-94,880	-7,415	-61,345
N3.10.2	Urban piped supply from DTW			27,500	32,500	120,000	25,000
N3.11.1	Peri urban mini DTW + IRP +distribution			457,500	282,500	175,000	405,000
N3.12	Community level WS (slum)			0	0	0	0
N3.14	DTW wellfield supply for cities			0	0	0	0
				1,078,461	665,120	3,075,585	4,825,655

Chittagong Water Supply			Incremental Investment Requirements - Number of Population				
Option	Description		2000	2005	2010	2025	2050
	Total population		2,500,000	3,050,000	3,700,000	6,100,000	11,000,000
N3.2.2	FM hand pump (local Tara) with new HTW			152,500	0	0	0
N3.2.3	Mini Tara in existing HTW			0	0	0	0
N3.6.1	Rural mini DTW + IRP + distribution			0	0	0	0
N3.6.2	Rural mini DTW + distribution			0	0	0	0
N3.13.2	SW supply for Chittagong			442,500	597,500	2,788,000	4,457,000
N3.10.1	Urban piped supply from DTW + IRP			0	0	0	0
N3.10.2	Urban piped supply from DTW			27,500	32,500	120,000	25,000
N3.11.1	Peri urban mini DTW + IRP +distribution			457,500	282,500	175,000	405,000
N3.12	Community level WS (slum)			0	0	0	0
N3.14	DTW wellfield supply for cities			0	0	0	0
				1,080,000	912,500	3,083,000	4,887,000

Chittagong Water Supply			Incremental Investment Requirements - Capital Costs				
Option	Description	Unit Capital Cost Tk/capita	2000	2005	2010	2025	2050
	Total population		2,500,000	3,050,000	3,700,000	6,100,000	11,000,000
N3.2.2	FM hand pump (local Tara) with new HTW	180		27	0	0	0
N3.2.3	Mini Tara in existing HTW	360		0	0	0	0
N3.6.1	Rural mini DTW + IRP + distribution	526		0	0	0	0
N3.6.2	Rural mini DTW + distribution	386		0	0	0	0
N3.13.2	SW supply for Chittagong	4880		2,159	3,062	15,306	27,188
N3.10.1	Urban piped supply from DTW + IRP	2063		0	0	0	0
N3.10.2	Urban piped supply from DTW	1080		30	37	146	34
N3.11.1	Peri urban mini DTW + IRP +distribution	1314		601	390	259	665
N3.12	Community level WS (slum)	55		0	0	0	0
N3.14	DTW wellfield supply for cities	3070		0	0	0	0
	<b>Total Incremental Capital Cost</b>			<b>2,818</b>	<b>3,488</b>	<b>15,711</b>	<b>27,887</b>
	<b>Total Cumulative Capital Cost</b>			<b>2,818</b>	<b>6,306</b>	<b>22,017</b>	<b>49,903</b>

**Khulna Bulk Water Supply & Distribution Systems**

Ref: MC 004

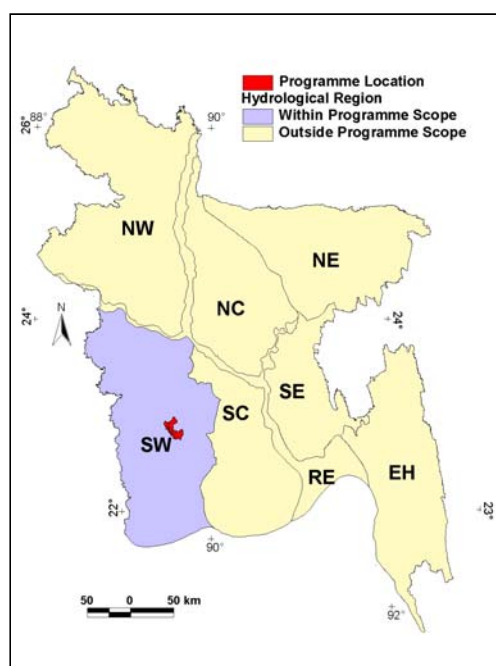
**Basic Data**

NWMP Sub-sector      **Major Cities**

Region(s)              **South West Region**  
**Khulna SMA**

**Relevance to NWPo**

Water allocation for domestic and municipal use is the first priority under the NWPo. The programme for Khulna, under both the NWPo and the National Policy for Safe Water Supply and Sanitation (NPSWSS), aims to address the need for “....safe and affordable drinking water supplies through various means....” for all inhabitants, especially the urban poor. Policy also mandates that investments to improve and extend water services in the major cities should be paralleled by appropriate and substantive institutional and financial reform to attain:



- (a) significant improvements in service efficiency and financial viability of existing institutions;
- (b) private sector participation;
- (c) stakeholder consultation, particularly in peri-urban and poor communities; and
- (d) full cost recovery.

**Purpose of Programme**

Khulna is the third largest city, commercial and administrative centre of the south west portion of the country. The population is projected to increase four-fold in the next 50 years, from 1.1 million in 2000 to 2.4 million in 2025 and 4 million by 2050. The expansion will put increasing pressure on all public services and infrastructure, especially the need for a safe and reliable water supply system for all inhabitants. At present, about 51% of Khulna's population is served by the main public water supply system. The rest of the population, mainly poor and disadvantaged communities, are dependent on local sources, many of which are unreliable and increasingly polluted.

The programme for Khulna will require significant investment in rehabilitation, improvement and extension of the city's water supply systems to raise and sustain service coverage levels at 100% by 2010. This will be accomplished through a combination of public/private sector initiatives to develop major new wellfields and surface water sources for bulk water supplies, coupled with improvement and expansion of the main water distribution system based on existing DTWs and new surface sources. In the intermediate phases of the plan, peri-urban and poor communities will be encouraged and supported to develop and install safe hand pumps and small DTW based systems.

## Programme Outline

Improvements and extensions of the water supply systems will continue throughout the implementation of the NWMP. The coverage targets by service type are summarised as follows:

Component	2000	2005	2010	2025
Population (million)	1.1	1.3	1.6	2.4
Water supply coverage (%)				
Hand pumps	0	10	20	10
Small DTW based systems	0	8	15	15
Large DTW based systems	50	40	25	20
Wellfields	0	25	20	15
Surface water (rivers)	1	1	20	40
Total	51	84	100	100

## Financing Arrangements

For effective sustained implementation, the investment programme will require the active and co-ordinated participation of the public sector (GoB and international development agencies), private sector (domestic and foreign, the latter in the medium to long term), and community based organisations with the support of NGOs. Indicative financing targets are presented below:

Sector	%
Public (GoB and international development agencies)	65
Private (domestic and foreign)	30
Local Communities	5
Total	100

The Government and the executing agencies will need to ensure the availability of adequate funds for:

- (a) rehabilitation/replacement of existing water supply facilities;
- (b) capital replacement during and after the NWMP period; and
- (c) effective operations and maintenance.

In this context, the establishment of full cost recovery pricing will be essential.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Uncollected water fees reduced to 10% of due	I1	• DPHE records	2012
• Sustainable operation and maintenance of city water supply systems	I2	• Frequency of service breaks	2017
• Reduced incidence of water borne or water related disease	I3	• Response times	2022
• 100% of Khulna's population have access to formal water supplies	K	• Public health records	2027
• Demand for safe and reliable drinking water supplies and services satisfied in the Statistical Metropolitan Areas	D	• Water quality	2027
		• Survey reports	
		• % service coverage verified by survey	2027

## **Institutional Arrangements**

The institutional arrangements for programme implementation are expected to comprise three components:

- (a) Public sector - Khulna City Corporation (KCC) will retain prime responsibility in the short to medium term with the support of GoB and international development agencies. Much greater emphasis will be given to increased autonomy and management expertise, organisational reform, service coverage and efficiency, full cost recovery and financial viability.
- (b) Private sector participation - in the medium to longer term, the private sector is expected to play an increasing role in the provision of water services for Khulna. This will include: contract services (e.g. operation and maintenance of specific facilities, revenue billing and collection, etc.); BOT/BOOT schemes (e.g. bulk water supplies and water treatment plants); and full private concessions for the main water supply system of the city. In partnership with community based organisations, the private sector will also be expected to play a leading role in the development and operation of peri-urban water supply schemes.
- (c) Community-based and NGO participation - in the peri-urban and disadvantaged areas, community-based water supply schemes will be encouraged with investment funds from GoB, and the collaboration of NGOs and the private sector.

The implementation of these institutional developments will need to be carefully formulated and programmed with the full political commitment of GoB and interested stakeholders. In the short to medium term, the Government will also establish an appropriate independent Regulatory Framework to supervise and monitor public and private sector performance in the provision of water services.

## **Existing Documentation**

- (a) Chapter 8, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

## **Linkages**

The sustained development of water supply services for Khulna should be closely linked and co-ordinated with other NWMP programmes, namely:

- (a) Independent Regulatory Bodies for the Water Supply and Sanitation Service Sector (ID 002);
- (b) Support to the Preparation of New Legislation (EE 001);
- (c) Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);
- (d) Regulatory and Economic Instruments (EE 005);
- (e) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (f) Raising Public Awareness in the Wise Use and Management of Water (EE 010);
- (g) Private Sector Participation in Water Management (EE 011);
- (h) Alternative Financing Methods for Water Management (EE 013);
- (i) Khulna Sanitation and Sewerage Systems (MC 008);
- (j) Khulna Flood Protection (MC 014);
- (k) Khulna Stormwater Drainage (MC 015);
- (l) National Clean-up of Existing Industrial Pollution (EA 002);
- (m) National Pollution Control Plan (EA 001);
- (n) National Water Quality Monitoring (EA 003); and

(o) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

The Inventory and Asset Management Plan of the Water and Sanitation Sector (MC 001) is also relevant here.

In addition, planning and implementation should be co-ordinated with Khulna City Corporation (KCC), Bangladesh Water Development Board (BWDB), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO and other interested parties.

### **Risks and Assumptions**

There are a number of important risks associated with a sustained development programme for the provision of safe and reliable water services in Khulna. They fall into three main categories: institutional; financial and environmental.

The institutional risks focus mainly on the political willingness and commitment to reform the organisation and management of the City's water services through a concerted drive to improve efficiency, involve the private sector, and promote effective consumer participation. National policy statements (NWPo and NPSWSS) clearly indicate that Government is aware of the problems, but it will need real political commitment to create an independent structure which is solely dedicated to the provision of effective and efficient water services for all inhabitants.

The financial risks are that the necessary investment and maintenance resources for Khulna will become increasingly constrained, especially from international sources, if the institutional and efficiency issues are not addressed in a constructive manner, and Government does not give sustained support for the policy of full cost recovery. Future Government investment budgets will be under increasing pressure from other public sectors; therefore, it is crucial that there is a phased introduction of private sector participation and effective promotion of community-based systems particularly for peri-urban and disadvantaged communities.

The environmental risks for water supply are mainly related to any waste product from the water treatment process and construction operations. These risks can be mitigated if there is an effective parallel programme to deal with municipal and industrial wastewater.

#### **Assumptions:**

- Materials used for construction of new systems will give the assumed working lives.
- Construction of new systems is adequately supervised so as to minimise future operation and maintenance.
- Technical skills will be adequate to enable the efficient and effective O & M of the water systems.
- The operating utility will be able to run the water supply function without political interference.
- Full cost recovery is affordable.
- Environmental risks can be successfully mitigated.

**Khulna Bulk Water Supply and Distribution Systems**

Ref :

**MC 004**

Cluster :	Major Cities		Region(s) :	SW	
Focus/Foci :	Water Supplies		Location :	Khulna City	
Start Year <sup>1</sup> :	2003	Duration <sup>2</sup> :	23 year(s)	Agency(s) Responsible :	KCC (Lead) None (Supporting)
Short Description :	Water allocation for domestic and municipal use is the first priority under the NWPo. This programme, which responds to both the NWPo and the National Policy for Safe Water Supply and Sanitation (NPSWSS), aims to address the need for "...safe and affordable drinking water supplies through various means..." for all inhabitants, especially the urban poor (NWPo \$4.6.a). The population of Khulna is expected to double over the next 25 years, from 1.1 million in 2000 to 2.4 million in 2025. At present, only 51% of the population is served by the main public water supply system, the rest being dependant on unreliable and increasingly polluted local sources. This programme deals with the massive task of rehabilitation, improvement and extension of the city's water supply systems in order to raise and sustain coverage levels at 100% by 2010. It will be accomplished through the development of new water sources, improvement and expansion of the existing DTW-fed system, and the introduction of safe hand-pumps fed by small DTW systems in peri-urban and poor communities.				

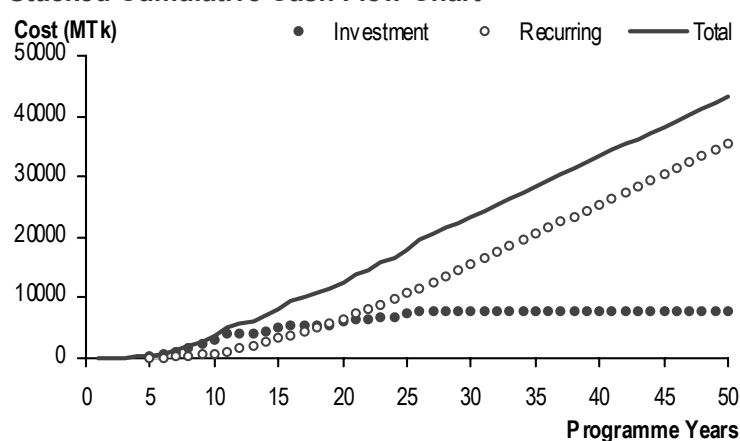
**MIS Links**

Cost Calculation :	MC Programme costing.xls	Map :	MC 004 Map.jpg
Disb't Schedule :	MC Programme costing.xls	Description :	MC 004 PgP.doc

**Finance**

Finance			Funding (%)		Expected by
	Costs	Private	GoB	Beneficiaries	ProgrammeYear
Total Capital <sup>3</sup>	7,879.00 MTK	30%	65%	5%	23
Ultimate Recurring	989.00 MTK/yr	n/a	50%	50%	26

Date of Data :

**31 07 01**  
 (dd) (mm) (yy)
**Stacked Cumulative Cash Flow Chart**

Status :

**Identified**

Financial Base Year:

**mid-2000**Planned Expenditure  
(to date) :**0** MTkActual Expenditure<sup>4</sup>  
(to date) :**0** MTk**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Uncollected water fees reduced to 10% of due	• DPHE records	NYD
• Sustainable operation and maintenance of city water supply systems	• Frequency of service breaks • Response times	NYD
• Reduced incidence of water borne or water related disease	• Public health records • Water quality	NYD
• 100% of Khulna's population have access to formal water supplies	• Survey Reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref

MC 004

Title

Khulna Bulk Water Supply and Distribution Systems

### Assumptions:

Taka/US\$ 51.000

TA duration

0.0

years

All prices in mid-2000 values

Investment duration

25.0

years<sup>1</sup>

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

### Technical Assistance

Expatriate consultants (all-in rate)

Senior National consultants (all-in rate)

Mid-level National consultants (all-in rate)

Sub-totals

Other general TA programme costs

Specific other TA programme costs

**Total TA Costs**

TA costs for this programme are included in the capital costs

### Investment items - short term

FM hand pump (local Tara) with new HTW

Is

na

24.0

13.5%

3.2

Mini Tara in existing HTW

Is

na

24.0

13.4%

3.2

SW supply

Is

na

10.0

12.2%

1.2

Peri-urban mini DTW +distribution

Is

na

38.0

23.6%

9.0

DTW wellfield supply

Is

na

1,013.0

13.0%

131.7

### Investment items - term

FM hand pump (local Tara) with new HTW

Is

na

36.0

13.5%

4.9

Mini Tara in existing HTW

Is

na

36.0

13.4%

4.8

SW supply

Is

na

1,619.0

12.2%

197.5

Peri-urban mini DTW +distribution

Is

na

41.0

23.6%

9.7

### Investment items - short term

SW supply

Is

na

3,726.0

12.2%

454.6

Urban piped supply from DTW

Is

na

174.0

14.8%

25.8

DTW wellfield supply

Is

na

138.0

13.0%

17.9

**Total Investment Items**

**6,879.0**

**12.6%**

**863.5**

**Overall Costs of meeting demands accruing during NWMP timeframe**

**6,879.0**

**863.5**

**Additional NWMP provision to maintain capacity ahead of demand**

**1,000.0**

**125.5**

**7,879.0**

**989.0**

Notes

1

The step-wise approach to investment necessary to achieve and maintain installed capacity ahead of demands may mean that the total investment against +25 year demand is disbursed within the 25 year horizon. However, an additional provision will also be disbursed before the end of the 25 year, in order again to keep capacity ahead of ongoing demand increases.



Khulna Water Supply			Coverage Targets (%)				
Option	Description	Total Annual Cost (Tk/m³)	2000	2005	2010	2025	2050
	Total population		1,100,000	1,320,000	1,600,000	2,400,000	4,000,000
N3.2.2	FM hand pump (local Tara) with new HTW	1.33	0%	10%	20%	10%	0%
N3.2.3	Mini Tara in existing HTW	2.65	0%	5%	10%	5%	0%
N3.6.1	Rural mini DTW + IRP + distribution	5.12	0%	0%	0%	0%	0%
N3.6.2	Rural mini DTW + distribution	4.02	0%	0%	0%	0%	0%
N3.13.3	SW supply for Khulna	9.26	1%	1%	22%	45%	70%
N3.10.1	Urban piped supply from DTW + IRP	5.73	0%	0%	0%	0%	0%
N3.10.2	Urban piped supply from DTW	3.51	50%	40%	23%	15%	15%
N3.11.2	Peri urban mini DTW + distribution	5.01	0%	3%	5%	10%	5%
N3.12	Community level WS (slum)	8.32	0%	0%	0%	0%	0%
N3.14	DTW wellfield supply for cities	5.47	0%	25%	20%	15%	10%
			51%	84%	100%	100%	100%

Khulna Water Supply		Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	1,100,000	1,320,000	1,600,000	2,400,000	4,000,000
N3.2.2	FM hand pump (local Tara) with new HTW	0	132,000	320,000	240,000	0
N3.2.3	Mini Tara in existing HTW	0	66,000	160,000	120,000	0
N3.6.1	Rural mini DTW + IRP + distribution	0	0	0	0	0
N3.6.2	Rural mini DTW + distribution	0	0	0	0	0
N3.13.3	SW supply for Khulna	11,000	13,200	352,000	1,080,000	2,800,000
N3.10.1	Urban piped supply from DTW + IRP	0	0	0	0	0
N3.10.2	Urban piped supply from DTW	550,000	528,000	368,000	360,000	600,000
N3.11.2	Peri urban mini DTW + distribution	0	39,600	80,000	240,000	200,000
N3.12	Community level WS (slum)	0	0	0	0	0
N3.14	DTW wellfield supply for cities	0	330,000	320,000	360,000	400,000
		561,000	1,108,800	1,600,000	2,400,000	4,000,000

Khulna Water Supply		Incremental Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	1,100,000	1,320,000	1,600,000	2,400,000	4,000,000
N3.2.2	FM hand pump (local Tara) with new HTW		132,000	188,000	-80,000	-240,000
N3.2.3	Mini Tara in existing HTW		66,000	94,000	-40,000	-120,000
N3.6.1	Rural mini DTW + IRP + distribution		0	0	0	0
N3.6.2	Rural mini DTW + distribution		0	0	0	0
N3.13.3	SW supply for Khulna		2,200	338,800	728,000	1,720,000
N3.10.1	Urban piped supply from DTW + IRP		0	0	0	0
N3.10.2	Urban piped supply from DTW		-22,000	-160,000	-8,000	240,000
N3.11.2	Peri urban mini DTW + distribution		39,600	40,400	160,000	-40,000
N3.12	Community level WS (slum)		0	0	0	0
N3.14	DTW wellfield supply for cities		330,000	-10,000	40,000	40,000
			547,800	491,200	800,000	1,600,000

Khulna Water Supply		Incremental Investment Requirements - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	1,100,000	1,320,000	1,600,000	2,400,000	4,000,000
N3.2.2	FM hand pump (local Tara) with new HTW		132,000	188,000	0	0
N3.2.3	Mini Tara in existing HTW		66,000	94,000	0	0
N3.6.1	Rural mini DTW + IRP + distribution		0	0	0	0
N3.6.2	Rural mini DTW + distribution		0	0	0	0
N3.13.3	SW supply for Khulna		2,200	338,800	728,000	1,720,000
N3.10.1	Urban piped supply from DTW + IRP		0	0	0	0
N3.10.2	Urban piped supply from DTW		0	0	0	240,000
N3.11.2	Peri urban mini DTW + distribution		39,600	40,400	160,000	0
N3.12	Community level WS (slum)		0	0	0	0
N3.14	DTW wellfield supply for cities		330,000	0	40,000	40,000
			569,800	661,200	928,000	2,000,000

Khulna Water Supply		Incremental Investment Requirements - Capital Costs					
Option	Description	Unit Capital Cost Tk/capita	2000	2005	2010	2025	2050
	Total population		1,100,000	1,320,000	1,600,000	2,400,000	4,000,000
				TkM	TkM	TkM	TkM
N3.2.2	FM hand pump (local Tara) with new HTW	180		24	36	0	0
N3.2.3	Mini Tara in existing HTW	360		24	36	0	0
N3.6.1	Rural mini DTW + IRP + distribution	526		0	0	0	0
N3.6.2	Rural mini DTW + distribution	386		0	0	0	0
N3.13.3	SW supply for Khulna	4550		10	1,619	3,726	9,783
N3.10.1	Urban piped supply from DTW + IRP	2063		0	0	0	0
N3.10.2	Urban piped supply from DTW	1080		0	0	0	324
N3.11.2	Peri urban mini DTW + distribution	967		38	41	174	0
N3.12	Community level WS (slum)	55		0	0	0	0
N3.14	DTW wellfield supply for cities	3070		1,013	0	138	154
	<b>Total Incremental Capital Cost</b>			<b>1,109</b>	<b>1,731</b>	<b>4,039</b>	<b>10,260</b>
	<b>Total Cumulative Capital Cost</b>			<b>1,109</b>	<b>2,840</b>	<b>6,878</b>	<b>17,138</b>

**Rajshahi Bulk Water Supply & Distribution Systems**

Ref: MC 005

**Basic Data**

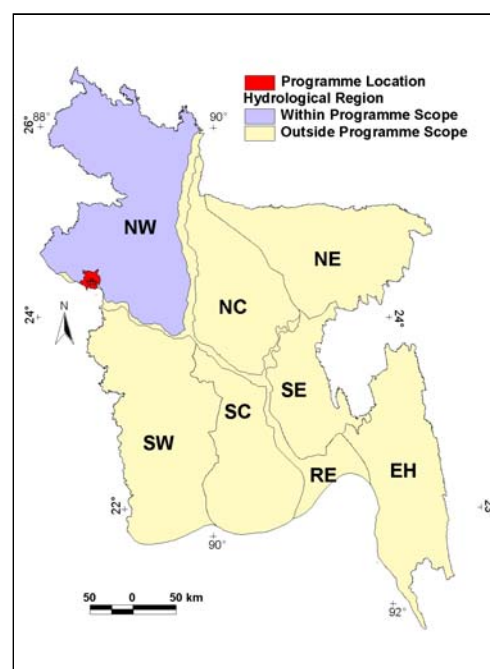
NWMP Sub-sector      **Major Cities**

Region(s)              **North West Region**  
**Rajshahi SMA**

**Relevance to NWPo**

Water allocation for domestic and municipal use is the first priority under the NWPo. The programme for Rajshahi, under both the NWPo and the National Policy for Safe Water Supply and Sanitation (NPSWSS), aims to address the need for “....safe and affordable drinking water supplies through various means....” for all inhabitants, especially the urban poor. Policy also mandates that investments to improve and extend water services in the major cities should be paralleled by appropriate and substantive institutional and financial reform to attain:

- (a) significant improvements in service efficiency and financial viability of existing institutions;
- (b) private sector participation;
- (c) stakeholder consultation, particularly in peri-urban and poor communities; and
- (d) full cost recovery.

**Purpose of Programme**

Rajshahi is the fourth largest city, and administrative centre of the north west portion of the country. The population is projected to increase four-fold in the next 50 years, from about 700,000 in 2000 to 2.3 million in 2025 and 4 million by 2050. The expansion will put increasing pressure on all public services and infrastructure, especially the need for a safe and reliable water supply system for all inhabitants. At present, only 40% of Rajshahi's population is served by the main public water supply system. The rest of the population, mainly poor and disadvantaged communities, are dependent on local sources, many of which are unreliable and increasingly polluted.

The programme for Rajshahi will require significant investment in rehabilitation, improvement and extension of the city's water supply systems to raise and sustain service coverage levels at 100% by 2010. This will be accomplished through a combination of public/private sector initiatives to develop the existing system based on DTWs, and in the medium to long term the development of new wellfields. In the intermediate phases of the plan, peri-urban and poor communities will be encouraged and supported to develop and install safe hand pumps and small DTW based systems. Development of bulk water supplies from surface water sources is expected to take place beyond 2025.

## Programme Outline

Improvements and extensions of the water supply systems will continue throughout the implementation of the NWMP. The coverage targets by service type are summarised as follows:

Component	2000	2005	2010	2025
Population (million)	0.7	1.0	1.2	2.3
Water supply coverage (%)				
Hand pumps	0	10	10	0
Small DTW based systems	0	15	20	30
Large DTW based systems	40	55	65	60
Wellfields	0	0	5	10
Surface water (rivers)	0	0	0	0
Total	40	80	100	100

## Financing Arrangements

For effective sustained implementation, the investment programme will require the active and co-ordinated participation of the public sector (GoB and international development agencies), private sector (domestic and foreign, the latter in the medium to long term), and community based organisations with the support of NGOs. Indicative financing targets are presented below:

Sector	%
Public (GoB and international development agencies)	65
Private (domestic and foreign)	30
Local Communities	5
Total	100

The Government and the executing agencies will need to ensure the availability of adequate funds for:

- (a) rehabilitation/replacement of existing water supply facilities;
- (b) capital replacement during and after the NWMP period; and
- (c) effective operations and maintenance.

In this context, the establishment of full cost recovery pricing will be essential.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Uncollected water fees reduced to 10% of due	I1	• DPHE records	2012
• Sustainable operation and maintenance of city water supply systems	I2	• Frequency of service breaks	2017
• Reduced incidence of water borne or water related disease	I3	• Response times	
• 100% of Rajshahi's population have access to formal water supplies	K	• Public health records	2022
		• Water quality	
• Demand for safe and reliable drinking water supplies and services satisfied in the Statistical Metropolitan Areas	D	• Survey reports	2027
		• % service coverage verified by survey	2027

## **Institutional Arrangements**

The institutional arrangements for programme implementation are expected to comprise three components:

- (a) Public sector - Rajshahi City Corporation (RCC) will retain prime responsibility in the short to medium term with the support of GoB and international development agencies. Much greater emphasis will be given to increased autonomy and management expertise, organisational reform, service coverage and efficiency, full cost recovery and financial viability.
- (b) Private sector participation - in the medium to longer term, the private sector is expected to play an increasing role in the provision of water services for Rajshahi. This will include: contract services (e.g. operation and maintenance of specific facilities, revenue billing and collection, etc.); BOT/BOOT schemes (e.g. bulk water supplies and water treatment plants); and full private concessions for the main water supply system of the city. In partnership with community based organisations, the private sector will also be expected to play a leading role in the development and operation of peri-urban water supply schemes.
- (c) Community-based and NGO participation - in the peri-urban and disadvantaged areas, community-based water supply schemes will be encouraged with investment funds from GoB, and the collaboration of NGOs and the private sector.

The implementation of these institutional developments will need to be carefully formulated and programmed with the full political commitment of GoB and interested stakeholders. In the short to medium term, the Government will also establish an appropriate independent Regulatory Framework to supervise and monitor public and private sector performance in the provision of water services.

## **Existing Documentation**

- (a) Chapter 8, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

## **Linkages**

The sustained development of water supply services for Rajshahi should be closely linked and co-ordinated with other NWMP programmes, namely:

- (a) Independent Regulatory Bodies for the Water Supply and Sanitation Service Sector (ID 002);
- (b) Support to the Preparation of New Legislation (EE 001);
- (c) Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);
- (d) Regulatory and Economic Instruments (EE 005);
- (e) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (f) Raising Public Awareness in the Wise Use and Management of Water (EE 010);
- (g) Private Sector Participation in Water Management (EE 011);
- (h) Alternative Financing Methods for Water Management (EE 013);
- (i) Rajshahi Sanitation and Sewerage Systems (MC 009);
- (j) Rajshahi Flood Protection (MC 016);
- (k) Rajshahi Stormwater Drainage (MC 017);
- (l) National Clean-up of Existing Industrial Pollution (EA 002);
- (m) National Pollution Control Plan (EA 001);

- (n) National Water Quality Monitoring (EA 003); and
- (o) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

The Inventory and Asset Management Plan of Water Supply & Sanitation Sector (MC 001) is also relevant here.

In addition, planning and implementation should be co-ordinated with Rajshahi City Corporation (RCC), Bangladesh Water Development Board (BWDB), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO and other interested parties.

## **Risks and Assumptions**

There are a number of important risks associated with a sustained development programme for the provision of safe and reliable water services in Rajshahi. They fall into three main categories: institutional; financial and environmental.

The institutional risks focus mainly on the political willingness and commitment to reform the organisation and management of the City's water services through a concerted drive to improve efficiency, involve the private sector, and promote effective consumer participation. National policy statements (NWPO and NPSWSS) clearly indicate that Government is aware of the problems, but it will need real political commitment to create an independent structure which is solely dedicated to the provision of effective and efficient water services for all inhabitants.

The financial risks are that the necessary investment and maintenance resources for Rajshahi will become increasingly constrained, especially from international sources, if the institutional and efficiency issues are not addressed in a constructive manner, and Government does not give sustained support for the policy of full cost recovery. Future Government investment budgets will be under increasing pressure from other public sectors; therefore, it is crucial that there is a phased introduction of private sector participation and effective promotion of community-based systems particularly for peri-urban and disadvantaged communities.

The environmental risks for water supply are mainly related to any waste product from the water treatment process and construction operations. These risks can be mitigated if there is an effective parallel programme to deal with municipal and industrial wastewater.

Assumptions:

- Materials used for construction of new systems will give the assumed working lives.
- Construction of new systems is adequately supervised so as to minimise future operation and maintenance.
- Technical skills will be adequate to enable the efficient and effective O&M of the water systems.
- The operating utility will be able to run the water supply function without political interference.
- Full cost recovery is affordable.
- Environmental risks can be successfully mitigated.

**Rajshahi Bulk Water Supply and Distribution Systems**

Ref :

**MC 005**

Cluster :	Major Cities	Region(s) :	NW			
Focus/Foci :	Water Supplies	Location :	Rajshahi City			
Start Year <sup>1</sup> :	2003	Duration <sup>2</sup> :	23 year(s)	Agency(s) Responsible :	RCC	(Lead)
					None	(Supporting)
Short Description :	Water allocation for domestic and municipal use is the first priority under the NWPo. This programme, which responds to both the NWPo and the National Policy for Safe Water Supply and Sanitation (NPSWSS), aims to address the need for "...safe and affordable drinking water supplies through various means..." for all inhabitants, especially the urban poor (NWPo \$4.6.a). The population of Rajshahi is expected to tripple over the next 25 years, from 0.7 million in 2000 to 2.3 million in 2025. At present, only 40% of the population is served by the main public water supply system, the rest being dependant on unreliable and increasingly polluted local sources. This programme deals with the massive task of rehabilitation, improvement and extension of the city's water supply systems in order to raise and sustain coverage levels at 100% by 2010. It will be accomplished through the development of new wellfields, improvement and expansion of the existing DTW-fed system, and the introduction of safe hand-pumps fed by small DTW systems in peri-urban and poor communities.					

**MIS Links**

Cost Calculation :	MC Programme costing.xls	Map :	MC 005 Map.jpg
Disb't Schedule :	MC Programme costing.xls	Description :	MC 005 PgP.doc

**Finance**

Finance			Funding (%)		Expected by																																																
	Costs	Private	GoB	Beneficiaries	ProgrammeYear																																																
Total Capital <sup>3</sup>	5,087.00 MTk	30%	65%	5%	23																																																
Ultimate Recurring	754.60 MTk/yr	n/a	50%	50%	26																																																
Date of Data :	31 07 01	Stacked Cumulative Cash Flow Chart																																																			
	(dd) (mm) (yy)	<div>Cost (MTk)</div> <div><div>● Investment</div><div>○ Recurring</div><div>— Total</div></div> <table border="1"><caption>Approximate Data for Stacked Cumulative Cash Flow Chart</caption><thead><tr><th>Programme Years</th><th>Investment (MTk)</th><th>Recurring (MTk)</th><th>Total (MTk)</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>5</td><td>~500</td><td>~500</td><td>~1000</td></tr><tr><td>10</td><td>~1000</td><td>~1000</td><td>~2000</td></tr><tr><td>15</td><td>~2000</td><td>~2000</td><td>~4000</td></tr><tr><td>20</td><td>~3000</td><td>~3000</td><td>~6000</td></tr><tr><td>25</td><td>~4000</td><td>~4000</td><td>~8000</td></tr><tr><td>30</td><td>~4500</td><td>~6500</td><td>~11000</td></tr><tr><td>35</td><td>~4500</td><td>~9000</td><td>~13500</td></tr><tr><td>40</td><td>~4500</td><td>~11500</td><td>~16000</td></tr><tr><td>45</td><td>~4500</td><td>~14000</td><td>~18500</td></tr><tr><td>50</td><td>~4500</td><td>~16500</td><td>~21000</td></tr></tbody></table>				Programme Years	Investment (MTk)	Recurring (MTk)	Total (MTk)	0	0	0	0	5	~500	~500	~1000	10	~1000	~1000	~2000	15	~2000	~2000	~4000	20	~3000	~3000	~6000	25	~4000	~4000	~8000	30	~4500	~6500	~11000	35	~4500	~9000	~13500	40	~4500	~11500	~16000	45	~4500	~14000	~18500	50	~4500	~16500	~21000
Programme Years	Investment (MTk)	Recurring (MTk)	Total (MTk)																																																		
0	0	0	0																																																		
5	~500	~500	~1000																																																		
10	~1000	~1000	~2000																																																		
15	~2000	~2000	~4000																																																		
20	~3000	~3000	~6000																																																		
25	~4000	~4000	~8000																																																		
30	~4500	~6500	~11000																																																		
35	~4500	~9000	~13500																																																		
40	~4500	~11500	~16000																																																		
45	~4500	~14000	~18500																																																		
50	~4500	~16500	~21000																																																		
Status :	Identified																																																				
Financial Base Year:	mid-2000																																																				
Planned Expenditure (to date) :	0 MTk																																																				
Actual Expenditure <sup>4</sup> (to date) :	0 MTk																																																				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Uncollected water fees reduced to 10% of due	• DPHE records	NYD
• Sustainable operation and maintenance of city water supply systems	• Frequency of service breaks • Response times	NYD
• Reduced incidence of water borne or water related disease	• Public health records • Water quality	NYD
• 100% of Rajshahi's population have access to formal water supplies	• Survey Reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	MC 005
Title	Rajshahi Bulk Water Supply and Distribution Systems

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years <sup>1</sup>	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

### Technical Assistance

Expatriate consultants (all-in rate)  
 Senior National consultants (all-in rate)  
 Mid-level National consultants (all-in rate)  
 Sub-totals  
 Other general TA programme costs  
 Specific other TA programme costs  
**Total TA Costs**

TA costs for this programme are included in the capital costs

### Investment items - short term

FM hand pump (local Tara) with new HTW	Is	na		17.0	13.5%	2.3
Mini Tara in existing HTW	Is	na		35.0	13.4%	4.7
Urban piped supply from DTW + IRP	Is	na		512.0	12.7%	65.0
Peri-urban mini DTW +IRP + distribution	Is	na		63.0	21.2%	13.4

### Investment items - term

FM hand pump (local Tara) with new HTW	Is	na		5.0	13.5%	0.7
Urban piped supply from DTW + IRP	Is	na		546.0	13.4%	73.2
Peri-urban mini DTW +IRP + distribution	Is	na		182.0	21.2%	38.6
DTW well field supply	Is	na		193.0	13.0%	25.1

### Investment items - short term

Urban piped supply from DTW + IRP	Is	na		1,393.0	12.7%	176.9
Peri-urban mini DTW +IRP + distribution	Is	na		754.0	21.2%	159.8
DTW well field supply	Is	na		587.0	13.0%	76.3
<b>Total Investment Items</b>				<b>4,287.0</b>	<b>14.8%</b>	<b>635.9</b>

<b>Overall Costs of meeting demands accruing during NWMP timeframe</b>	<b>4,287.0</b>	<b>635.9</b>
<b>Additional NWMP provision to maintain capacity ahead of demand</b>	<b>800.0</b>	<b>118.7</b>
	<b>5,087.0</b>	<b>754.6</b>

Notes	1	The step-wise approach to investment necessary to achieve and maintain installed capacity ahead of demands may mean that the total investment against +25 year demand is disbursed within the 25 year horizon. However, an additional provision will also be disbursed before the end of the 25 year, in order again to keep capacity ahead of ongoing demand increases.
-------	---	--

Rajshahi Water Supply			Coverage Targets (%)				
Option	Description	Total Annual Cost (Tk/m <sup>3</sup> )	2000	2005	2010	2025	2050
	Total population		700,000	960,000	1,200,000	2,300,000	4,000,000
N3.2.2	FM hand pump (local Tara) with new HTW	1.33	0%	10%	10%	0%	0%
N3.2.3	Mini Tara in existing HTW	2.65	0%	10%	5%	0%	0%
N3.6.1	Rural mini DTW + IRP + distribution	5.12	0%	0%	0%	0%	0%
N3.6.2	Rural mini DTW + distribution	4.02	0%	0%	0%	0%	0%
N3.13.4	SW supply for Rajshahi	9.26	0%	0%	0%	0%	2%
N3.10.1	Urban piped supply from DTW + IRP	5.73	40%	55%	65%	60%	78%
N3.10.2	Urban piped supply from DTW	3.51	0%	0%	0%	0%	0%
N3.11.1	Peri urban mini DTW + IRP +distribution	6.11	0%	5%	15%	30%	15%
N3.12	Community level WS (slum)	8.32	0%	0%	0%	0%	0%
N3.14	DTW wellfield supply for cities	5.47	0%	0%	5%	10%	5%
			40%	80%	100%	100%	100%

Rajshahi Water Supply		Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	700,000	960,000	1,200,000	2,300,000	4,000,000
N3.2.2	FM hand pump (local Tara) with new HTW	0	96,000	120,000	0	0
N3.2.3	Mini Tara in existing HTW	0	96,000	60,000	0	0
N3.6.1	Rural mini DTW + IRP + distribution	0	0	0	0	0
N3.6.2	Rural mini DTW + distribution	0	0	0	0	0
N3.13.4	SW supply for Rajshahi	0	0	0	0	80,000
N3.10.1	Urban piped supply from DTW + IRP	280,000	528,000	780,000	1,380,000	3,120,000
N3.10.2	Urban piped supply from DTW	0	0	0	0	0
N3.11.1	Peri urban mini DTW + IRP +distribution	0	48,000	180,000	690,000	600,000
N3.12	Community level WS (slum)	0	0	0	0	0
N3.14	DTW wellfield supply for cities	0	0	60,000	230,000	200,000
		280,000	768,000	1,200,000	2,300,000	4,000,000

Rajshahi Water Supply		Incremental Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	700,000	960,000	1,200,000	2,300,000	4,000,000
N3.2.2	FM hand pump (local Tara) with new HTW		96,000	24,000	-120,000	0
N3.2.3	Mini Tara in existing HTW		96,000	-36,000	-60,000	0
N3.6.1	Rural mini DTW + IRP + distribution		0	0	0	0
N3.6.2	Rural mini DTW + distribution		0	0	0	0
N3.13.4	SW supply for Rajshahi		0	0	0	80,000
N3.10.1	Urban piped supply from DTW + IRP		248,000	252,000	600,000	1,740,000
N3.10.2	Urban piped supply from DTW		0	0	0	0
N3.11.1	Peri urban mini DTW + IRP +distribution		48,000	132,000	510,000	-90,000
N3.12	Community level WS (slum)		0	0	0	0
N3.14	DTW wellfield supply for cities		0	60,000	170,000	-30,000
			488,000	432,000	1,100,000	1,700,000

Rajshahi Water Supply		Incremental Investment Requirements - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	700,000	960,000	1,200,000	2,300,000	4,000,000
N3.2.2	FM hand pump (local Tara) with new HTW		96,000	24,000	0	0
N3.2.3	Mini Tara in existing HTW		96,000	0	0	0
N3.6.1	Rural mini DTW + IRP + distribution		0	0	0	0
N3.6.2	Rural mini DTW + distribution		0	0	0	0
N3.13.4	SW supply for Rajshahi		0	0	0	80,000
N3.10.1	Urban piped supply from DTW + IRP		248,000	252,000	600,000	1,740,000
N3.10.2	Urban piped supply from DTW		0	0	0	0
N3.11.1	Peri urban mini DTW + IRP +distribution		48,000	132,000	510,000	0
N3.12	Community level WS (slum)		0	0	0	0
N3.14	DTW wellfield supply for cities		0	60,000	170,000	0
			488,000	468,000	1,280,000	1,820,000

Rajshahi Water Supply		Incremental Investment Requirements - Capital Costs					
Option	Description	Unit Capital Cost Tk/capita	2000	2005	2010	2025	2050
	Total population		700,000	960,000	1,200,000	2,300,000	4,000,000
				TkM	TkM	TkM	TkM
N3.2.2	FM hand pump (local Tara) with new HTW	180		17	5	0	0
N3.2.3	Mini Tara in existing HTW	360		35	0	0	0
N3.6.1	Rural mini DTW + IRP + distribution	526		0	0	0	0
N3.6.2	Rural mini DTW + distribution	386		0	0	0	0
N3.13.4	SW supply for Rajshahi	4250		0	0	0	425
N3.10.1	Urban piped supply from DTW + IRP	2063		512	546	1,393	4,487
N3.10.2	Urban piped supply from DTW	1080		0	0	0	0
N3.11.1	Peri urban mini DTW + IRP +distribution	1314		63	182	754	0
N3.12	Community level WS (slum)	55		0	0	0	0
N3.14	DTW wellfield supply for cities	3070		0	193	587	0
	<b>Total Incremental Capital Cost</b>			<b>627</b>	<b>926</b>	<b>2,734</b>	<b>4,912</b>
	<b>Total Cumulative Capital Cost</b>			<b>627</b>	<b>1,552</b>	<b>4,286</b>	<b>9,198</b>



**Dhaka Sanitation and Sewerage System**

Ref: MC 006

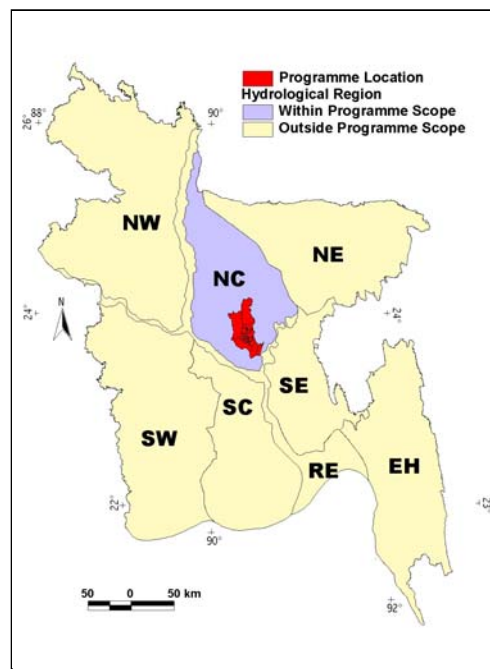
**Basic Data**NWMP Sub-sector      **Major Cities**Region(s)              **North Central  
Dhaka SMA****Relevance to NWPo**

The programme will address basic policy objectives to provide hygienic and affordable sanitation and sewerage services for all the inhabitants of Dhaka, especially the poor and disadvantaged communities in the city. The NWPo “mandates relevant public water and sewerage institutions to provide necessary drainage and sanitation, including treatment of domestic wastewater and sewage and replacement of open drains and construction of sewers, in the interest of public health”, “...regulate the use of water for preventing wastage and pollution by human action”, and “...create awareness among people in checking water pollution and wastage.” The NPSWSS reinforces these aims by highlighting the need for basic sanitation facilities, public health implications, environmental impacts and the importance of promoting social awareness through behavioural development and hygiene education especially for women and children. Policy also mandates that investments to improve and extend sanitation and sewerage services in the major cities should be paralleled by appropriate and substantive institutional and financial reform to attain:

- (a) significant improvements in service efficiency and financial viability of existing institutions;
- (b) private sector participation;
- (c) stakeholder consultation, particularly in peri-urban and poor communities; and
- (d) full cost recovery, particularly in the application of the “polluter-pays” principle.

**Purpose of Programme**

Dhaka is expected to become one of the world’s megacities, with the population increasing five-fold in the next 50 years from nearly 9 million in 2000 to 27 million in 2025 and 50 million by 2050. The expansion will put immense pressure on all public services and infrastructure, especially the need for appropriate sanitation and sewerage services for all inhabitants. At present, about 68% of Dhaka’s population is served by adequate sanitation facilities, of whom 35% depend on pit latrines, 1% on community facilities and 32% on waterborne sewerage systems with and without sewage treatment. The main public sewerage system is in poor condition and inadequately maintained. Most of the wastewater seeps into the ground or local surface water courses without ever reaching the sewage treatment plant at Pagla. In the slum areas, more than 80% of the poor rely on “hanging latrines” (often over the nearest water course) or have no basic sanitation at all. Against this background, pollution levels will continue to rise leading to serious public health problems and the increased likelihood of epidemic outbreaks of waterborne and water-related diseases.



The investment programme will require sustained commitment to provide appropriate sanitation facilities for all inhabitants to raise service coverage to 98% by 2010 and 100% by 2025. Initial investment packages are expected to focus on raising the standards of basic sanitation (hygienic latrines and community facilities), especially for the urban poor, coupled with a concerted effort to rehabilitate the existing waterborne sewerage system. This would be followed by sustained development of affordable smallbore sewerage systems and further expansion of the main sewerage system.

### Programme Outline

Improvements and extensions of appropriate and affordable sanitation and waterborne sewerage systems will continue throughout the implementation of the NWMP. The coverage targets by service type are summarised as follows:

Component	2000	2005	2010	2025
Population (million)	8.8	11.7	14.9	26.8
Sanitation coverage (%)				
Pit latrine	15	20	15	5
HH latrine with septic tank	20	30	25	15
Community sanitation facility	1	7	15	10
Smallbore sewerage system	2	3	8	30
Sewerage system with WWTP	30	33	35	40
Total	68	93	98	100

### Financing Arrangements

For effective sustained implementation, the investment programme will require the active and co-ordinated participation of the public sector (GoB and international development agencies), private sector (domestic and foreign, the latter in the medium to long term), and community based organisations with the support of NGOs. Indicative financing targets are presented below:

Sector	%
Public (GoB and international development agencies)	75
Private (domestic and foreign)	20
Local Communities	5
Total	100

The Government and the executing agencies will also need to ensure the availability of adequate funds for:

- (a) rehabilitation/replacement of existing sanitation and sewerage facilities;
- (b) capital replacement during and after the NWMP period; and
- (c) effective operations and maintenance. In this context, the establishment of full cost recovery pricing will be essential.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Sustainable operation and maintenance of town sanitation systems	I1	• Frequency of service break downs	2011
• Reduced environmental pollution	I2	• Response times	2016
• Improved public health	I3	• Fæcal coliform counts	2021
• 100% of Dhaka's population have access to sanitation facilities	K	• Public health statistics	2026
• Demand for sanitation facilities and services created and satisfied in the Statistical Metropolitan Areas	D	• Survey reports	2026
		• % service coverage verified by survey	2026

## Institutional Arrangements

The institutional arrangements for programme implementation are expected to comprise three components:

- (a) Public sector - DWASA will retain prime responsibility in the short to medium term with the support of GoB and international development agencies. Much greater emphasis will be given to increased autonomy and management expertise, organisational reform, service coverage and efficiency, full cost recovery and financial viability.
- (b) Private sector participation - in the medium to longer term, the private sector is expected to play an increasing role in the provision of sanitation and sewerage services for Dhaka. This will include: contract services (e.g. operation and maintenance of specific facilities, revenue billing and collection, etc.); BOT/BOOT schemes (e.g. wastewater treatment plants); and full private concessions for the main sewerage system of the city. In partnership with community based organisations, the private sector will also be expected to play a leading role in the development and operation of peri-urban sanitation and smallbore sewerage systems.
- (c) Community-based and NGO participation - in the peri-urban and disadvantaged areas, community-based sanitation and smallbore sewerage schemes will be encouraged with investment funds from GoB, and the collaboration of NGOs and the private sector.

The implementation of these institutional developments will need to be carefully formulated and programmed with the full political commitment of GoB and interested stakeholders. In the short to medium term, the Government will also establish an appropriate independent Regulatory Framework to supervise and monitor public and private sector performance in the provision of sanitation and sewerage services.

## Existing Documentation

- (a) Chapter 8, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

## Linkages

The programme to improve and develop sanitation and sewerage facilities for Dhaka will need to be co-ordinated with other NWMP programmes, namely:

- (a) Independent Regulatory Bodies for the Water Supply and Sanitation Service Sector (ID 002);
- (b) Support to the Preparation of New Legislation (EE 001);
- (c) Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);

- (d) Regulatory and Economic Instruments (EE 005);
- (e) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (f) Raising Public Awareness in the Wise Use and Management of Water (EE 010);
- (g) Private Sector Participation in Water Management (EE 011);
- (h) Alternative Financing Methods for Water Management (EE 013);
- (i) Dhaka Bulk Water Supply and Distribution Systems (MC 002);
- (a) Dhaka Flood Protection (MC 010);
- (b) Dhaka Stormwater Drainage (MC 011);
- (c) National Clean-up of Existing Industrial Pollution (EA002);
- (d) National Pollution Control Plan (EA 001);
- (e) National Water Quality Monitoring (EA 003); and
- (f) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

The Inventory and Asset Management Plan of the Water and Sanitation Sector (MC 001) is also relevant here.

In addition, planning and implementation should be co-ordinated with Dhaka City Corporation (DCC), Rajdhani Unnayan Kartripakkha (RAJUK) on city planning, Bangladesh Water Development Board (BWDB), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO and other interested parties.

## **Risks and Assumptions**

### *Risks:*

There are a number of important risks associated with a sustained development programme for the provision of adequate sanitation and sewerage services in Dhaka. They fall into three main categories: institutional; financial and environmental.

The institutional risks focus mainly on the political willingness and commitment to reform the organisation and management of the City's sanitation services through a concerted drive to improve efficiency, involve the private sector, and promote effective user participation. National policy statements (NWPo and NPSWSS) clearly indicate that Government is aware of the problems, but it will need real political commitment to create an independent structure which is solely dedicated to the provision of effective and efficient sanitation services for all inhabitants.

The financial risks are that the necessary investment and maintenance resources for Dhaka will become increasingly constrained, especially from international sources, if the institutional and efficiency issues are not addressed in a constructive manner, and Government does not give sustained support for the policy of full cost recovery. Future Government investment budgets will be under increasing pressure from other public sectors; therefore, it is crucial that there is a phased introduction of private sector participation and effective promotion of community-based systems particularly for peri-urban and disadvantaged communities.

The environmental risks are mainly related to the increasing volumes of untreated wastewater, associated public health risks and environmental degradation in the city and downstream to the coastal areas.

Dhaka is the capital city and should offer constructive leadership to the rest of the country. The risks of inaction are too great for the Government not to implement the mandates of its own policy statements.

*Assumptions:*

- Materials used for construction of new systems will give the assumed working lives.
- Construction of new systems is adequately supervised so as to minimise future operation and maintenance.
- Technical skills will be adequate to enable the efficient and effective O & M of the sanitation systems.
- The operating utility will be able to provide sanitation services without political interference.
- Full cost recovery is affordable.
- Environmental risks can be successfully mitigated.

**Dhaka Sanitation and Sewerage Systems**

Ref :

**MC 006**

Cluster :	<b>Major Cities</b>	Region(s) :	<b>NC</b>
Focus/Foci :	<b>Sanitation</b>	Location :	<b>Dhaka City</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>24 year(s)</b>
		Agency(s) :	<b>DWASA</b> (Lead)
		Responsible :	None (Supporting)
Short Description :	The NWPo "mandates relevant public water and sewerage institutions to provide necessary drainage and sanitation, including treatment of domestic wastewater and sewage and replacement of open drains and construction of sewers, in the interest of public health." (NWPo §4.6.c). The population of Dhaka is expected to treble over the next 25 years, from 9 million in 2000 to 27 million in 2025. At present, about 68% of the population is adequately served by sanitation facilities. The main public sewerage system is in poor condition and is inadequately maintained, and as such is likely to exacerbate pollution and public health problems and increase the likelihood of epidemic outbreaks of waterborne and water-related diseases. This programme aims to ensure that by 2010, there are appropriate sanitation facilities for 98% of the city's population.		

<b>MIS Links</b>	Cost Calculation :	MC Programme costing.xls	Map :	MC 006 Map.jpg
	Disb't Schedule :	MC Programme costing.xls	Description :	MC 006 PgP.doc

<b>Finance</b>	Costs	Private	Funding (%)	Expected by	
			GoB	Beneficiaries	ProgrammeYear
Total Capital <sup>3</sup>	<b>89,676.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>24</b>
Ultimate Recurring	<b>9,435.80</b> MTk/yr	<b>n/a</b>	<b>50%</b>	<b>50%</b>	<b>26</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Sustainable operation and maintenance of town sanitation systems	• Frequency of service break downs • Response times	NYD
• Reduced environmental pollution	• Faecal coliform counts	NYD
• Improved public health	• Public health statistics	NYD
• 100% of Dhaka's population have access to sanitation facilities	• Survey reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	<b>MC 006</b>
Title	<b>Dhaka Sanitation and Sewerage Systems</b>

*Assumptions:*

Taka/US\$	51.000	TA duration	<b>0.0</b>	years <sup>1</sup>	All prices in mid-2000 values
		Investment duration	25.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)							
Senior National consultants (all-in rate)							
Mid-level National consultants (all-in rate)							
Sub-totals							
Other general TA programme costs							
Specific other TA programme costs							
<b>Total TA Costs</b>							
<b>Investment items - short term</b>							
Standard single pit latrine					205.0	22.5%	46.1
Household latrine with septic tank and soakaway facility					748.0	18.8%	140.6
Large septic tank + soakaway					204.0	13.4%	27.3
Community level sanitation facility					867.0	21.3%	184.7
Small bore sewerage system with street level septic tanks					432.0	102.0%	440.6
Main sewerage system					8,274.0	8.9%	736.4
<b>Investment items - term</b>							
Household latrine with septic tank and soakaway facility					89.0	1.8%	1.6
Large septic tank + soakaway					445.0	13.4%	59.6
Community level sanitation facility					1,573.0	21.3%	335.0
Small bore sewerage system with street level septic tanks					1,016.0	10.2%	103.6
Small bore sewerage system with household septic tanks					939.0	10.5%	98.6
Main sewerage system					9,536.0	8.9%	848.7
<b>Investment items - short term</b>							
Household latrine with septic tank and soakaway facility					126.0	18.8%	23.7
Community level sanitation facility					2,071.0	21.3%	441.1
Small bore sewerage system with street level septic tanks					5,355.0	10.2%	546.2
Small bore sewerage system with household septic tanks					11,054.0	10.5%	1,160.7
Main sewerage system					41,742.0	8.9%	3,715.0
<b>Total Investment Items</b>					<b>84,676.0</b>	<b>10.5%</b>	<b>8,909.7</b>
<b>Overall Costs of meeting demands accruing during NWMP timeframe</b>							
					<b>84,676.0</b>		<b>8,909.7</b>
<b>Additional NWMP provision to maintain capacity ahead of demand</b>							
					5,000.0		526.1
					<b>89,676.0</b>		<b>9,435.8</b>

Notes            1        The step-wise approach to investment necessary to achieve and maintain installed capacity ahead of demands may mean that the total investment against +25 year demand is disbursed within the 25 year horizon. However, an additional provision will also be disbursed before the end of the 25 year, in order again to keep capacity ahead of ongoing demand increases.

# Dhaka Sanitation

Option	Description	Total Annual Cost (Tk/capita)	Coverage Targets (%)				
			2000	2005	2010	2025	2050
	Total population		8,800,000	11,720,000	14,900,000	26,800,000	50,000,000
N4.1	Facility for Night-soil Collection and Treatment	109	0%	0%	0%	0%	0%
N4.2.1	Standard Single Pit Latrine	45	15%	20%	15%	5%	0%
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	80	20%	30%	25%	15%	5%
N4.3	Large Septic Tank + Soakaway	117	0%	2%	5%	0%	0%
N4.4	Community Level Sanitation Facility	370	1%	5%	10%	10%	5%
N4.5.3	Small Bore Sewerage System with Street-Level Septic Tanks (Dhaka)	250	2%	3%	5%	10%	15%
N4.6.3	Small Bore Sewerage System with Household Septic Tanks (Dhaka)	210	0%	0%	3%	20%	30%
N4.7.1	Main Sewerage System - Dhaka	600	30%	33%	35%	40%	45%
			<b>68%</b>	<b>93%</b>	<b>98%</b>	<b>100%</b>	<b>100%</b>

# Dhaka Sanitation

Option	Description	Coverage Targets - Number of Population				
		2000	2005	2010	2025	2050
	Total population	8,800,000	11,720,000	14,900,000	26,800,000	50,000,000
N4.1	Facility for Night-soil Collection and Treatment	0	0	0	0	0
N4.2.1	Standard Single Pit Latrine	1,320,000	2,344,000	2,235,000	1,340,000	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	1,760,000	3,516,000	3,725,000	4,020,000	2,500,000
N4.3	Large Septic Tank + Soakaway	0	234,400	745,000	0	0
N4.4	Community Level Sanitation Facility	88,000	586,000	1,490,000	2,680,000	2,500,000
N4.5.3	Small Bore Sewerage System with Street-Level Septic Tanks (Dhaka)	176,000	351,600	745,000	2,680,000	7,500,000
N4.6.3	Small Bore Sewerage System with Household Septic Tanks (Dhaka)	0	0	447,000	5,360,000	15,000,000
N4.7.1	Main Sewerage System - Dhaka	2,640,000	3,867,600	5,215,000	10,720,000	22,500,000

# Dhaka Sanitation

Option	Description	Incremental Coverage Targets - Number of Population				
		2000	2005	2010	2025	2050
	Total population	8,800,000	11,720,000	14,900,000	26,800,000	50,000,000
N4.1	Facility for Night-soil Collection and Treatment		0	0	0	0
N4.2.1	Standard Single Pit Latrine		1,024,000	-109,000	-895,000	-1,340,000
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility		1,756,000	209,000	295,000	-1,520,000
N4.3	Large Septic Tank + Soakaway		234,400	510,600	-745,000	0
N4.4	Community Level Sanitation Facility		498,000	904,000	1,190,000	-180,000
N4.5.3	Small Bore Sewerage System with Street-Level Septic Tanks (Dhaka)		175,600	393,400	1,935,000	4,820,000
N4.6.3	Small Bore Sewerage System with Household Septic Tanks (Dhaka)		0	447,000	4,913,000	9,640,000
N4.7.1	Main Sewerage System - Dhaka		1,227,600	1,347,400	5,505,000	11,780,000

# Dhaka Sanitation

Option	Description	Incremental Investment Requirements - Number of Population				
		2000	2005	2010	2025	2050
	Total population	8,800,000	11,720,000	14,900,000	26,800,000	50,000,000
N4.1	Facility for Night-soil Collection and Treatment		0	0	0	0
N4.2.1	Standard Single Pit Latrine		1,024,000	0	0	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility		1,756,000	209,000	295,000	0
N4.3	Large Septic Tank + Soakaway		234,400	510,600	0	0
N4.4	Community Level Sanitation Facility		498,000	904,000	1,190,000	0
N4.5.3	Small Bore Sewerage System with Street-Level Septic Tanks (Dhaka)		175,600	393,400	1,935,000	4,820,000
N4.6.3	Small Bore Sewerage System with Household Septic Tanks (Dhaka)		0	447,000	4,913,000	9,640,000
N4.7.1	Main Sewerage System - Dhaka		1,227,600	1,347,400	5,505,000	11,780,000

# Dhaka Sanitation

Option	Description	Unit Capital Cost Tk/capita	Incremental Investment Requirements - Capital Costs				
			2000	2005	2010	2025	2050
	Total population		8,800,000	11,720,000	14,900,000	26,800,000	50,000,000
N4.1	Facility for Night-soil Collection and Treatment	790		0	0	0	0
N4.2.1	Standard Single Pit Latrine	200		205	0	0	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	426		748	89	126	0
N4.3	Large Septic Tank + Soakaway	872		204	445	0	0
N4.4	Community Level Sanitation Facility	1740		867	1,573	2,071	0
N4.5.3	Small Bore Sewerage System with Street-Level Septic Tanks (Dhaka)	2460		432	1,016	5,355	14,822
N4.6.3	Small Bore Sewerage System with Household Septic Tanks (Dhaka)	2000		0	939	11,054	24,100
N4.7.1	Main Sewerage System - Dhaka	6740		8,274	9,536	41,742	99,247
<b>Total Incremental Capital Cost</b>				<b>10,730</b>	<b>13,598</b>	<b>60,347</b>	<b>138,168</b>
<b>Total Cumulative Capital Cost</b>				<b>10,730</b>	<b>24,327</b>	<b>84,675</b>	<b>222,843</b>



**Chittagong Sanitation and Sewerage System**

Ref: MC 007

**Basic Data**

NWMP Sub-sector	<b>Major Cities</b>
Region(s)	<b>Eastern Hills Chittagong SMA</b>

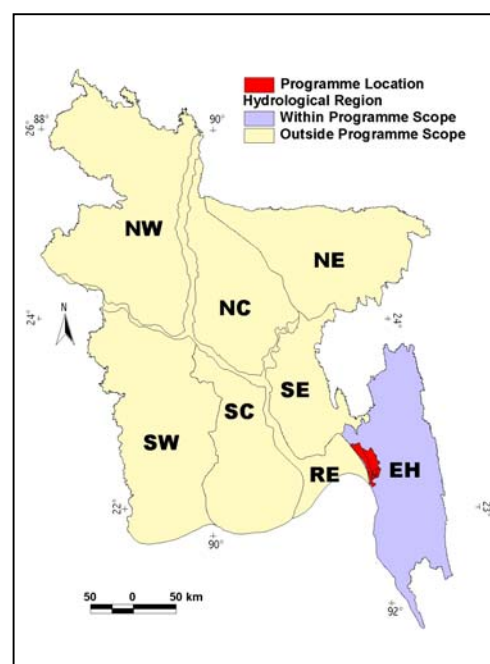
**Relevance to NWPo**

The programme will address basic policy objectives to provide hygienic and affordable sanitation and sewerage services for all the inhabitants of Chittagong, especially the poor and disadvantaged communities in the city. The NWPo “mandates relevant public water and sewerage institutions to provide necessary drainage and sanitation, including treatment of domestic wastewater and sewage and replacement of open drains and construction of sewers, in the interest of public health”, “...regulate the use of water for preventing wastage and pollution by human action”, and “...create awareness among people in checking water pollution and wastage.” The NPSWSS reinforces these aims by highlighting the need for basic sanitation facilities, public health implications, environmental impacts and the importance of promoting social awareness through behavioural development and hygiene education especially for women and children. Policy also mandates that investments to improve and extend sanitation and sewerage services in the major cities should be paralleled by appropriate and substantive institutional and financial reform to attain:

- (a) significant improvements in service efficiency and financial viability of existing institutions;
- (b) private sector participation;
- (c) stakeholder consultation, particularly in peri-urban and poor communities; and
- (d) full cost recovery, particularly in the application of the “polluter-pays” principle.

**Purpose of Programme**

Chittagong is the second largest city, main commercial port and administrative centre of the eastern portion of the country. The population is projected to increase four-fold in the next 50 years, from 2.5 million in 2000 to 6.1 million in 2025 and 11 million by 2050. The expansion will put increasing pressure on all public services and infrastructure, especially the need for appropriate sanitation and sewerage services for all inhabitants. At present, about 52% of Chittagong’s population is served by adequate basic sanitation facilities: pit latrines, with and without septic tanks, serve 50%; while the other 2% are served by community facilities and a smallbore sewerage system. There is no conventional waterborne sewerage system in the city. In the slums and other disadvantaged areas, more than 95% are dependent on “hanging latrines” and open defecation which creates increasing public health and pollution problems, and the likelihood of epidemic outbreaks of waterborne and water-related diseases.



The investment programme will require sustained commitment to provide appropriate sanitation facilities for all inhabitants to raise and sustain service coverage at 100% by 2010. Initial investment packages are expected to focus on raising the standards of basic sanitation (hygienic latrines and community facilities), especially for the urban poor, coupled with a concerted effort to improve and extend the smallbore sewerage system. In the medium to longer term, a conventional waterborne sewerage system will be developed to serve up to 15% of the population by 2025.

### Programme Outline

Improvements and extensions of appropriate and affordable sanitation and waterborne sewerage systems will continue throughout the implementation of the NWMP. The coverage targets by service type are summarised as follows:

Component	2000	2005	2010	2025
Population (million)	2.5	3.1	3.7	6.1
Sanitation coverage (%)				
Pit latrine	20	40	25	5
HH latrine with septic tank	30	35	40	35
Community sanitation facility	1	10	20	15
Smallbore sewerage system	1	2	10	30
Sewerage system with WWTP	0	0	5	15
Total	52	87	100	100

### Financing Arrangements

For effective sustained implementation, the investment programme will require the active and co-ordinated participation of the public sector (GoB and international development agencies), private sector (domestic and foreign, the latter in the medium to long term), and community based organisations with the support of NGOs. Indicative financing targets are presented below:

Sector	%
Public (GoB and international development agencies)	75
Private (domestic and foreign)	20
Local Communities	5
Total	100

The Government and the executing agencies will also need to ensure the availability of adequate funds for:

- (a) rehabilitation/replacement of existing sanitation and sewerage facilities;
- (b) capital replacement during and after the NWMP period; and
- (c) effective operations and maintenance. In this context, the establishment of full cost recovery pricing will be essential.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Sustainable operation and maintenance of town sanitation systems	I1	• Frequency of service break downs	2011
• Reduced environmental pollution	I2	• Response times	
• Improved public health	I3	• Fæcal coliform counts	2016
• 100% of Chittagong's population have access to sanitation facilities	K	• Public health statistics	2021
		• Survey reports	2026
• Demand for sanitation facilities and services created and satisfied in the Statistical Metropolitan Areas	D	• % service coverage verified by survey	2026

## Institutional Arrangements

The institutional arrangements for programme implementation are expected to comprise three components:

- (a) Public sector - CWASA will retain prime responsibility in the short to medium term with the support of GoB and international development agencies. Much greater emphasis will be given to increased autonomy and management expertise, organisational reform, service coverage and efficiency, full cost recovery and financial viability.
- (b) Private sector participation - in the medium to longer term, the private sector is expected to play an increasing role in the provision of sanitation and sewerage services for Chittagong. This will include: contract services (e.g. operation and maintenance of specific facilities, revenue billing and collection, etc.); BOT/BOOT schemes to develop and manage smallbore sewerage systems; and, in the longer term, private concessions to develop a main sewerage system with wastewater treatment. The smaller schemes will be developed in partnership with community based organisations.
- (c) Community-based and NGO participation - in the peri-urban and disadvantaged areas, community-based sanitation and smallbore sewerage schemes will be encouraged with investment funds from GoB, and the collaboration of NGOs and the private sector.

The implementation of these institutional developments will need to be carefully formulated and programmed with the full political commitment of GoB and interested stakeholders. In the short to medium term, the Government will also establish an appropriate independent Regulatory Framework to supervise and monitor public and private sector performance in the provision of sanitation and sewerage services.

## Existing Documentation

- (a) Chapter 8, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

## Linkages

The programme to improve and develop sanitation and sewerage facilities for Chittagong will need to be co-ordinated with other NWMP programmes, namely:

- (a) Independent Regulatory Bodies for the Water Supply and Sanitation Service Sector (ID 002);
- (b) Support to the Preparation of New Legislation (EE 001);
- (c) Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);

- (d) Regulatory and Economic Instruments (EE 005);
- (e) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (f) Raising Public Awareness in the Wise Use and Management of Water (EE 010);
- (g) Private Sector Participation in Water Management (EE 011);
- (h) Alternative Financing Methods for Water Management (EE 013);
- (i) Chittagong Bulk Water Supply and Distribution Systems (MC 003);
- (j) Chittagong Flood Protection (MC 012);
- (k) Chittagong Stormwater Drainage (MC 013);
- (l) National Clean-up of Existing Industrial Pollution (EA 002);
- (m) National Pollution Control Plan (EA 001);
- (n) National Water Quality Monitoring (EA 003); and
- (o) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

The Inventory and Asset Management Plan of the Water and Sanitation Sector (MC 001) is also relevant here.

In addition, planning and implementation should be co-ordinated with Chittagong City Corporation (CCC), Chittagong Water and Sewerage Authority (CWASA), Bangladesh Water Development Board (BWDB), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO and other interested parties.

## **Risks and Assumptions**

There are a number of important risks associated with a sustained development programme for the provision of adequate sanitation and sewerage services in Chittagong. They fall into three main categories: institutional; financial and environmental.

The institutional risks focus mainly on the political willingness and commitment to reform the organisation and management of the City's sanitation services through a concerted drive to improve efficiency, involve the private sector, and promote effective user participation. National policy statements (NWPo and NPSWSS) clearly indicate that Government is aware of the problems, but it will need real political commitment to create an independent structure which is solely dedicated to the provision of effective and efficient sanitation services for all inhabitants.

The financial risks are that the necessary investment and maintenance resources for Chittagong will become increasingly constrained, especially from international sources, if the institutional and efficiency issues are not addressed in a constructive manner, and Government does not give sustained support for the policy of full cost recovery. Future Government investment budgets will be under increasing pressure from other public sectors; therefore, it is crucial that there is a phased introduction of private sector participation and effective promotion of community-based systems particularly for peri-urban and disadvantaged communities

The environmental risks are mainly related to the increasing volumes of untreated wastewater, associated public health risks and environmental degradation in the city and downstream to the coastal areas.

Assumptions:

- Materials used for construction of new systems will give the assumed working lives.
- Construction of new systems is adequately supervised so as to minimise future operation and maintenance.
- Technical skills will be adequate to enable the efficient and effective O & M of the sanitation systems.
- The operating utility will be able to provide sanitation services without political interference.
- Full cost recovery is affordable.
- Environmental risks can be successfully mitigated.

**Chittagong Sanitation and Sewerage Systems**

Ref :

**MC 007**

Cluster :	<b>Major Cities</b>	Region(s) :	<b>EH</b>																
Focus/Foci :	<b>Sanitation</b>	Location :	<b>Chittagong City</b>																
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>24 year(s)</b>																
		Agency(s) :	<b>CWASA</b> (Lead)																
		Responsible :	None (Supporting)																
Short Description :	The NWPo "mandates relevant public water and sewerage institutions to provide necessary drainage and sanitation, including treatment of domestic wastewater and sewage and replacement of open drains and construction of sewers, in the interest of public health." (NWPo §4.6.c). The population of Chittagong is expected to more than double over the next 25 years, from 2.5 million in 2000 to 6.1 million in 2025. At present, about 52% of the population is adequately served by sanitation facilities, mainly by pit latrines with/without septic tanks. Only one part of the city is served by a smallbore sewerage system which is in poor condition. There is no conventional waterborne sewerage system. In the slums and other disadvantaged areas, more than 95% are dependant on 'hanging latrines' and open defecation which exacerbates pollution and public health problems and increases the likelihood of epidemic outbreaks of waterborne and water-related diseases. This programme aims to raise and sustain appropriate service coverage to 100% of Chittagong inhabitants by 2010.																		
<b>MIS Links</b>	Cost Calculation : MC Programme costing.xls    Map : MC 007 Map.jpg Disb't Schedule : MC Programme costing.xls    Description : MC 007 PgP.doc																		
<b>Finance</b>	<table> <tr> <th>Costs</th><th>Private</th><th>Funding (%)</th><th>Expected by</th></tr> <tr> <th></th><th></th><th>GoB</th><th>Beneficiaries</th></tr> <tr> <td>Total Capital<sup>3</sup></td><td><b>13,979.00</b> MTk</td><td><b>20%</b></td><td><b>75%</b></td></tr> <tr> <td>Ultimate Recurring</td><td><b>1,331.30</b> MTk/yr</td><td><b>n/a</b></td><td><b>50%</b></td></tr> </table>			Costs	Private	Funding (%)	Expected by			GoB	Beneficiaries	Total Capital <sup>3</sup>	<b>13,979.00</b> MTk	<b>20%</b>	<b>75%</b>	Ultimate Recurring	<b>1,331.30</b> MTk/yr	<b>n/a</b>	<b>50%</b>
Costs	Private	Funding (%)	Expected by																
		GoB	Beneficiaries																
Total Capital <sup>3</sup>	<b>13,979.00</b> MTk	<b>20%</b>	<b>75%</b>																
Ultimate Recurring	<b>1,331.30</b> MTk/yr	<b>n/a</b>	<b>50%</b>																
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b> Cost (MTk)    • Investment    ○ Recurring    — Total 																	
Status :	<b>Identified</b>																		
Financial Base Year:	<b>mid-2000</b>																		
Planned Expenditure (to date) :	<b>0</b> MTk																		
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk																		

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Sustainable operation and maintenance of town sanitation systems	• Frequency of service break downs • Response times	NYD
• Reduced environmental pollution	• Faecal coliform counts	NYD
• Improved public health	• Public health statistics	NYD
• 100% of Chittagong's population have access to sanitation facilities	• Survey reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
 5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	MC 007
Title	Chittagong Sanitation and Sewerage Systems

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years <sup>1</sup>	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

### Technical Assistance

Expatriate consultants (all-in rate)  
 Senior National consultants (all-in rate)  
 Mid-level National consultants (all-in rate)  
 Sub-totals  
 Other general TA programme costs  
 Specific other TA programme costs  
**Total TA Costs**

TA costs for this programme are included in the capital costs

### Investment items - short term

Standard single pit latrine			144.0	22.5%	32.4
Household latrine with septic tank and soakaway facility			135.0	18.8%	25.4
Large septic tank + soakaway			133.0	13.4%	17.8
Community level sanitation facility			222.0	21.3%	47.3
Small bore sewerage system with street level septic tanks			85.0	6.3%	5.4

### Investment items - term

Household latrine with septic tank and soakaway facility			176.0	18.8%	33.1
Large septic tank + soakaway			28.0	13.4%	3.8
Community level sanitation facility			700.0	13.4%	93.8
Small bore sewerage system with street level septic tanks			307.0	6.3%	19.3
Small bore sewerage system with household septic tanks			369.0	7.2%	26.6
Main sewerage system			1,282.0	9.1%	116.7

### Investment items - short term

Household latrine with septic tank and soakaway facility			279.0	18.8%	52.5
Large septic tank + soakaway			105.0	13.4%	14.1
Community level sanitation facility			96.0	21.3%	20.4
Small bore sewerage system with street level septic tanks			1,938.0	6.3%	122.1
Small bore sewerage system with household septic tanks			1,560.0	7.2%	112.3
Main sewerage system			5,420.0	9.1%	493.2

<b>Total Investment Items</b>			<b>12,979.0</b>	<b>9.5%</b>	<b>1,236.1</b>
-------------------------------	--	--	-----------------	-------------	----------------

<b>Overall Costs of meeting demands accruing during NWMP timeframe</b>			<b>12,979.0</b>		<b>1,236.1</b>
<b>Additional NWMP provision to maintain capacity ahead of demand</b>			<b>1,000.0</b>		<b>95.2</b>
			<b>13,979.0</b>		<b>1,331.3</b>

Notes	1	The step-wise approach to investment necessary to achieve and maintain installed capacity ahead of demands may mean that the total investment against +25 year demand is disbursed within the 25 year horizon. However, an additional provision will also be disbursed before the end of the 25 year, in order again to keep capacity ahead of ongoing demand increases.
-------	---	--

# Chittagong Sanitation

Chittagong Sanitation		Coverage Targets (%)					
Option	Description	Total Annual Cost (Tk/capita)	2000	2005	2010	2025	2050
	Total population		2,500,000	3,050,000	3,700,000	6,100,000	11,000,000
N4.1	Facility for Night-soil Collection and Treatment	109	0%	0%	0%	0%	0%
N4.2.1	Standard Single Pit Latrine	45	20%	40%	25%	5%	0%
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	80	30%	35%	40%	35%	20%
N4.3	Large Septic Tank + Soakaway	117	0%	5%	5%	5%	5%
N4.4	Community Level Sanitation Facility	370	1%	5%	15%	10%	5%
N4.5.2	Small Bore Sewerage System with Street-Level Septic Tanks (City)	250	1%	2%	5%	15%	15%
N4.6.2	Small Bore Sewerage System with Household Septic Tanks (City)	210	0%	0%	5%	15%	20%
N4.7.2	Main Sewerage System - Chittagong	600	0%	0%	5%	15%	35%
			52%	87%	100%	100%	100%

# Chittagong Sanitation

		Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	2,500,000	3,050,000	3,700,000	6,100,000	11,000,000
N4.1	Facility for Night-soil Collection and Treatment	0	0	0	0	0
N4.2.1	Standard Single Pit Latrine	500,000	1,220,000	925,000	305,000	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	750,000	1,067,500	1,480,000	2,135,000	2,200,000
N4.3	Large Septic Tank + Soakaway	0	152,500	185,000	305,000	550,000
N4.4	Community Level Sanitation Facility	25,000	152,500	555,000	610,000	550,000
N4.5.2	Small Bore Sewerage System with Street-Level Septic Tanks (City)	25,000	61,000	185,000	915,000	1,650,000
N4.6.2	Small Bore Sewerage System with Household Septic Tanks (City)	0	0	185,000	915,000	2,200,000
N4.7.2	Main Sewerage System - Chittagong	0	0	185,000	915,000	3,850,000

# Chittagong Sanitation

		Incremental Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	2,500,000	3,050,000	3,700,000	6,100,000	11,000,000
N4.1	Facility for Night-soil Collection and Treatment		0	0	0	0
N4.2.1	Standard Single Pit Latrine		720,000	-295,000	-620,000	-305,000
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility		317,500	412,500	655,000	65,000
N4.3	Large Septic Tank + Soakaway		152,500	32,500	120,000	245,000
N4.4	Community Level Sanitation Facility		127,500	402,500	55,000	-60,000
N4.5.2	Small Bore Sewerage System with Street-Level Septic Tanks (City)		36,000	124,000	730,000	735,000
N4.6.2	Small Bore Sewerage System with Household Septic Tanks (City)		0	185,000	730,000	1,285,000
N4.7.2	Main Sewerage System - Chittagong		0	185,000	730,000	2,935,000

# Chittagong Sanitation

		Incremental Investment Requirements - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	2,500,000	3,050,000	3,700,000	6,100,000	11,000,000
N4.1	Facility for Night-soil Collection and Treatment		0	0	0	0
N4.2.1	Standard Single Pit Latrine		720,000	0	0	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility		317,500	412,500	655,000	65,000
N4.3	Large Septic Tank + Soakaway		152,500	32,500	120,000	245,000
N4.4	Community Level Sanitation Facility		127,500	402,500	55,000	0
N4.5.2	Small Bore Sewerage System with Street-Level Septic Tanks (City)		36,000	124,000	730,000	735,000
N4.6.2	Small Bore Sewerage System with Household Septic Tanks (City)		0	185,000	730,000	1,285,000
N4.7.2	Main Sewerage System - Chittagong		0	185,000	730,000	2,935,000

# Chittagong Sanitation

Chittagong Sanitation		Incremental Investment Requirements - Capital Costs					
Option	Description	Unit Capital Cost Tk/capita	2000	2005	2010	2025	2050
Total population			2,500,000	3,050,000	3,700,000	6,100,000	11,000,000
				TkM	TkM	TkM	TkM
N4.1	Facility for Night-soil Collection and Treatment	790		0	0	0	0
N4.2.1	Standard Single Pit Latrine	200		144	0	0	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	426		135	176	279	28
N4.3	Large Septic Tank + Soakaway	872		133	28	105	214
N4.4	Community Level Sanitation Facility	1740		222	700	96	0
N4.5.2	Small Bore Sewerage System with Street-Level Septic Tanks (City)	2360		85	307	1,938	2,168
N4.6.2	Small Bore Sewerage System with Household Septic Tanks (City)	1900		0	369	1,560	3,052
N4.7.2	Main Sewerage System - Chittagong	6600		0	1,282	5,420	24,214
Total Incremental Capital Cost				719	2,863	9,398	29,675
Total Cumulative Capital Cost				719	3,582	12,980	42,655



**Khulna Sanitation and Sewerage System**

Ref: MC 008

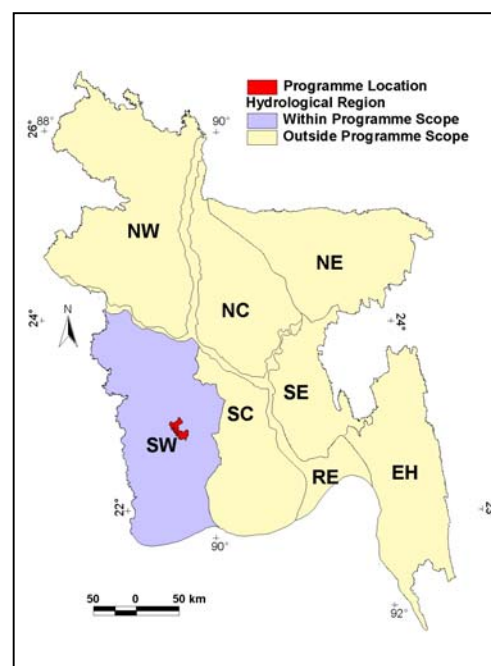
**Basic Data**NWMP Sub-sector      **Major Cities**Region(s)              **South West  
Khulna SMA****Relevance to NWPo**

The programme will address basic policy objectives to provide hygienic and affordable sanitation and sewerage services for all the inhabitants of Khulna, especially the poor and disadvantaged communities in the city. The NWPo “mandates relevant public water and sewerage institutions to provide necessary drainage and sanitation, including treatment of domestic wastewater and sewage and replacement of open drains and construction of sewers, in the interest of public health”, “...regulate the use of water for preventing wastage and pollution by human action”, and “...create awareness among people in checking water pollution and wastage.” The NPSWSS reinforces these aims by highlighting the need for basic sanitation facilities, public health implications, environmental impacts and the importance of promoting social awareness through behavioural development and hygiene education especially for women and children. Policy also mandates that investments to improve and extend sanitation and sewerage services in the major cities should be paralleled by appropriate and substantive institutional and financial reform to attain:

- (a) significant improvements in service efficiency and financial viability of existing institutions;
- (b) private sector participation;
- (c) stakeholder consultation, particularly in peri-urban and poor communities; and
- (d) full cost recovery, particularly in the application of the “polluter-pays” principle.

**Purpose of Programme**

Khulna is the third largest city, commercial and administrative centre of the south west portion of the country. The population is projected to increase four-fold in the next 50 years, from 1.1 million in 2000 to 2.4 million in 2025 and 4 million by 2050. The expansion will put increasing pressure on all public services and infrastructure, especially the need for appropriate sanitation and sewerage services for all inhabitants. At present, about 51% of Khulna’s population is served by adequate basic sanitation facilities: pit latrines, with and without septic tanks, serve 50%; while the other 1% are served by community facilities. There is no conventional waterborne sewerage system in the city. In other areas of the city, including the slums and disadvantaged communities, the population is dependent on “hanging latrines” and open defecation which creates increasing public health and pollution problems, and the likelihood of epidemic outbreaks of waterborne and water-related diseases.



The investment programme will require sustained commitment to provide appropriate sanitation facilities for all inhabitants to raise and sustain service coverage at 100% by 2010. Initial investment packages are expected to focus on raising the standards of basic sanitation (hygienic latrines and community facilities), especially for the urban poor, plus the development of smallbore sewerage systems. In the longer term, a conventional waterborne sewerage system will be developed to serve up to 15% of the population by 2025.

### Programme Outline

Improvements and extensions of appropriate and affordable sanitation and waterborne sewerage systems will continue throughout the implementation of the NWMP. The coverage targets by service type are summarised as follows:

Component	2000	2005	2010	2025
Population (million)	1.1	1.3	1.6	2.4
Sanitation coverage (%)				
Pit latrine	20	50	40	20
HH latrine with septic tank	30	35	40	30
Community sanitation facility	1	5	15	10
Smallbore sewerage system	0	2	5	25
Sewerage system with WWTP	0	0	0	15
Total	51	92	100	100

### Financing Arrangements

For effective sustained implementation, the investment programme will require the active and co-ordinated participation of the public sector (GoB and international development agencies), private sector (domestic and foreign, the latter in the medium to long term), and community based organisations with the support of NGOs. Indicative financing targets are presented below:

Sector	%
Public (GoB and international development agencies)	75
Private (domestic and foreign)	20
Local Communities	5
Total	100

The Government and the executing agencies will also need to ensure the availability of adequate funds for:

- (a) rehabilitation/replacement of existing sanitation and sewerage facilities;
- (b) capital replacement during and after the NWMP period; and
- (c) effective operations and maintenance. In this context, the establishment of full cost recovery pricing will be essential.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Sustainable operation and maintenance of town sanitation systems	I1	• Frequency of service break downs	2012
• Reduced environmental pollution	I2	• Response times	2017
• Improved public health	I3	• Fæcal coliform counts	2022
• 100% of Khulna's population have access to sanitation facilities	K	• Public health statistics	2027
• Demand for sanitation facilities and services created and satisfied in the Statistical Metropolitan Areas	D	• Survey reports	2027
		• % service coverage verified by survey	2027

## Institutional Arrangements

The institutional arrangements for programme implementation are expected to comprise three components:

- Public sector - KCC will retain prime responsibility in the short to medium term with the support of GoB and international development agencies. Much greater emphasis will be given to increased autonomy and management expertise, organisational reform, service coverage and efficiency, full cost recovery and financial viability.
- Private sector participation - in the medium to longer term, the private sector is expected to play an increasing role in the provision of sanitation and sewerage services for Khulna. This will include: contract services (e.g. operation and maintenance of specific facilities, revenue billing and collection, etc.); BOT/BOOT schemes to develop and manage smallbore sewerage systems; and, in the longer term, private concessions to develop a main sewerage system with wastewater treatment. The smaller schemes will be developed in partnership with community based organisations.
- Community-based and NGO participation - in the peri-urban and disadvantaged areas, community-based sanitation and smallbore sewerage schemes will be encouraged with investment funds from GoB, and the collaboration of NGOs and the private sector.

The implementation of these institutional developments will need to be carefully formulated and programmed with the full political commitment of GoB and interested stakeholders. In the short to medium term, the Government will also establish an appropriate independent Regulatory Framework to supervise and monitor public and private sector performance in the provision of sanitation and sewerage services.

## Existing Documentation

- Chapter 8, Development Strategy Report, March 2001
- National Water Resources Database in WARPO

## Linkages

The programme to improve and develop sanitation and sewerage facilities for Khulna will need to be co-ordinated with other NWMP programmes, namely:

- Independent Regulatory Bodies for the Water Supply and Sanitation Service Sector (ID 002);
- Support to the Preparation of New Legislation (EE 001);
- Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);

- (d) Regulatory and Economic Instruments (EE 005);
- (e) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (f) Raising Public Awareness in the Wise Use and Management of Water (EE 010);
- (g) Private Sector Participation in Water Management (EE 011);
- (h) Alternative Financing Methods for Water Management (EE 013);
- (i) Khulna Bulk Water Supply and Distribution Systems (MC 004);
- (j) Khulna Flood Protection (MC 014);
- (k) Khulna Stormwater Drainage (MC 015);
- (l) National Clean-up of Existing Industrial Pollution (EA 002);
- (m) National Pollution Control Plan (EA 001);
- (n) National Water Quality Monitoring (EA 003); and
- (o) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

The Inventory and Asset Management Plan of the Water and Sanitation Sector (MC 001) is also relevant here.

In addition, planning and implementation should be co-ordinated with Khulna City Corporation (KCC), Bangladesh Water Development Board (BWDB), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO and other interested parties.

## **Risks and Assumptions**

There are a number of important risks associated with a sustained development programme for the provision of adequate sanitation and sewerage services in Khulna. They fall into three main categories: institutional; financial and environmental.

The institutional risks focus mainly on the political willingness and commitment to reform the organisation and management of the City's sanitation services through a concerted drive to improve efficiency, involve the private sector, and promote effective user participation. National policy statements (NWPO and NPSWSS) clearly indicate that Government is aware of the problems, but it will need real political commitment to create an independent structure that is solely dedicated to the provision of effective and efficient sanitation services for all inhabitants.

The financial risks are that the necessary investment and maintenance resources for Khulna will become increasingly constrained, especially from international sources, if the institutional and efficiency issues are not addressed in a constructive manner, and Government does not give sustained support for the policy of full cost recovery. Future Government investment budgets will be under increasing pressure from other public sectors; therefore, it is crucial that there is a phased introduction of private sector participation and effective promotion of community-based systems particularly for peri-urban and disadvantaged communities

The environmental risks are mainly related to the increasing volumes of untreated wastewater, associated public health risks and environmental degradation in the city and downstream to the coastal areas.

Assumptions:

- Materials used for construction of new systems will give the assumed working lives.
- Construction of new systems is adequately supervised so as to minimise future operation and maintenance.
- Technical skills will be adequate to enable the efficient and effective O & M of the sanitation systems.
- The operating utility will be able to provide sanitation services without political interference.
- Full cost recovery is affordable.
- Environmental risks can be successfully mitigated.

**Khulna Sanitation and Sewerage Systems**Ref : **MC 008**

Cluster :	Major Cities		Region(s) :	SW	
Focus/Foci :	Sanitation		Location :	Khulna City	
Start Year <sup>1</sup> :	2003	Duration <sup>2</sup> :	23 year(s)	Agency(s) Responsible :	KCC (Lead) None (Supporting)
Short Description :	The NWPo "mandates relevant public water and sewerage institutions to provide necessary drainage and sanitation, including treatment of domestic wastewater and sewage and replacement of open drains and construction of sewers, in the interest of public health." (NWPo §4.6.c). The population of Khulna is expected to double over the next 25 years, from 1.1 million in 2000 to 2.4 million in 2025. At present, about 51% of the population is adequately served by sanitation facilities, mainly by pit latrines with/without septic tanks. In one part of the city there is a smallbore sewerage system which is now defunct. There is no conventional waterborne sewerage system. In the slums and other disadvantaged areas, people are dependant on 'hanging latrines' and open defecation which exacerbates pollution and public health problems and increases the likelihood of epidemic outbreaks of waterborne and water-related diseases. This programme aims to raise and sustain appropriate service coverage to 100% by 2010.				

<b>MIS Links</b>	Cost Calculation :	MC Programme costing.xls	Map :	MC 008 Map.jpg
	Disb't Schedule :	MC Programme costing.xls	Description :	MC 008 PgP.doc

<b>Finance</b>						
	Costs	Private	Funding (%)	Expected by		
			GoB	Beneficiaries	Programme	Year
Total Capital <sup>3</sup>	<b>5,664.00</b> MTk	<b>20%</b>	<b>75%</b>	<b>5%</b>		<b>23</b>
Ultimate Recurring	<b>575.80</b> MTk/yr	<b>n/a</b>	<b>50%</b>	<b>50%</b>		<b>25</b>
Date of Data :	<b>31 07 01</b>	<b>Stacked Cumulative Cash Flow Chart</b>				
	(dd) (mm) (yy)					
Status :	<b>Identified</b>					
Financial Base Year:	<b>mid-2000</b>					
Planned Expenditure (to date) :	<b>0</b> MTk					
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk					

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Sustainable operation and maintenance of town sanitation systems	• Frequency of service break downs • Response times	NYD
• Reduced environmental pollution	• Faecal coliform counts	NYD
• Improved public health	• Public health statistics	NYD
• 100% of Khulna's population have access to sanitation facilities	• Survey reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan Programme Costing Sheet

Programme Ref	MC 008
Title	Khulna Sanitation and Sewerage Systems

## Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years <sup>1</sup>	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

## Technical Assistance

Expatriate consultants (all-in rate)  
Senior National consultants (all-in rate)  
Mid-level National consultants (all-in rate)  
Sub-totals  
Other general TA programme costs  
Specific other TA programme costs

TA costs for this programme are included in the capital costs

## Total TA Costs

## Investment items - short term

Standard single pit latrine		88.0	22.5%	19.8
Household latrine with septic tank and soakaway facility		56.0	18.8%	10.5
Community level sanitation facility		96.0	21.3%	20.4
Small bore sewerage system with street level septic tanks		62.0	6.3%	3.9

## Investment items - term

Household latrine with septic tank and soakaway facility		76.0	18.8%	14.3
Community level sanitation facility		303.0	21.3%	64.5
Small bore sewerage system with street level septic tanks		14.0	6.3%	0.9
Small bore sewerage system with household septic tanks		96.0	7.2%	6.9

## Investment items - short term

Household latrine with septic tank and soakaway facility		34.0	18.8%	6.4
Small bore sewerage system with street level septic tanks		552.0	6.3%	34.8
Small bore sewerage system with household septic tanks		667.0	7.2%	48.0
Main sewerage system		2,620.0	9.3%	243.7
<b>Total Investment Items</b>		<b>4,664.0</b>	<b>10.2%</b>	<b>474.2</b>

<b>Overall Costs of meeting demands accruing during NWMP timeframe</b>	<b>4,664.0</b>	<b>474.2</b>
<b>Additional NWMP provision to maintain capacity ahead of demand</b>	<b>1,000.0</b>	<b>101.7</b>
	<b>5,664.0</b>	<b>575.8</b>

Notes	1	The step-wise approach to investment necessary to achieve and maintain installed capacity ahead of demands may mean that the total investment against +25 year demand is disbursed within the 25 year horizon. However, an additional provision will also be disbursed before the end of the 25 year, in order again to keep capacity ahead of ongoing demand increases.
-------	---	--

Khulna Sanitation		Coverage Targets (%)					
Option	Description	Total Annual Cost (Tk/capita)	2000	2005	2010	2025	2050
	Total population		1,100,000	1,320,000	1,600,000	2,400,000	4,000,000
N4.1	Facility for Night-soil Collection and Treatment	109	0%	0%	0%	0%	0%
N4.2.1	Standard Single Pit Latrine	45	20%	50%	40%	20%	0%
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	80	30%	35%	40%	30%	15%
N4.3	Large Septic Tank + Soakaway	117	0%	0%	0%	0%	0%
N4.4	Community Level Sanitation Facility	370	1%	5%	15%	10%	5%
N4.5.2	Small Bore Sewerage System with Street-Level Septic Tanks (City)	250	0%	2%	2%	10%	25%
N4.6.2	Small Bore Sewerage System with Household Septic Tanks (City)	210	0%	0%	3%	15%	25%
N4.7.3	Main Sewerage System - Khulna	600	0%	0%	0%	15%	30%
			51%	92%	100%	100%	100%

Khulna Sanitation		Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	1,100,000	1,320,000	1,600,000	2,400,000	4,000,000
N4.1	Facility for Night-soil Collection and Treatment	0	0	0	0	0
N4.2.1	Standard Single Pit Latrine	220,000	660,000	640,000	480,000	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	330,000	462,000	640,000	720,000	600,000
N4.3	Large Septic Tank + Soakaway	0	0	0	0	0
N4.4	Community Level Sanitation Facility	11,000	66,000	240,000	240,000	200,000
N4.5.2	Small Bore Sewerage System with Street-Level Septic Tanks (City)	0	26,400	32,000	240,000	1,000,000
N4.6.2	Small Bore Sewerage System with Household Septic Tanks (City)	0	0	48,000	360,000	1,000,000
N4.7.3	Main Sewerage System - Khulna	0	0	0	360,000	1,200,000

Khulna Sanitation		Incremental Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	1,100,000	1,320,000	1,600,000	2,400,000	4,000,000
N4.1	Facility for Night-soil Collection and Treatment		0	0	0	0
N4.2.1	Standard Single Pit Latrine		440,000	-20,000	-160,000	-480,000
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility		132,000	178,000	80,000	-120,000
N4.3	Large Septic Tank + Soakaway		0	0	0	0
N4.4	Community Level Sanitation Facility		55,000	174,000	0	-40,000
N4.5.2	Small Bore Sewerage System with Street-Level Septic Tanks (City)		26,400	5,600	208,000	760,000
N4.6.2	Small Bore Sewerage System with Household Septic Tanks (City)		0	48,000	312,000	640,000
N4.7.3	Main Sewerage System - Khulna		0	0	360,000	840,000

Khulna Sanitation		Incremental Investment Requirements - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	1,100,000	1,320,000	1,600,000	2,400,000	4,000,000
N4.1	Facility for Night-soil Collection and Treatment		0	0	0	0
N4.2.1	Standard Single Pit Latrine		440,000	0	0	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility		132,000	178,000	80,000	0
N4.3	Large Septic Tank + Soakaway		0	0	0	0
N4.4	Community Level Sanitation Facility		55,000	174,000	0	0
N4.5.2	Small Bore Sewerage System with Street-Level Septic Tanks (City)		26,400	5,600	208,000	760,000
N4.6.2	Small Bore Sewerage System with Household Septic Tanks (City)		0	48,000	312,000	640,000
N4.7.3	Main Sewerage System - Khulna		0	0	360,000	840,000

Khulna Sanitation		Incremental Investment Requirements - Capital Costs					
Option	Description	Unit Capital Cost Tk/capita	2000	2005	2010	2025	2050
	Total population		1,100,000	1,320,000	1,600,000	2,400,000	4,000,000
				TkM	TkM	TkM	TkM
N4.1	Facility for Night-soil Collection and Treatment	790		0	0	0	0
N4.2.1	Standard Single Pit Latrine	200		88	0	0	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	426		56	76	34	0
N4.3	Large Septic Tank + Soakaway	872		0	0	0	0
N4.4	Community Level Sanitation Facility	1740		96	303	0	0
N4.5.2	Small Bore Sewerage System with Street-Level Septic Tanks (City)	2360		62	14	552	2,242
N4.6.2	Small Bore Sewerage System with Household Septic Tanks (City)	1900		0	96	667	1,520
N4.7.3	Main Sewerage System - Khulna	6470		0	0	2,620	6,794
Total Incremental Capital Cost				302	488	3,874	10,556
Total Cumulative Capital Cost				302	790	4,664	15,220



**Rajshahi Sanitation and Sewerage System**

Ref: MC 009

**Basic Data**

NWMP Sub-sector	<b>Major Cities</b>
Region(s)	<b>North West Rajshahi SMA</b>

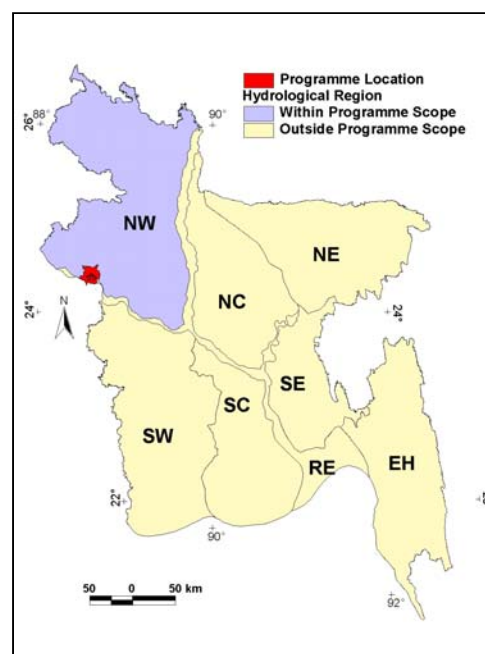
**Relevance to NWPo**

The programme will address basic policy objectives to provide hygienic and affordable sanitation and sewerage services for all the inhabitants of Rajshahi, especially the poor and disadvantaged communities in the city. The NWPo “mandates relevant public water and sewerage institutions to provide necessary drainage and sanitation, including treatment of domestic wastewater and sewage and replacement of open drains and construction of sewers, in the interest of public health”, “...regulate the use of water for preventing wastage and pollution by human action”, and “...create awareness among people in checking water pollution and wastage.” The NPSWSS reinforces these aims by highlighting the need for basic sanitation facilities, public health implications, environmental impacts and the importance of promoting social awareness through behavioural development and hygiene education especially for women and children. Policy also mandates that investments to improve and extend sanitation and sewerage services in the major cities should be paralleled by appropriate and substantive institutional and financial reform to attain:

- (a) significant improvements in service efficiency and financial viability of existing institutions;
- (b) private sector participation;
- (c) stakeholder consultation, particularly in peri-urban and poor communities; and
- (d) full cost recovery, particularly in the application of the “polluter-pays” principle.

**Purpose of Programme**

Rajshahi is the fourth largest city, and administrative centre of the north west portion of the country. The population is projected to increase four-fold in the next 50 years, from about 700,000 in 2000 to 2.3million in 2025 and 4million by 2050. The expansion will put increasing pressure on all public services and infrastructure, especially the need for appropriate sanitation and sewerage services for all inhabitants. At present, about 70% of Rajshahi’s population is served by adequate basic sanitation facilities: pit latrines, with and without septic tanks, serve 67%; while the other 3% are served by community facilities. There is no conventional waterborne sewerage system in the city. In other areas of the city, including the slums and disadvantaged communities, the population is dependent on “hanging latrines” and open defecation which creates increasing public health and pollution problems, and the increased likelihood of epidemic outbreaks of waterborne and water-related diseases.



The investment programme will require sustained commitment to provide appropriate sanitation facilities for all inhabitants to raise and sustain service coverage at 100% by 2010. Initial investment packages are expected to focus on raising the standards of basic sanitation (hygienic latrines and community facilities), especially for the urban poor, plus the development of smallbore sewerage systems. In the longer term, a conventional waterborne sewerage system will be developed to serve up to 10% of the population by 2025.

### Programme Outline

Improvements and extensions of appropriate and affordable sanitation and waterborne sewerage systems will continue throughout the implementation of the NWMP. The coverage targets by service type are summarised as follows:

Component	2000	2005	2010	2025
Population (million)	0.7	1.0	1.2	2.3
Sanitation coverage (%)				
Pit latrine	42	51	40	20
HH latrine with septic tank	25	35	35	30
Community sanitation facility	3	7	15	20
Smallbore sewerage system	0	5	10	20
Sewerage system with WWTP	0	0	0	10
Total	70	98	100	100

### Financing Arrangements

For effective sustained implementation, the investment programme will require the active and co-ordinated participation of the public sector (GoB and international development agencies), private sector (domestic and foreign, the latter in the medium to long term), and community based organisations with the support of NGOs. Indicative financing targets are presented below:

Sector	%
Public (GoB and international development agencies)	75
Private (domestic and foreign)	20
Local Communities	5
Total	100

The Government and the executing agencies will also need to ensure the availability of adequate funds for:

- (a) rehabilitation/replacement of existing sanitation and sewerage facilities;
- (b) capital replacement during and after the NWMP period; and
- (c) effective operations and maintenance.

In this context, the establishment of full cost recovery pricing will be essential.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Sustainable operation and maintenance of town sanitation systems	I1	• Frequency of service break downs	2012
• Reduced environmental pollution	I2	• Response times	2017
• Improved public health	I3	• Fæcal coliform counts	2022
• 100% of Rajshahi's population have access to sanitation facilities	K	• Public health statistics	2027
• Demand for sanitation facilities and services created and satisfied in the Statistical Metropolitan Areas	D	• Survey reports	2027
		• % service coverage verified by survey	2027

## Institutional Arrangements

The institutional arrangements for programme implementation are expected to comprise three components:

- (a) Public sector - RCC will retain prime responsibility in the short to medium term with the support of GoB and international development agencies. Much greater emphasis will be given to increased autonomy and management expertise, organisational reform, service coverage and efficiency, full cost recovery and financial viability.
- (b) Private sector participation - in the medium to longer term, the private sector is expected to play an increasing role in the provision of sanitation and sewerage services for Rajshahi. This will include: contract services (e.g. operation and maintenance of specific facilities, revenue billing and collection, etc.); BOT/BOOT schemes to develop and manage smallbore sewerage systems; and, in the longer term, private concessions to develop a main sewerage system with wastewater treatment. The smaller schemes will be developed in partnership with community based organisations.
- (c) Community-based and NGO participation - in the peri-urban and disadvantaged areas, community-based sanitation and smallbore sewerage schemes will be encouraged with investment funds from GoB, and the collaboration of NGOs and the private sector.

The implementation of these institutional developments will need to be carefully formulated and programmed with the full political commitment of GoB and interested stakeholders. In the short to medium term, the Government will also establish an appropriate independent Regulatory Framework to supervise and monitor public and private sector performance in the provision of sanitation and sewerage services.

## Existing Documentation

- (a) Chapter 8, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

## Linkages

The programme to improve and develop sanitation and sewerage facilities for Rajshahi will need to be co-ordinated with other NWMP programmes, namely:

- (a) Independent Regulatory Bodies for the Water Supply and Sanitation Service Sector (ID 002);
- (b) Support to the Preparation of New Legislation (EE 001);
- (c) Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);

- (d) Regulatory and Economic Instruments (EE 005);
- (e) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (f) Raising Public Awareness in the Wise Use and Management of Water (EE 010);
- (g) Private Sector Participation in Water Management (EE 011);
- (h) Alternative Financing Methods for Water Management (EE 013);
- (i) Rajshahi Bulk Water Supply and Distribution Systems (MC 005);
- (a) Rajshahi Flood Protection (MC 016);
- (b) Rajshahi Stormwater Drainage (MC 017);
- (c) National Clean-up of Existing Industrial Pollution (EA 002);
- (d) National Pollution Control Plan (EA 001);
- (e) National Water Quality Monitoring (EA 003); and
- (f) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

The Inventory and Asset Management Plan of the Water Supply and Sanitation Sector (MC 001) is also relevant here.

In addition, planning and implementation should be co-ordinated with Rajshahi City Corporation (RCC), Bangladesh Water Development Board (BWDB), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO and other interested parties.

## **Risks and Assumptions**

There are a number of important risks associated with a sustained development programme for the provision of adequate sanitation and sewerage services in Rajshahi. They fall into three main categories: institutional; financial and environmental.

The institutional risks focus mainly on the political willingness and commitment to reform the organisation and management of the City's sanitation services through a concerted drive to improve efficiency, involve the private sector, and promote effective user participation. National policy statements (NWPo and NPSWSS) clearly indicate that Government is aware of the problems, but it will need real political commitment to create an independent structure, which is solely, dedicated to the provision of effective and efficient sanitation services for all inhabitants.

The financial risks are that the necessary investment and maintenance resources for Rajshahi will become increasingly constrained, especially from international sources, if the institutional and efficiency issues are not addressed in a constructive manner, and Government does not give sustained support for the policy of full cost recovery. Future Government investment budgets will be under increasing pressure from other public sectors; therefore, it is crucial that there is a phased introduction of private sector participation and effective promotion of community-based systems particularly for peri-urban and disadvantaged communities.

The environmental risks are mainly related to the increasing volumes of untreated wastewater, associated public health risks and environmental degradation in the city.

Assumptions:

- Materials used for construction of new systems will give the assumed working lives.
- Construction of new systems is adequately supervised so as to minimise future operation and maintenance.
- Technical skills will be adequate to enable the efficient and effective O&M of the sanitation systems.
- The operating utility will be able to provide sanitation services without political interference.
- Full cost recovery is affordable.
- Environmental risks can be successfully mitigated.

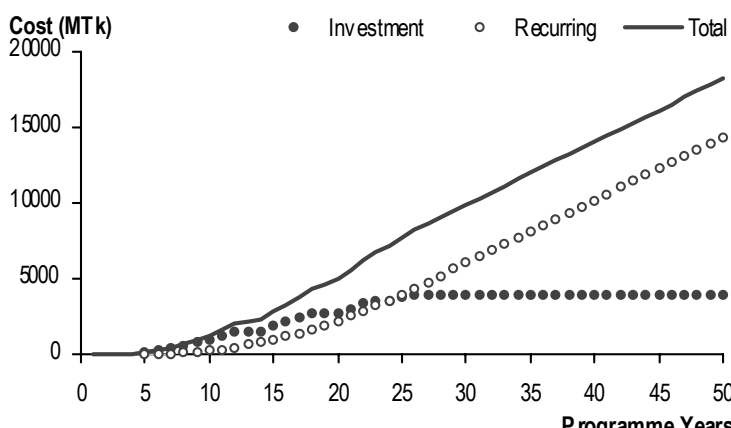
**Rajshahi Sanitation and Sewerage Systems**

Ref :

**MC 009**

Cluster :	Major Cities	Region(s) :	NW			
Focus/Foci :	Sanitation	Location :	Rajshahi City			
Start Year <sup>1</sup> :	2003	Duration <sup>2</sup> :	23 year(s)	Agency(s) Responsible :	RCC	(Lead)
					None	(Supporting)
Short Description :	The NWPo "mandates relevant public water and sewerage institutions to provide necessary drainage and sanitation, including treatment of domestic wastewater and sewage and replacement of open drains and construction of sewers, in the interest of public health." (NWPo \$4.6c). The population of Rajshahi is expected to triple over the next 25 years, from 0.7 million in 2000 to 2.3 million in 2025. At present, about 70% of the population is adequately served by sanitation facilities, mainly by pit latrines with/without septic tanks. There is no conventional waterborne sewerage system. In the slums and other disadvantaged areas, people are dependant on 'hanging latrines' and open defecation which exacerbates pollution and public health problems and increases the likelihood of epidemic outbreaks of waterborne and water-related diseases. This programme aims to raise and sustain appropriate service coverage to 100% by 2010.					

<b>MIS Links</b>	Cost Calculation :	MC Programme costing.xls	Map :	MC 009 Map.jpg
	Disb't Schedule :	MC Programme costing.xls	Description :	MC 009 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme	Year		
	Total Capital <sup>3</sup>		3,874.00 MTk	20%	75%	5%	23		
	Ultimate Recurring		415.60 MTk/yr	n/a	50%	50%	26		
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment    ○ Recurring    — Total				
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Sustainable operation and maintenance of town sanitation systems	• Frequency of service break downs • Response times	NYD
• Reduced environmental pollution	• Faecal coliform counts	NYD
• Improved public health	• Public health statistics	NYD
• 100% of Rajshahi's population have access to sanitation facilities	• Survey reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref

MC 009

Title

Rajshahi Sanitation and Sewerage Systems

### Assumptions:

Taka/US\$ 51.000

TA duration 0.0 years

All prices in mid-2000 values

Investment duration 25.0 years<sup>1</sup>

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

### Technical Assistance

Expatriate consultants (all-in rate)

Senior National consultants (all-in rate)

Mid-level National consultants (all-in rate)

Sub-totals

Other general TA programme costs

Specific other TA programme costs

**Total TA Costs**

TA costs for this programme are included in the capital costs

### Investment items - short term

Standard single pit latrine	40.0	22.5%	9.0
Household latrine with septic tank and soakaway facility	69.0	18.8%	13.0
Large septic tank and soakaway	17.0	13.4%	2.3
Community level sanitation facility	47.0	21.3%	10.0
Small bore sewerage system with household septic tanks	68.0	7.2%	4.9
Small bore sewerage system with street level septic tanks	36.0	6.3%	2.3

### Investment items - term

Household latrine with septic tank and soakaway facility	36.0	18.8%	6.8
Large septic tank and soakaway	36.0	13.4%	4.8
Community level sanitation facility	125.0	21.3%	26.6
Small bore sewerage system with household septic tanks	77.0	7.2%	5.5
Small bore sewerage system with street level septic tanks	81.0	6.3%	5.1

### Investment items - short term

Household latrine with septic tank and soakaway facility	115.0	18.8%	21.6
Large septic tank and soakaway	148.0	13.4%	19.8
Community level sanitation facility	191.0	21.3%	40.7
Small bore sewerage system with household septic tanks	451.0	7.2%	32.5
Small bore sewerage system with street level septic tanks	363.0	6.3%	22.9
Main sewerage system	1,674.0	9.3%	155.7

### Total Investment Items

**3,574.0 10.7% 383.4**

### Overall Costs of meeting demands accruing during NWMP timeframe

**3,574.0 383.4**

### Additional NWMP provision to maintain capacity ahead of demand

**300.0 32.2**

**3,874.0 415.6**

Notes

1

The step-wise approach to investment necessary to achieve and maintain installed capacity ahead of demands may mean that the total investment against +25 year demand is disbursed within the 25 year horizon. However, an additional provision will also be disbursed before the end of the 25 year, in order again to keep capacity ahead of ongoing demand increases.

**Rajshahi Sanitation**

Rajshahi Sanitation		Coverage Targets (%)					
Option	Description	Total Annual Cost (Tk/capita)	2000	2005	2010	2025	2050
	Total population		700,000	960,000	1,200,000	2,300,000	4,000,000
N4.1	Facility for Night-soil Collection and Treatment	109	2%	1%	0%	0%	0%
N4.2.1	Standard Single Pit Latrine	45	40%	50%	40%	20%	0%
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	80	25%	35%	35%	30%	15%
N4.3	Large Septic Tank + Soakaway	117	0%	2%	5%	10%	5%
N4.4	Community Level Sanitation Facility	370	3%	5%	10%	10%	5%
N4.5.2	Small Bore Sewerage System with Street-Level Septic Tanks (City)	250	0%	3%	5%	10%	20%
N4.6.2	Small Bore Sewerage System with Household Septic Tanks (City)	210	0%	2%	5%	10%	25%
N4.7.4	Main Sewerage System - Rajshahi	600	0%	0%	0%	10%	30%
			70%	98%	100%	100%	100%

**Rajshahi Sanitation**

		Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	700,000	960,000	1,200,000	2,300,000	4,000,000
N4.1	Facility for Night-soil Collection and Treatment	14,000	9,600	0	0	0
N4.2.1	Standard Single Pit Latrine	280,000	480,000	480,000	460,000	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	175,000	336,000	420,000	690,000	600,000
N4.3	Large Septic Tank + Soakaway	0	19,200	60,000	230,000	200,000
N4.4	Community Level Sanitation Facility	21,000	48,000	120,000	230,000	200,000
N4.5.2	Small Bore Sewerage System with Street-Level Septic Tanks (City)	0	28,800	60,000	230,000	800,000
N4.6.2	Small Bore Sewerage System with Household Septic Tanks (City)	0	19,200	60,000	230,000	1,000,000
N4.7.4	Main Sewerage System - Rajshahi	0	0	0	230,000	1,200,000

**Rajshahi Sanitation**

		Incremental Coverage Targets - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	700,000	960,000	1,200,000	2,300,000	4,000,000
N4.1	Facility for Night-soil Collection and Treatment		-4,400	-9,600	0	0
N4.2.1	Standard Single Pit Latrine		200,000	0	-20,000	-460,000
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility		161,000	84,000	270,000	-90,000
N4.3	Large Septic Tank + Soakaway		19,200	40,800	170,000	-30,000
N4.4	Community Level Sanitation Facility		27,000	72,000	110,000	-30,000
N4.5.2	Small Bore Sewerage System with Street-Level Septic Tanks (City)		28,800	31,200	170,000	570,000
N4.6.2	Small Bore Sewerage System with Household Septic Tanks (City)		19,200	40,800	170,000	770,000
N4.7.4	Main Sewerage System - Rajshahi		0	0	230,000	970,000

**Rajshahi Sanitation**

		Incremental Investment Requirements - Number of Population				
Option	Description	2000	2005	2010	2025	2050
	Total population	700,000	960,000	1,200,000	2,300,000	4,000,000
N4.1	Facility for Night-soil Collection and Treatment		0	0	0	0
N4.2.1	Standard Single Pit Latrine		200,000	0	0	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility		161,000	84,000	270,000	0
N4.3	Large Septic Tank + Soakaway		19,200	40,800	170,000	0
N4.4	Community Level Sanitation Facility		27,000	72,000	110,000	0
N4.5.2	Small Bore Sewerage System with Street-Level Septic Tanks (City)		28,800	31,200	170,000	570,000
N4.6.2	Small Bore Sewerage System with Household Septic Tanks (City)		19,200	40,800	170,000	770,000
N4.7.4	Main Sewerage System - Rajshahi		0	0	230,000	970,000

**Rajshahi Sanitation**

Rajshahi Sanitation		Incremental Investment Requirements - Capital Costs					
Option	Description	Unit Capital Cost Tk/capita	2000	2005	2010	2025	2050
	Total population		700,000	960,000	1,200,000	2,300,000	4,000,000
				TkM	TkM	TkM	TkM
N4.1	Facility for Night-soil Collection and Treatment	790		0	0	0	0
N4.2.1	Standard Single Pit Latrine	200		40	0	0	0
N4.2.2	Household Latrine with Septic Tank and Soakaway Facility	426		69	36	115	0
N4.3	Large Septic Tank + Soakaway	872		17	36	148	0
N4.4	Community Level Sanitation Facility	1740		47	125	191	0
N4.5.2	Small Bore Sewerage System with Street-Level Septic Tanks (City)	2360		68	77	451	1,682
N4.6.2	Small Bore Sewerage System with Household Septic Tanks (City)	1900		36	81	363	1,829
N4.7.4	Main Sewerage System - Rajshahi	6470		0	0	1,674	7,845
	<b>Total Incremental Capital Cost</b>			<b>277</b>	<b>355</b>	<b>2,943</b>	<b>11,355</b>
	<b>Total Cumulative Capital Cost</b>			<b>277</b>	<b>632</b>	<b>3,576</b>	<b>14,931</b>



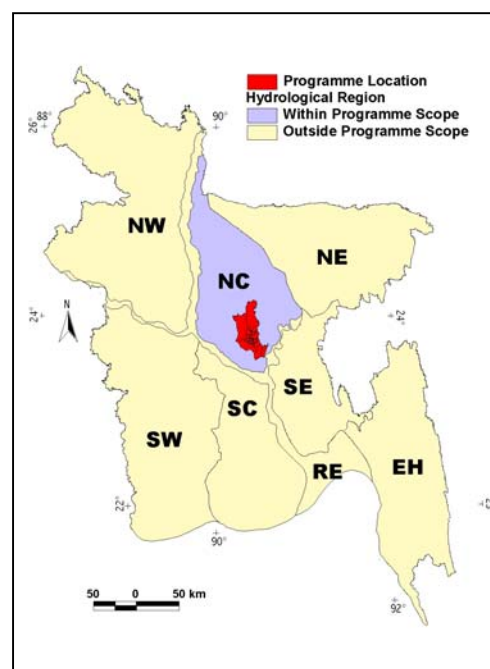
**Dhaka Flood Protection**Ref: **MC 010****Basic Data**

NWMP Sub-sector      **Major Cities**

Region(s)              **North Central Region**  
**Dhaka SMA**

**Relevance to NWPo**

The programme is aimed at completing the flood protection works for Dhaka in accordance with the NWPo. Policy states that “Regions of economic importance such as metropolitan areas, sea and airports, and export processing zones will be fully protected against floods as a matter of first priority.” The fulfilment of this objective will provide appropriate levels of protection for life, property, normal economic activity and public infrastructure. The NWPo also states that all public buildings and infrastructure will be constructed above the highest ever-recorded flood level.

**Purpose of Programme**

Dhaka is the capital city as well as being the commercial, administrative and cultural centre of the country, with a population which is expected to increase five-fold in the next 50 years from nearly 9million in 2000 to 27million in 2025 and 50million by 2050. The programme will complete the primary flood protection network with the construction of the Dhaka Eastern Flood Protection Scheme and modest additions in the western part as the city continues to expand throughout the NWMP. The completion of the city's flood defences will provide protection against floods with an acceptable flood return period. The increased security will protect life, property and infrastructure, and limit the adverse impact on normal commercial activity. The poor will also benefit, but it is important that these communities are consulted during the planning and implementation process.

**Programme Outline**

The construction of the Dhaka Eastern Flood Protection Scheme is programmed for completion during the NWMP.

In the longer term, modest additions to the flood protection defences will be required as the city expands.

**Financing Arrangements**

The investment requirements will be funded by GoB, possibly with international donor assistance.

Bangladesh Water Development Board (BWDB) is responsible for the implementation, repair and maintenance of the city's flood protection facilities. It is essential that this function be carried out diligently and with adequate funding support from GoB and DCC.

### Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Dhaka Flood protection programme prepared and agreed	I1	• Signed programme/project documents	2004
• Dhaka Flood protection programme implemented	I2	• Programme/project completion reports	2027
• Dhaka protected from 1:100 year flood	K	• Physical evidence and hydrological data	2027
• Statistical Metropolitan Areas protected from flooding and stormwater run-off	D	• Duration of inundation	2027

### Institutional Arrangements

Under existing institutional arrangements, the Bangladesh Water Development Board (BWDB) will be responsible for the planning, construction and maintenance of the Dhaka Eastern Flood Protection Scheme and further works in the future. In the planning and implementation stages, it is important that local communities and other stakeholders are consulted; and that any population resettlement is properly planned and carried out in a fair and appropriate manner.

In future, it is essential that BWDB carries out effective and appropriate maintenance on all the flood protection works for Dhaka in order to ensure the integrity and security of the network. GoB and DCC will need to guarantee that BWDB has adequate annual financial resources to carry out this task. There is an opportunity for community-based organisations in the vicinity of the main flood defences to participate in these activities, providing BWDB provides expert supervision.

### Existing Documentation

- (a) Chapter 8, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

### Linkages

The completion of Dhaka's flood protection facilities should be linked and co-ordinated with other NWMP programmes, namely:

- (a) BWDB Capacity Building (ID 010);
- (b) Disaster Management Bureau Capacity Building (ID 008);
- (c) Capacity Building for Other Organisations (ID 009);
- (d) Support to the Preparation of New Legislation (EE 001);
- (e) Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);
- (f) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (g) Raising Public Awareness in the Wise Use and Management (EE 010);
- (h) Dhaka Bulk Water Supply and Distribution Systems (MC 002);
- (i) Dhaka Sanitation and Sewerage Systems (MC 006);
- (j) Dhaka Stormwater Drainage (MC 011);
- (k) National Clean-up of Existing Industrial Pollution (EA 002);
- (l) National Pollution Control Plan (EA 001);

- (m) National Water Quality Monitoring (EA 003); and
- (n) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

In addition, planning and development should be co-ordinated with Dhaka City Corporation (DCC), Rajdhani Unnyan Kartripakkha (RAJUK) on city planning, Dhaka Water and Sewerage Authority (DWASA), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO and other interested parties.

### **Risks and Assumptions**

The main risks associated with the completion of the flood protection programme are social, economic and financial.

The social risks concern the potential impact on particular areas of Dhaka (depending on the size of future floods) if the programme is not completed. The main impact will be felt by the poor who live in exposed low lying areas and adjacent to water courses which are prone to flood risk. These risks can be mitigated with timely construction, coupled with the full consultation and participation of those peri-urban and local communities which are in the immediate impact zone.

The economic risks relate to the widespread damage which would occur in the short and medium term if the programme is not completed. The economic impact would be felt not only in Dhaka itself but also in the country as a whole with the subsequent disruption to normal administrative and commercial activities.

The financial risks concern the availability of the required capital funds and resources to sustain adequate maintenance levels for the entire flood protection network. These risks can be mitigated through appropriate ADP allocations and partnerships with international donors, providing the needs of the poor and disadvantaged communities are fully taken into account. Adequate maintenance can be assured by appropriate financial transfers from both GoB and DCC, and conscientious sustained activity by BWDB.

**Dhaka Flood Protection**

Ref :

**MC 010**

Cluster :	<b>Major Cities</b>	Region(s) :	<b>NC</b>
Focus/Foci :	<b>Flood Protection</b>	Location :	<b>Dhaka City</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>23 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) None (Supporting)
Short Description :	NWPo states that "Regions of economic importance such as metropolitan areas,...will be fully protected against floods as a matter of first priority" (NWPo §4.2.p.i) After Dhaka was severely affected by the 1988 flood, the western flood embankment was constructed. During the 1998 flood it afforded some relief to parts of the city but the eastern part was extensively inundated. There are significant areas of existing development in Dhaka where reconstruction and the associated opportunity to raise land will not occur for many years. This programme will provide flood control infrastructures along right bank of the Balu River, which will include construction of a flood embankment, flood wall and drainage sluices.		

<b>MIS Links</b>	Cost Calculation :	MC Programme costing.xls	Map :	MC 010 Map.jpg
	Disb't Schedule :	MC Programme costing.xls	Description :	MC 010 PgP.doc

<b>Finance</b>	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>5,423.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>23</b>
Ultimate Recurring	<b>488.10</b> MTk/yr	<b>n/a</b>	<b>85%</b>	<b>15%</b>	<b>26</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Dhaka Flood protection programme prepared and agreed	• Signed programme/project documents	NYD
• Dhaka Flood protection programme implemented	• Programme/project completion reports	NYD
• Dhaka protected from 1:100 year flood	• Physical evidence and hydrological data	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	MC 010
Title	Dhaka Flood Protection

*Assumptions:*

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

**Technical Assistance**

Expatriate consultants (all-in rate)  
 Senior National consultants (all-in rate)  
 Mid-level National consultants (all-in rate)  
 Sub-totals  
 Other general TA programme costs  
 Specific other TA programme costs  
**Total TA Costs**

TA costs for this programme are included in the capital costs

**Investment items - short term**

Flood protection embankments				4,820.0	9.0%	433.8
------------------------------	--	--	--	---------	------	-------

**Investment items - medium term**

**Investment items - long term**

Flood protection embankments				603.0	9.0%	54.3
------------------------------	--	--	--	-------	------	------

<b>Total Investment Items</b>				<b>5,423.0</b>	<b>9.0%</b>	<b>488.1</b>
-------------------------------	--	--	--	----------------	-------------	--------------

<b>Overall Programme Costs</b>				<b>5,423.0</b>		<b>488.1</b>
--------------------------------	--	--	--	----------------	--	--------------

**Dhaka Stormwater Drainage**

Ref: MC 011

**Basic Data**

NWMP Sub-sector	<b>Major Cities</b>
ccRegion(s)	<b>North Central Dhaka SMA</b>

**Relevance to NWPo**

There are no specific policy statements on stormwater drainage in the NWPo. However, there are subsidiary references which indicate that the NWMP should take full account of the need for efficient urban drainage networks to evacuate storm flows and reduce the impact of flood events.

**Purpose of Programme**

Dhaka is the capital city as well as being the commercial, administrative and cultural centre of the country, with a population which is expected to increase five-fold in the next 50 years from nearly 9million in 2000 to 27million in 2025 and 50million by 2050. The total area of the city is expected to increase from 304km<sup>2</sup> in 2000 to 1339km<sup>2</sup> by 2025. Therefore, it is important that the city should have an adequate and efficient stormwater drainage system. The existing storm drainage system is poor due to: insufficient drainage network; continuing increase of impermeable surfaces; poor maintenance resulting in loss of capacity and blockages; encroachment onto drainage channels and water bodies; and high water levels at the drainage outfall. In many locations, poorly planned and uncontrolled development has resulted in the obstruction of natural drainage routes, including surface runoff, without replacement by a new drainage system.

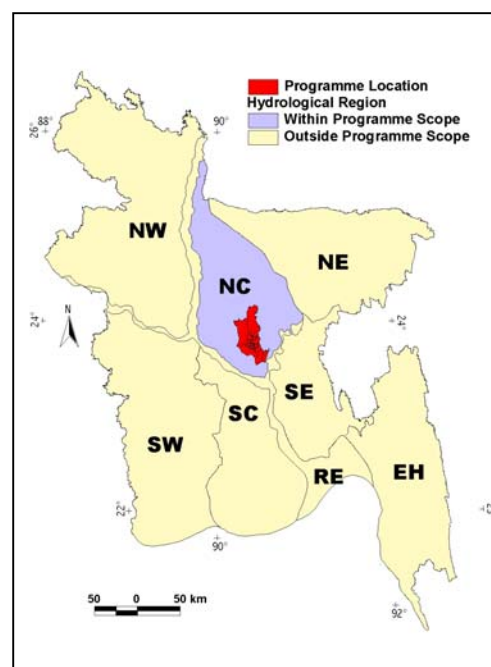
The programme is intended to develop and extend the stormwater drainage network as the city continues to expand and grow. Final option selection will depend on local conditions in each area of the city, including:

- (a) gravity or pumped systems;
- (b) open or covered drainage networks; and
- (c) need to set aside low lying areas for stormwater retention to reduce peak flows.

NWMP estimates indicate that about 60% or 800 km<sup>2</sup> of the Dhaka Metropolitan Area will require improved and new stormwater drainage facilities. In addition, it is estimated that up to 80% of the total metropolitan area will require pumping support.

**Programme Outline**

The rehabilitation, improvement and extension of the stormwater drainage system in Dhaka will be a continuous programme throughout the 25 years of the NWMP.



## Financing Arrangements

The investment requirements will be funded by GoB, possibly with international donor assistance.

DCC and DWASA are responsible for the operation and maintenance of the city's stormwater drainage facilities. It is essential that this function is carried out diligently and with adequate financial resources if the network is to operate efficiently especially in the wet season.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Dhaka Stormwater drainage programme prepared and agreed	I1	• Signed programme/project documents	2004
• Dhaka Stormwater drainage programme implemented	I2	• Programme/project completion reports	2024
• Dhaka served by stormwater drainage facilities	K	• Survey reports	2024
• Statistical Metropolitan Areas protected from flooding and stormwater run-off	D	• Duration of inundation	2024

## Institutional Arrangements

DWASA will be the main agency responsible for the implementation of the programme, with the support of DCC in the central areas where piped drainage will be complementary to the main sewerage system. It is also crucial that DWASA inter-links the programme with its parallel responsibilities for supervision and enforcement of planning and building regulations to:

- ensure that private developers and public agencies include appropriate drainage facilities;
- prevent encroachment on open drains and water bodies, and infilling of natural water courses; and
- improve solid waste management, collection and disposal throughout the city.

In the peri-urban and poorer areas of the city, DWASA should actively encourage the participation of community-based organisations and NGOs to plan, construct and maintain local drainage facilities.

Adequate maintenance, including structural repairs and regular cleaning (especially before and during the rainy season), is essential if the existing and future drainage system is to work efficiently and effectively for all the inhabitants of Dhaka, especially among the urban poor. DWASA should actively develop a strategy, which involves maintenance contracts with the private sector and community-based organisations.

## Existing Documentation

- Chapter 8, Development Strategy Report, March 2001
- National Water Resources Database in WARPO

## Linkages

The development programme to augment and improve Dhaka's stormwater drainage system should be linked and co-ordinated with other NWMP programmes, namely:

- BWDB Capacity Building (ID 010);
- Disaster Management Bureau Capacity Building (ID 008);

- (c) Capacity Building for Other Organisations (ID 009);
- (d) Support to the Preparation of New Legislation (EE 001);
- (e) Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);
- (f) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (g) Raising Public Awareness in the Wise Use and Management (EE 010);
- (h) Dhaka Bulk Water Supply and Distribution Systems (MC 002);
- (i) Dhaka Sanitation and Sewerage Systems (MC 006);
- (j) Dhaka Flood Protection (MC 010);
- (k) National Clean-up of Existing Industrial Pollution (EA 002);
- (l) National Pollution Control Plan (EA 001);
- (m) National Water Quality Monitoring (EA 003); and
- (n) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

In addition, planning and development should be co-ordinated with Dhaka City Corporation (DCC), Rajdhani Unnayan Kartripakkha (RAJUK) on city planning, Dhaka Water and Sewerage Authority (DWASA), Bangladesh Water Development Board (BWDB), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO and other interested parties.

### **Risks and Assumptions**

Risks associated with the implementation of the stormwater drainage programme are social, institutional and financial.

The social risks are that poor and disadvantaged areas of the city will be neglected not only in terms of adequate drainage but also the lack of planned settlement and slum upgrading schemes, which will encourage encroachment over drains and natural water courses. These risks can be mitigated by a more inclusive approach to planning and implementation of drainage facilities, which involves consultation and active participation in both construction and maintenance.

The institutional risks are that DCC and DWASA will continue to under-perform in this sector due to inadequate funding, lack of enforcement of planning regulations and poor management. These limitations can be overcome with:

- (a) a secure pipeline of funds for capital works and maintenance;
- (b) more effective commitment to and enforcement of planning regulations;
- (c) effective solid waste management; and
- (d) active involvement of the private sector and community-based organisations.

Financial risks relate to the possibility that adequate funds will not be forthcoming for the programme itself and appropriate regular maintenance. Government, in partnership with the responsible agencies, must address this issue to ensure that the necessary funds are committed in accordance with the NWMP strategy.

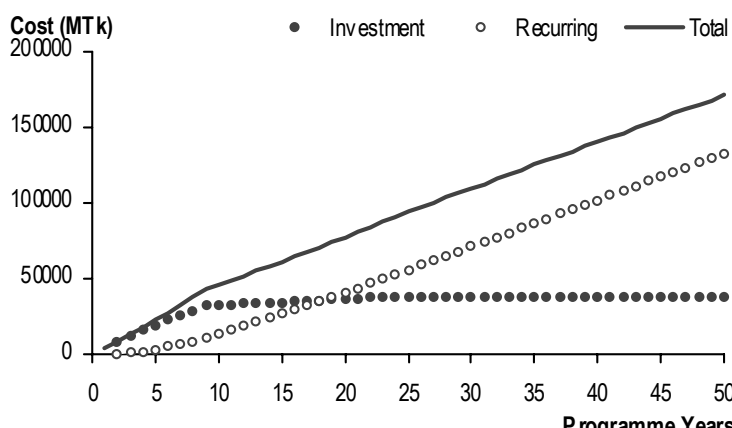


**Dhaka Stormwater Drainage**Ref : **MC 011**

Cluster :	<b>Major Cities</b>	Region(s) :	<b>NC</b>
Focus/Foci :	<b>Stormwater Drainage</b>	Location :	<b>Dhaka City</b>
Start Year <sup>1</sup> :	<b>2004</b>	Duration <sup>2</sup> :	<b>22 year(s)</b>
		Agency(s) :	<b>DWASA</b>
		Responsible :	<b>DCC</b>
Short Description :	NWPo states that "Regions of economic importance such as metropolitan areas,...will be fully protected against floods as a matter of first priority" (NWPo §4.2.p.i). The progressive expansion and urbanization of Dhaka increases the need for storm drainage as the increase in paved surfaces hastens runoff rates and reduces infiltration thereby causing urban flooding. Each heavy rainstorm causes inconvenience and sometimes major damage and disruption as a result of ineffective or inadequate drainage. This 38500TkM programme will mitigate Dhakas' drainage problem by providing a properly planned, comprehensive drainage system ranging from collection of water at local street level to disposal of accumulated drainage water at pump stations.		

<b>MIS Links</b>	Cost Calculation :	MC Programme costing.xls	Map :	MC 011 Map.jpg
	Disb't Schedule :	MC Programme costing.xls	Description :	MC 011 PgP.doc

Finance							
	Costs	Private	Funding (%)	Beneficiaries	Expected by		
			GoB		ProgrammeYear		
	Total Capital <sup>3</sup>	38,500.00 MTk	0%	100%	0%	22	
	Ultimate Recurring	3,080.00 MTk/yr	n/a	85%	15%	26	
	Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart		
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring	— Total
Status :	Identified						
Financial Base Year:	mid-2000						
Planned Expenditure (to date) :	0 MTk						
Actual Expenditure <sup>4</sup> (to date) :	0 MTk						



Programme Years	Investment (MTk)	Recurring (MTk)	Total (MTk)
0	0	0	0
5	30,000	5,000	35,000
10	30,000	10,000	40,000
15	30,000	15,000	45,000
20	30,000	20,000	50,000
25	30,000	25,000	55,000
30	30,000	30,000	60,000
35	30,000	35,000	65,000
40	30,000	40,000	70,000
45	30,000	45,000	75,000
50	30,000	50,000	80,000

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Dhaka Stormwater drainage programme prepared and agreed	• Signed programme/project documents	NYD
• Dhaka Stormwater drainage programme implemented	• Programme/project completion reports	NYD
• Dhaka served by stormwater drainage facilities	• Survey reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
 5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	<b>MC 011</b>
Title	<b>Dhaka Stormwater Drainage</b>

*Assumptions:*

Taka/US\$ 51.000      TA duration **0.0** years      All prices in mid-2000 values  
Investment duration 25.0 years

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

**Technical Assistance**

Expatriate consultants (all-in rate)	}	TA costs for this programme are included in the capital costs
Senior National consultants (all-in rate)		
Mid-level National consultants (all-in rate)		
Sub-totals		
Other general TA programme costs		
Specific other TA programme costs		
<b>Total TA Costs</b>		

**Investment items - short term**

Gravity and pumped drainage infrastructure	16,000.0	8.0%	1,280.0
--	----------	------	---------

**Investment items - term**

Gravity and pumped drainage infrastructure	16,000.0	8.0%	1,280.0
--	----------	------	---------

**Investment items - short term**

Gravity and pumped drainage infrastructure	6,500.0	8.0%	520.0
--	---------	------	-------

<b>Total Investment Items</b>	<b>38,500.0</b>	<b>8.0%</b>	<b>3,080.0</b>
-------------------------------	-----------------	-------------	----------------

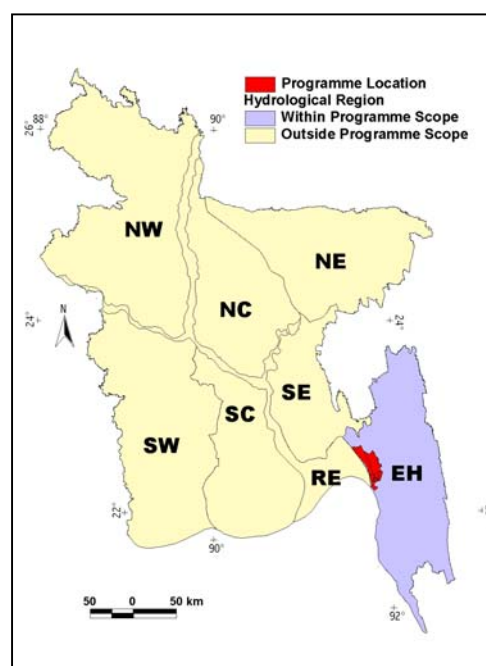
<b>Overall Programme Costs</b>	<b>38,500.0</b>		<b>3,080.0</b>
--------------------------------	-----------------	--	----------------

**Chittagong Flood Protection**Ref: **MC 012****Basic Data**

NWMP Sub-sector	<b>Major Cities</b>
Region(s)	<b>Eastern Hills Chittagong SMA</b>

**Relevance to NWPo**

The programme is aimed at completing the flood protection works for Chittagong in the long term, in accordance with the NWPo. Policy states that “Regions of economic importance such as metropolitan areas, sea and airports, and export processing zones will be fully protected against floods as a matter of first priority.” The fulfilment of this objective will provide appropriate levels of protection for life, property, normal economic activity and public infrastructure. The NWPo also states that all public buildings and infrastructure will be constructed above the highest ever-recorded flood level.

**Purpose of Programme**

Chittagong is the second largest city, main commercial port and administrative centre of the eastern portion of the country. The population is projected to increase four-fold in the next 50 years, from 2.5 million in 2000 to 6.1 million in 2025 and 11 million by 2050. The city's main flood defences are already in place.

The completion of the city's flood defences will provide protection against floods with an acceptable flood return period. The increased security will protect life, property and infrastructure, and limit the adverse impact on normal commercial activity. The poor will also benefit, but it is important that these communities are consulted during the planning and implementation process.

**Programme Outline**

The construction of the works is programmed for completion during the NWMP.

**Financing Arrangements**

The investment requirements will be funded by GoB, possibly with international donor assistance.

The Bangladesh Water Development Board (BWDB) is responsible for the implementation, repair and maintenance of the city's flood protection facilities. It is essential that this function is carried out diligently and with adequate funding support from GoB and CCC.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Chittagong Flood protection programme prepared and agreed	I1	• Signed programme/project documents	2004
• Chittagong Flood protection programme implemented	I2	• Programme/project completion reports	2009
• Chittagong protected from 1:100 year flood	K	• Physical evidence and hydrological data	2009
• Statistical Metropolitan Areas protected from flooding and stormwater run-off	D	• Duration of inundation	2027

## Institutional Arrangements

Under existing institutional arrangements, the Bangladesh Water Development Board (BWDB) will be responsible for the planning, construction and maintenance. In the planning and implementation stages, it is important that local communities and other stakeholders are consulted; and that any population resettlement is properly planned and carried out in a fair and appropriate manner.

In future, it is essential that BWDB carries out effective and appropriate maintenance on all the flood protection works for Chittagong in order to ensure the integrity and security of the network. GoB and CCC will need to guarantee that BWDB has adequate annual financial resources to carry out this task. There is an opportunity for community-based organisations in the vicinity of the main flood defences to participate in these activities, providing BWDB provides expert supervision.

## Existing Documentation

- (a) Chapter 8, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

## Linkages

The completion of Chittagong's flood protection facilities should be linked and co-ordinated with other NWMP programmes, namely:

- (a) BWDB Capacity Building (ID 010);
- (b) Disaster Management Bureau Capacity Building (ID 008);
- (c) Capacity Building for Other Organisations (ID 009);
- (d) Support to the Preparation of New Legislation (EE 001);
- (e) Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);
- (f) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (g) Raising Public Awareness in the Wise Use and Management (EE 010);
- (h) Chittagong Bulk Water Supply and Distribution Systems (MC 003);
- (i) Chittagong Sanitation and Sewerage Systems (MC 007);
- (j) Chittagong Stormwater Drainage (MC 013);
- (k) National Clean-up of Existing Industrial Pollution (EA 002);
- (l) National Pollution Control Plan (EA 001);
- (m) National Water Quality Monitoring (EA 003); and
- (n) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

In addition, planning and development should be co-ordinated with Chittagong City Corporation (CCC), Chittagong Water and Sewerage Authority (CWASA), Bangladesh Water Development Board (BWDB), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO and other interested parties.

### **Risks and Assumptions**

The main risks associated with the completion of the flood protection programme are social, economic and financial.

The social risks concern the potential impact on particular areas of Chittagong (depending on the size of future floods) if the programme is not completed. The main impact will be felt by the poor who live in exposed low lying areas and adjacent to water courses which are prone to flood risk. These risks can be mitigated with timely construction, coupled with the full consultation and participation of those peri-urban and local communities which are in the immediate impact zone.

The economic risks relate to the widespread damage, which would occur in the short and medium term if the programme is not completed. The economic impact would be felt not only in Chittagong itself but also in the country as a whole with the subsequent disruption to normal administrative and commercial activities.

The financial risks concern the availability of the required capital funds and resources to sustain adequate maintenance levels for the entire flood protection network. These risks can be mitigated through appropriate ADP allocations and partnerships with international donors, providing the needs of the poor and disadvantaged communities are fully taken into account. Adequate maintenance can be assured by appropriate financial transfers from both GoB and CCC, and conscientious sustained activity by BWDB.

**Chittagong Flood Protection**

Ref :

**MC 012**

Cluster :	<b>Major Cities</b>	Region(s) :	<b>EH</b>
Focus/Foci :	<b>Flood Protection</b>	Location :	<b>Chittagong City</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>4 year(s)</b>
		Agency(s) :	<b>BWDB</b> (Lead)
		Responsible :	<b>CWASA, CCC</b> (Supporting)
Short Description :	NWPO states that "Regions of economic importance such as metropolitan areas,...will be fully protected against floods as a matter of first priority" (NWPO §4.2.p.i). The low areas of Chittagong city are vulnerable to flooding during cyclones and spring tides. Local flooding is also caused by heavy rainfall and poor internal drainage. This programme is to provide an embankment or flood wall on the Karnaphuli River banks, proper maintenance of the existing sea dyke along with construction of new wave protection works, drainage sluices etc. In addition, this programme provides for the installation of pumps for selected areas and maintenance of internal drains. The short to medium term beneficiaries of the programme will comprise some 3.1 million estimated to be at risk of the cyclone threat once every forty years or less.		

<b>MIS Links</b>	Cost Calculation :	MC Programme costing.xls	Map :	MC 012 Map.jpg
	Disb't Schedule :	MC Programme costing.xls	Description :	MC 012 PgP.doc

Finance						
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear	
	Total Capital <sup>3</sup>	877.00 MTk	0%	100%	0%	4
	Ultimate Recurring	78.90 MTk/yr	n/a	85%	15%	5
	Date of Data :	31 07 01	Stacked Cumulative Cash Flow Chart			
	(dd) (mm) (yy)					
Status :	Identified					
Financial Base Year:	mid-2000					
Planned Expenditure (to date) :	0 MTk					
Actual Expenditure <sup>4</sup> (to date) :	0 MTk					

Cost (MTk)

● Investment ○ Recurring — Total

Programme Years	Investment (MTk)	Recurring (MTk)	Total (MTk)
0	0	0	0
5	800	0	800
10	800	500	1300
15	800	1000	1800
20	800	1500	2300
25	800	2000	2800
30	800	2500	3300
35	800	3000	3800
40	800	3500	4300
45	800	3000	3800
50	800	3500	4300

Programme Years

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Chittagong Flood protection programme prepared and agreed	• Signed programme/project documents	NYD
• Chittagong Flood protection programme implemented	• Programme/project completion reports	NYD
• Chittagong protected from 1:100 year flood	• Physical evidence and hydrological data	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	MC 012
Title	Chittagong Flood Protection

Assumptions:					
Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	4.0	years	

Item	Unit	Quantity	Rate		Amount	O&M	O&M/yr
			US\$	Tk'000	TkM	%	TkM
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)							
Senior National consultants (all-in rate)							
Mid-level National consultants (all-in rate)							
Sub-totals							
Other general TA programme costs							
Specific other TA programme costs							
<b>Total TA Costs</b>							
TA costs for this programme are included in the capital costs							
<b>Investment items - short term</b>							
Flood protection embankments					877.0	9.0%	78.9
<b>Investment items - term</b>							
<b>Investment items - short term</b>							
<b>Total Investment Items</b>					877.0	9.0%	78.9
<b>Overall Programme Costs</b>							
					877.0		78.9

**Chittagong Stormwater Drainage**

Ref: MC 013

**Basic Data**

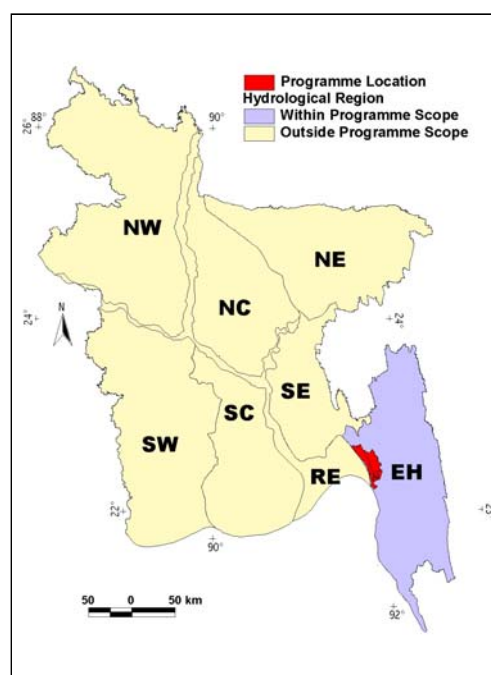
NWMP Sub-sector	<b>Major Cities</b>
Region(s)	<b>Eastern Hills Chittagong SMA</b>

**Relevance to NWPo**

There are no specific policy statements on stormwater drainage in the NWPo. However, there are subsidiary references which indicate that the NWMP should take full account of the need for efficient urban drainage networks to evacuate storm flows and reduce the impact of flood events.

**Purpose of Programme**

Chittagong is the second largest city, main commercial port and administrative centre of the eastern portion of the country. The population is projected to increase four-fold in the next 50 years, from 2.5 million in 2000 to 6.1 million in 2025 and 11 million by 2050. The total area of the city is expected to increase from 155 km<sup>2</sup> in 2000 to 650 km<sup>2</sup> by 2025. Therefore, it is important that the city should have an adequate and efficient stormwater drainage system. The existing drainage system is poor due to: insufficient drainage network; continuing increase of impermeable surfaces; poor maintenance resulting in loss of capacity and blockages; encroachment onto drainage channels and water bodies; and high water levels at the drainage outfall. In many locations, poorly planned and uncontrolled development has resulted in the obstruction of natural drainage routes, including surface runoff, without replacement by a new drainage system.



The programme is intended to develop and extend the stormwater drainage network as the city continues to expand and grow. Final option selection will depend on local conditions in each area of the city, including:

- (a) gravity or pumped systems;
- (b) open or covered drainage networks; and
- (c) need to set aside low lying areas for stormwater retention to reduce peak flows.

The Chittagong Metropolitan Area will require improved and new stormwater drainage facilities with pumping support.

**Programme Outline**

The rehabilitation, improvement and extension of the stormwater drainage system in Chittagong will be a continuous programme throughout the 25 years of the NWMP.



## Financing Arrangements

The investment requirements will be funded by GoB, possibly with international donor assistance.

CCC and CWASA are responsible for the operation and maintenance of the city's stormwater drainage facilities. It is essential that this function is carried out diligently and with adequate financial resources if the network is to operate efficiently especially in the wet season.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Chittagong Stormwater drainage programme prepared and agreed	I1	• Signed programme/project documents	2006
• Chittagong Stormwater drainage programme implemented	I2	• Programme/project completion reports	2021
• Chittagong served by stormwater drainage facilities	K	• Survey reports	2021
• Statistical Metropolitan Areas protected from flooding and stormwater run-off	D	• Duration of inundation	2027

## Institutional Arrangements

CWASA will be the main agency responsible for the implementation of the programme, with the support of CCC in the central areas where piped drainage will be complementary to the main sewerage system in the longer term. It is also crucial that CWASA inter-links the programme with its parallel responsibilities for supervision and enforcement of planning and building regulations to:

- ensure that private developers and public agencies include appropriate drainage facilities;
- prevent encroachment on open drains and water bodies, and infilling of natural water courses; and
- improve solid waste management, collection and disposal throughout the city.

In the peri-urban and poorer areas of the city, CWASA should actively encourage the participation of community based organisations and NGOs to plan, construct and maintain local drainage facilities.

Adequate maintenance, including structural repairs and regular cleaning (especially before and during the rainy season), is essential if the existing and future drainage system is to work efficiently and effectively for all the inhabitants of Chittagong, especially among the urban poor. CWASA should actively develop a strategy which involves maintenance contracts with the private sector and community-based organisations.

## Existing Documentation

- Chapter 8, Development Strategy Report, March 2001
- National Water Resources Database in WARPO

## Linkages

The development programme to improve Chittagong's stormwater drainage system should be linked and co-ordinated with other NWMP programmes, namely:

- BWDB Capacity Building (ID 010);

- (b) Disaster Management Bureau Capacity Building (ID 008);
- (c) Capacity Building for Other Organisations (ID 009);
- (d) Support to the Preparation of New Legislation (EE 001);
- (e) Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);
- (f) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (g) Raising Public Awareness in the Wise Use and Management (EE 010);
- (h) Chittagong Bulk Water Supply and Distribution Systems (MC 003);
- (i) Chittagong Sanitation and Sewerage Systems (MC 007);
- (j) Chittagong Flood Protection (MC 0012);
- (k) National Clean-up of Existing Industrial Pollution (EA 002);
- (l) National Pollution Control Plan (EA 001);
- (m) National Water Quality Monitoring (EA 003); and
- (n) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

In addition, planning and development should be co-ordinated with Chittagong City Corporation (CCC), Chittagong Water and Sewerage Authority (CWASA), Bangladesh Water Development Board (BWDB), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO and other interested parties.

### **Risks and Assumptions**

Risks associated with the implementation of the stormwater drainage programme are social, institutional and financial.

The social risks are that poor and disadvantaged areas of the city will be neglected not only in terms of adequate drainage but also the lack of planned settlement and slum upgrading schemes, which will encourage encroachment over drains and natural water courses. These risks can be mitigated by a more inclusive approach to planning and implementation of drainage facilities, which involves consultation and active participation in both construction and maintenance.

The institutional risks are that CCC and CWASA will continue to under-perform in this sector due to inadequate funding, lack of enforcement of planning regulations and poor management. These limitations can be overcome with:

- (a) a secure pipeline of funds for capital works and maintenance;
- (b) more effective commitment to and enforcement of planning regulations;
- (c) effective solid waste management; and
- (d) active involvement of the private sector and community-based organisations.

Financial risks relate to the possibility that adequate funds will not be forthcoming for the programme itself and appropriate regular maintenance. Government, in partnership with the responsible agencies, must address this issue to ensure that the necessary funds are committed in accordance with the NWMP strategy.

**Chittagong Stormwater Drainage**

Ref :

**MC 013**

Cluster :	<b>Major Cities</b>	Region(s) :	<b>EH</b>
Focus/Foci :	<b>Stormwater Drainage</b>	Location :	<b>Chittagong City</b>
Start Year <sup>1</sup> :	<b>2005</b>	Duration <sup>2</sup> :	<b>15 year(s)</b>
		Agency(s) :	<b>CWASA</b>
		Responsible :	<b>None</b>
Short Description :	<p>NWPo states that "Regions of economic importance such as metropolitan areas,...will be fully protected against floods as a matter of first priority" (NWPo §4.2.p.i) The progressive expansion and urbanization of Chittagong City increases the need for storm drainage as the increase in paved surfaces hastens runoff rates and reduces infiltration thereby causing urban flooding. Each heavy rainstorm causes inconvenience and sometimes major damage and disruption as a result of ineffective or inadequate drainage. This programme will mitigate Chittagongs' stormwater drainage problem by providing a properly planned, comprehensive drainage system ranging from collection of water at local street level to disposal of accumulated drainage water at pump stations.</p>		

<b>MIS Links</b>	Cost Calculation :	MC Programme costing.xls	Map :	MC 013 Map.jpg
	Disb't Schedule :	MC Programme costing.xls	Description :	MC 013 PgP.doc

<b>Finance</b>	Costs	Private	Funding (%)	Expected by
			GoB	ProgrammeYear
Total Capital <sup>3</sup>	<b>12,000.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>
Ultimate Recurring	<b>1,200.00</b> MTk/yr	<b>n/a</b>	<b>85%</b>	<b>15%</b>
Date of Data :	<b>31 07 01</b>	<b>Stacked Cumulative Cash Flow Chart</b>		
	(dd) (mm) (yy)			
Status :	<b>Identified</b>			
Financial Base Year:	<b>mid-2000</b>			
Planned Expenditure (to date) :	<b>0</b> MTk			
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk			

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Chittagong Stormwater drainage programme prepared and agreed	• Signed programme/project documents	NYD
• Chittagong Stormwater drainage programme implemented	• Programme/project completion reports	NYD
• Chittagong served by stormwater drainage facilities	• Survey reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	MC 013
Title	Chittagong Stormwater Drainage

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	15.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

### Technical Assistance

Expatriate consultants (all-in rate)  
 Senior National consultants (all-in rate)  
 Mid-level National consultants (all-in rate)  
 Sub-totals  
 Other general TA programme costs  
 Specific other TA programme costs  
**Total TA Costs**

TA costs for this programme are included in the capital costs

### Investment items - short term

Gravity and pumped drainage infrastructure	7,000.0	10.0%	700.0
--	---------	-------	-------

### Investment items - term

Gravity and pumped drainage infrastructure	3,000.0	10.0%	300.0
--	---------	-------	-------

### Investment items - short term

Gravity and pumped drainage infrastructure	2,000.0	10.0%	200.0
--	---------	-------	-------

### Total Investment Items

12,000.0	10.0%	1,200.0
----------	-------	---------

### Overall Programme Costs

12,000.0	1,200.0
----------	---------

**Khulna Flood Protection**

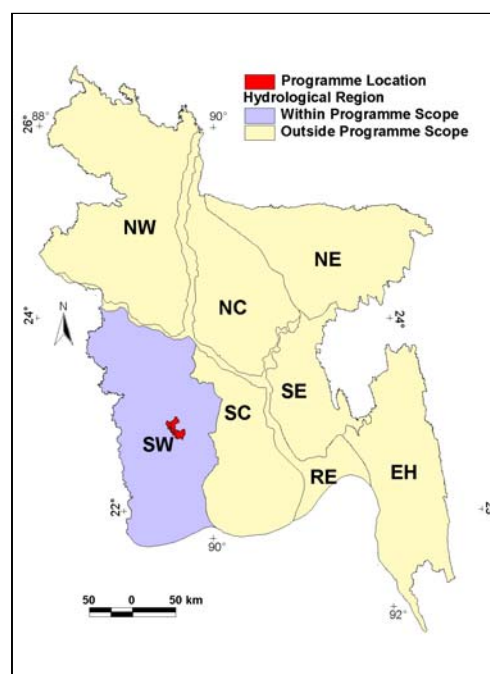
Ref: MC 014

**Basic Data**

NWMP Sub-sector	<b>Major Cities</b>
Region(s)	<b>South West Khulna SMA</b>

**Relevance to NWPo**

The programme is aimed at completing the flood protection works for Khulna in the long term, in accordance with the NWPo. Policy states that “Regions of economic importance such as metropolitan areas, sea and airports, and export processing zones will be fully protected against floods as a matter of first priority.” The fulfilment of this objective will provide appropriate levels of protection for life, property, normal economic activity and public infrastructure. The NWPo also states that all public buildings and infrastructure will be constructed above the highest ever-recorded flood level.

**Purpose of Programme**

Khulna is the third largest city, commercial and administrative centre of the south west portion of the country. The population is projected to increase four-fold in the next 50 years, from 1.1million in 2000 to 2.4million in 2025 and 4million by 2050. The city's main flood defences are already in place. The completion of the city's flood defences will provide protection against floods with an acceptable flood return period. The increased security will protect life, property and infrastructure, and limit the adverse impact on normal commercial activity. The poor will also benefit, but it is important that these communities are consulted during the planning and implementation process.

**Programme Outline**

The construction of the Khulna's Flood Protection Scheme is programmed for completion during the NWMP.

**Financing Arrangements**

The investment requirements will be funded by GoB, possibly with international donor assistance.

The Bangladesh Water Development Board (BWDB) is responsible for the implementation, repair and maintenance of the city's flood protection facilities. It is essential that this function is carried out diligently and with adequate funding support from GoB and KCC.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Khulna Flood protection programme prepared and agreed	I1	• Signed programme/project documents	2004
• Khulna flood protection programme implemented	I2	• Programme/project completion reports	2011
• Khulna protected from 1:100 year flood	K	• Physical evidence and hydrological data	2011
• Statistical Metropolitan Areas protected from flooding and stormwater run-off	D	• Duration of inundation	2027

## Institutional Arrangements

Under existing institutional arrangements, the Bangladesh Water Development Board (BWDB) will be responsible for the planning, construction and maintenance. In the planning and implementation stages, it is important that local communities and other stakeholders are consulted; and that any population resettlement is properly planned and carried out in a fair and appropriate manner.

In future, it is essential that BWDB carries out effective and appropriate maintenance on all the flood protection works for Khulna in order to ensure the integrity and security of the network. GoB and KCC will need to guarantee that BWDB has adequate annual financial resources to carry out this task. There is an opportunity for community-based organisations in the vicinity of the main flood defences to participate in these activities, providing BWDB provides expert supervision.

## Existing Documentation

- (a) Chapter 8, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

## Linkages

The completion of Khulna's flood protection facilities should be linked and co-ordinated with other NWMP programmes, namely:

- (a) BWDB Capacity Building (ID 010);
- (b) Disaster Management Bureau Capacity Building (ID 008);
- (c) Capacity Building for Other Organisations (ID 009);
- (d) Support to the Preparation of New Legislation (EE 001);
- (e) Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);
- (f) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (g) Raising Public Awareness in the Wise Use and Management (EE 010);
- (h) Khulna Bulk Water Supply and Distribution Systems (MC 004);
- (i) Khulna Sanitation and Sewerage Systems (MC 008);
- (j) Khulna Stormwater Drainage (MC 015);
- (k) National Clean-up of Existing Industrial Pollution (EA 002);
- (l) National Pollution Control Plan (EA 001);
- (m) National Water Quality Monitoring (EA 003); and
- (n) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

In addition, planning and development should be co-ordinated with Khulna City Corporation (KCC), Bangladesh Water Development Board (BWDB), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO and other interested parties.

### **Risks and Assumptions**

The main risks associated with the completion of the flood protection programme are social, economic and financial.

The social risks concern the potential impact on particular areas of Khulna (depending on the size of future floods) if the programme is not completed. The main impact will be felt by the poor who live in exposed low lying areas and adjacent to water courses which are prone to flood risk. These risks can be mitigated with timely construction, coupled with the full consultation and participation of those peri-urban and local communities which are in the immediate impact zone.

The economic risks relate to the widespread damage which would occur in the short and medium term if the programme is not completed. The economic impact would be felt not only in Khulna itself but also in the country as a whole with the subsequent disruption to normal administrative and commercial activities.

The financial risks concern the availability of the required capital funds and resources to sustain adequate maintenance levels for the entire flood protection network. These risks can be mitigated through appropriate ADP allocations and partnerships with international donors, providing the needs of the poor and disadvantaged communities are fully taken into account. Adequate maintenance can be assured by appropriate financial transfers from both GoB and KCC, and conscientious sustained activity by BWDB.

**Khulna Flood Protection**

Ref :

**MC 014**

Cluster :	<b>Major Cities</b>	Region(s) :	<b>SW</b>
Focus/Foci :	<b>Flood Protection</b>	Location :	<b>Khulna City</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>10 year(s)</b>
		Agency(s) :	<b>BWDB</b>
		Responsible :	<b>KCC</b>
Short Description :	NWPo states that "Regions of economic importance such as metropolitan areas,...will be fully protected against floods as a matter of first priority" (NWPo §4.2.p.i). Some of the lower, southern parts of Khulna are vulnerable to flooding during spring tides and a flood protection embankment with tidal sluices has been constructed to provide protection. However, the protected area is vulnerable to waterlogging when the drainage sluices cannot be operated due to high external water levels. In other parts of the city, local flooding is caused by heavy rainfall due to inadequate storm drainage. This programme contains measures to address these problems.		

<b>MIS Links</b>	Cost Calculation :	MC Programme costing.xls	Map :	MC 014 Map.jpg
	Disb't Schedule :	MC Programme costing.xls	Description :	MC 014 PgP.doc

Finance							
	Costs	Private	Funding (%)	Beneficiaries	Expected by		
			GoB		ProgrammeYear		
	Total Capital <sup>3</sup>	444.00 MTk	0%	100%	0%	10	
	Ultimate Recurring	40.00 MTk/yr	n/a	85%	15%	11	
	Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart		
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring	— Total
Status :	Identified						
Financial Base Year:	mid-2000						
Planned Expenditure (to date) :	0 MTk						
Actual Expenditure <sup>4</sup> (to date) :	0 MTk						

Programme Years	Investment (MTk)	Recurring (MTk)	Total (MTk)
0	0	0	0
5	400	100	500
10	400	200	600
15	400	300	700
20	400	400	800
25	400	500	900
30	400	600	1000
35	400	700	1100
40	400	800	1200
45	400	900	1300
50	400	1000	1400

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Khulna Flood protection programme prepared and agreed	• Signed programme/project documents	NYD
• Khulna flood protection programme implemented	• Programme/project completion reports	NYD
• Khulna protected from 1:100 year flood	• Physical evidence and hydrological data	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done



# National Water Management Plan

## Programme Costing Sheet

Programme Ref	MC 014
Title	Khulna Flood Protection

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	10.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

### Technical Assistance

Expatriate consultants (all-in rate)  
 Senior National consultants (all-in rate)  
 Mid-level National consultants (all-in rate)  
 Sub-totals  
 Other general TA programme costs  
 Specific other TA programme costs  
**Total TA Costs**

TA costs for this programme are included in the capital costs

### Investment items - short term

Flood protection embankments					333.0	9.0%	30.0
------------------------------	--	--	--	--	-------	------	------

### Investment items - term

Flood protection embankments					111.0	9.0%	10.0
------------------------------	--	--	--	--	-------	------	------

### Investment items - short term

<b>Total Investment Items</b>					<b>444.0</b>	<b>9.0%</b>	<b>40.0</b>
-------------------------------	--	--	--	--	--------------	-------------	-------------

<b>Overall Programme Costs</b>					<b>444.0</b>		<b>40.0</b>
--------------------------------	--	--	--	--	--------------	--	-------------

**Khulna Stormwater Drainage**Ref: **MC 015****Basic Data**

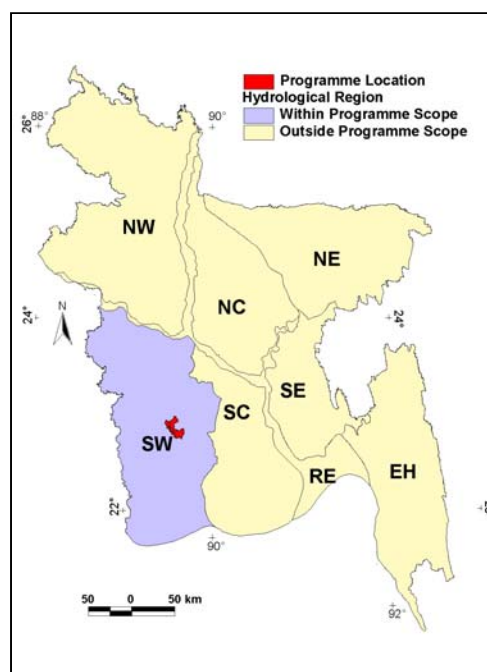
NWMP Sub-sector	<b>Major Cities</b>
Region(s)	<b>South West Khulna SMA</b>

**Relevance to NWPo**

There are no specific policy statements on stormwater drainage in the NWPo. However, there are subsidiary references which indicate that the NWMP should take full account of the need for efficient urban drainage networks to evacuate storm flows and reduce the impact of flood events.

**Purpose of Programme**

Khulna is the third largest city, commercial and administrative centre of the south west portion of the country. The population is projected to increase four-fold in the next 50 years, from 1.1million in 2000 to 2.4million in 2025 and 4million by 2050. The total area of the city is expected to increase from 74km<sup>2</sup> in 2000 to 247km<sup>2</sup> by 2025. Therefore, it is important that the city should have an adequate and efficient stormwater drainage system. The existing drainage system is poor due to: insufficient drainage network; continuing increase of impermeable surfaces; poor maintenance resulting in loss of capacity and blockages; encroachment onto drainage channels and water bodies; and high water levels at the drainage outfall. In many locations, poorly planned and uncontrolled development has resulted in the obstruction of natural drainage routes, including surface runoff, without replacement by a new drainage system.



The programme is intended to develop and extend the stormwater drainage network as the city continues to expand and grow. Final option selection will depend on local conditions in each area of the city, including:

- (a) gravity or pumped systems;
- (b) open or covered drainage networks; and
- (c) need to set aside low lying areas for stormwater retention to reduce peak flows.

The Khulna Metropolitan Area will require improved and new stormwater drainage facilities and in addition will require pumping support.

**Programme Outline**

The rehabilitation, improvement and extension of the stormwater drainage system in Khulna will be a continuous programme throughout the 25 years of the NWMP.

## Financing Arrangements

The investment requirements will be funded by GoB, possibly with international donor assistance.

KCC is responsible for the operation and maintenance of the city's stormwater drainage facilities. It is essential that this function is carried out diligently and with adequate financial resources if the network is to operate efficiently especially in the wet season.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Khulna stormwater drainage programme prepared and agreed	I1	• Signed programme/project documents	2005
• Khulna stormwater drainage programme implemented	I2	• Programme/project completion reports	2028
• Khulna served by stormwater drainage	K	• Survey reports	2028
• Statistical Metropolitan Areas protected from flooding and stormwater run-off	D	• Duration of inundation	2028

## Institutional Arrangements

KCC will be the main agency responsible for the implementation of the programme. It also crucial that KCC inter-links the programme with its parallel responsibilities for supervision and enforcement of planning and building regulations to:

- (a) ensure that private developers and public agencies include appropriate drainage facilities;
- (b) prevent encroachment on open drains and water bodies, and infilling of natural water courses; and
- (c) improve solid waste management, collection and disposal throughout the city.

In the peri-urban and poorer areas of the city, KCC should actively encourage the participation of community based organisations and NGOs to plan, construct and maintain local drainage facilities.

Adequate maintenance, including structural repairs and regular cleaning (especially before and during the rainy season), is essential if the existing and future drainage system is to work efficiently and effectively for all the inhabitants of Khulna, especially among the urban poor. KCC should actively develop a strategy which involves maintenance contracts with the private sector and community-based organisations.

## Existing Documentation

- (a) Chapter 8, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

## Linkages

The development programme improve Khulna's stormwater drainage system should be linked and co-ordinated with other NWMP programmes, namely:

- (a) BWDB Capacity Building (ID 010);
- (b) Disaster Management Bureau Capacity Building (ID 008);
- (c) Capacity Building for Other Organisations (ID 009);

- (d) Support to the Preparation of New Legislation (EE 001);
- (e) Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);
- (f) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (g) Raising Public Awareness in the Wise Use and Management (EE 010);
- (h) Khulna Bulk Water Supply and Distribution Systems (MC 004);
- (i) Khulna Sanitation and Sewerage Systems (MC 008);
- (j) Khulna Flood Protection (MC 014);
- (k) National Clean-up of Existing Industrial Pollution (EA 002);
- (l) National Pollution Control Plan (EA 001);
- (m) National Water Quality Monitoring (EA 003); and
- (n) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

In addition, planning and development should be co-ordinated with Khulna City Corporation (KCC), Bangladesh Water Development Board (BWDB), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO and other interested parties.

### **Risks and Assumptions**

Risks associated with the implementation of the stormwater drainage programme are social, institutional and financial.

The social risks are that poor and disadvantaged areas of the city will be neglected not only in terms of adequate drainage but also the lack of planned settlement and slum upgrading schemes, which will encourage encroachment over drains and natural water courses. These risks can be mitigated by a more inclusive approach to planning and implementation of drainage facilities, which involves consultation and active participation in both construction and maintenance.

The institutional risks are that KCC will continue to under-perform in this sector due to inadequate funding, lack of enforcement of planning regulations and poor management. These limitations can be overcome with:

- (a) a secure pipeline of funds for capital works and maintenance;
- (b) more effective commitment to and enforcement of planning regulations;
- (c) effective solid waste management; and
- (d) active involvement of the private sector and community-based organisations.

Financial risks relate to the possibility that adequate funds will not be forthcoming for the programme itself and appropriate regular maintenance. Government, in partnership with the responsible agencies, must address this issue to ensure that the necessary funds are committed in accordance with the NWMP strategy.

**Khulna Stormwater Drainage**

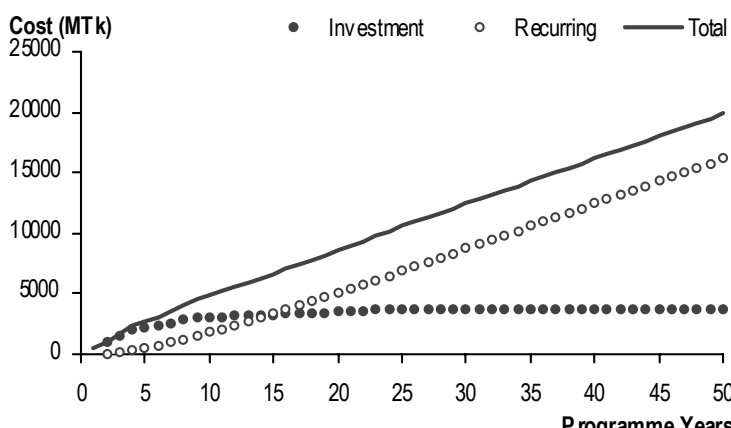
Ref :

**MC 015**

Cluster :	Major Cities	Region(s) :	SW			
Focus/Foci :	Stormwater Drainage	Location :	Khulna City			
Start Year <sup>1</sup> :	2004	Duration <sup>2</sup> :	22 year(s)	Agency(s) :	KCC	(Lead)
				Responsible :	BWDB	(Supporting)
Short Description :	NWPo states that "Regions of economic importance such as metropolitan areas,...will be fully protected against floods as a matter of first priority" (NWPo §4.2.p.i) . The progressive expansion and urbanization of Khulna City increases the need for storm drainage as the increase in paved surfaces hastens runoff rates and reduces infiltration thereby causing urban flooding. This programme will mitigate Khulnas' stormwater drainage problem by ensuring a properly planned, comprehensive drainage system ranging from collection of water at local street level to disposal of accumulated drainage water at pump stations.					

<b>MIS Links</b>	Cost Calculation :	MC Programme costing.xls	Map :	MC 015 Map.jpg
	Disb't Schedule :	MC Programme costing.xls	Description :	MC 015 PgP.doc

Finance							
	Costs	Private	Funding (%)	Beneficiaries	Expected by		
			GoB		ProgrammeYear		
	Total Capital <sup>3</sup>	3,724.00 MTk	0%	100%	0%	22	
	Ultimate Recurring	372.40 MTk/yr	n/a	85%	15%	26	
	Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart		
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring	— Total
Status :	Identified						
Financial Base Year:	mid-2000						
Planned Expenditure (to date) :	0 MTk						
Actual Expenditure <sup>4</sup> (to date) :	0 MTk						



Programme Years	Investment (MTk)	Recurring (MTk)	Total (MTk)
0	0	0	0
5	3000	0	3000
10	3000	1000	4000
15	3000	2500	5500
20	3000	4000	7000
25	3000	5500	8500
30	3000	7000	10000
35	3000	8500	11500
40	3000	10000	13000
45	3000	11500	14500
50	3000	13000	16000

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Khulna stormwater drainage programme prepared and agreed	• Signed programme/project documents	NYD
• Khulna stormwater drainage programme implemented	• Programme/project completion reports	NYD
• Khulna served by stormwater drainage facilities	• Survey reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	MC 015
Title	Khulna Stormwater Drainage

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

### Technical Assistance

Expatriate consultants (all-in rate)  
 Senior National consultants (all-in rate)  
 Mid-level National consultants (all-in rate)  
 Sub-totals  
 Other general TA programme costs  
 Specific other TA programme costs  
**Total TA Costs**

TA costs for this programme are included in the capital costs

### Investment items - short term

Gravity and pumped drainage infrastructure					2,000.0	10.0%	200.0
--	--	--	--	--	---------	-------	-------

### Investment items - term

Gravity and pumped drainage infrastructure					1,000.0	10.0%	100.0
--	--	--	--	--	---------	-------	-------

### Investment items - short term

Gravity and pumped drainage infrastructure					724.0	10.0%	72.4
--	--	--	--	--	-------	-------	------

### Total Investment Items

					3,724.0	10.0%	372.4
--	--	--	--	--	---------	-------	-------

### Overall Programme Costs

					3,724.0		372.4
--	--	--	--	--	---------	--	-------

**Rajshahi Flood Protection**

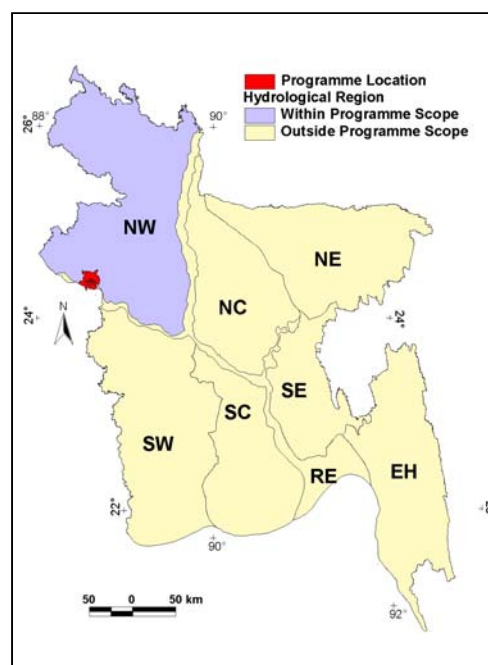
Ref: MC 016

**Basic Data**

NWMP Sub-sector	<b>Major Cities</b>
Region(s)	<b>North West Rajshahi SMA</b>

**Relevance to NWPo**

The programme is aimed at completing the flood protection works for Rajshahi in the medium to long term, in accordance with the NWPo. Policy states that “Regions of economic importance such as metropolitan areas, sea and airports, and export processing zones will be fully protected against floods as a matter of first priority.” The fulfilment of this objective will provide appropriate levels of protection for life, property, normal economic activity and public infrastructure. The NWPo also states that all public buildings and infrastructure will be constructed above the highest ever-recorded flood level.

**Purpose of Programme**

Rajshahi is the fourth largest city in the country and administrative centre of the north west portion of the country. The population is projected to increase four-fold in the next 50 years, from about 700,000 in 2000 to 2.3million in 2025 and 4million by 2050. The total area of the city is expected to increase from 50Km<sup>2</sup> in 2000 to 351 Km<sup>2</sup> by 2025. The city's main flood defences are already in place. BWDB is currently carrying out revetment work on the river from Rajshahi to Chapai Nowabganj.

The programme provides for modest additions and rehabilitation to the city's flood defences as the city continues to expand throughout the NWMP. The completion of the system will provide protection against floods with an acceptable flood return period. The increased security will protect life, property and infrastructure, and limit the adverse impact on normal commercial activity. The poor will also benefit, but it is important that these communities are consulted during the planning and implementation process.

**Programme Outline**

The completion of the Rajshahi flood protection system is programmed for the medium to the long term.

**Financing Arrangements**

The investment requirements will be funded by GoB, possibly with international donor assistance.

The Bangladesh Water Development Board (BWDB) is responsible for the implementation, repair and maintenance of the city's flood protection facilities. It is essential that this function is carried out diligently and with adequate funding support from GoB and RCC.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Rajshahi flood protection embankment erosion protection project prepared and agreed	I1	• Signed project document	2004
• Rajshahi flood embankments protected from erosion	K	• Programme/project completion report	2011
• Statistical Metropolitan Areas protected from flooding and stormwater run-off	D	• Duration of inundation	2027

## Institutional Arrangements

Under existing institutional arrangements, the Bangladesh Water Development Board (BWDB) will be responsible for the planning, construction and maintenance. In the planning and implementation stages, it is important that local communities and other stakeholders are consulted; and that any population resettlement is properly planned and carried out in a fair and appropriate manner.

In future, it is essential that BWDB carries out effective and appropriate maintenance on all the flood protection works for Rajshahi in order to ensure the integrity and security of the network. GoB and RCC will need to guarantee that BWDB has adequate annual financial resources to carry out this task. There is an opportunity for community-based organisations in the vicinity of the main flood defences to participate in these activities, providing BWDB provides expert supervision.

## Existing Documentation

- (a) Chapter 8, Development Strategy Report, March 2001
- (b) National Water Resources Database in WARPO

## Linkages

The completion of Rajshahi's flood protection facilities should be linked and co-ordinated with other NWMP programmes, namely:

- (a) BWDB Capacity Building (ID 010);
- (b) Disaster Management Bureau Capacity Building (ID 008);
- (c) Capacity Building for Other Organisations (ID 009);
- (d) Support to the Preparation of New Legislation (EE 001);
- (e) Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);
- (f) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (g) Raising Public Awareness in the Wise Use and Management (EE 010);
- (h) Rajshahi Bulk Water Supply and Distribution Systems (MC 005);
- (i) Rajshahi Sanitation and Sewerage Systems (MC 009);
- (j) Rajshahi Stormwater Drainage (MC 017);
- (k) National Clean-up of Existing Industrial Pollution (EA 002);
- (l) National Pollution Control Plan (EA 001);
- (m) National Water Quality Monitoring (EA 003); and



(n) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

In addition, planning and development should be co-ordinated with Rajshahi City Corporation (RCC), Bangladesh Water Development Board (BWDB), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO and other interested parties.

### **Risks and Assumptions**

The main risks associated with the completion of the flood protection programme are social, economic and financial.

The social risks concern the potential impact on particular areas of Rajshahi (depending on the size of future floods) if the programme is not completed. The main impact will be felt by the poor who live in exposed low lying areas and adjacent to water courses which are prone to flood risk. These risks can be mitigated with timely construction, coupled with the full consultation and participation of those peri-urban and local communities which are in the immediate impact zone.

The economic risks relate to the widespread damage which would occur in the short and medium term if the programme is not completed. The economic impact would be felt not only in Rajshahi itself but also in the country as a whole with the subsequent disruption to normal administrative and commercial activities.

The financial risks concern the availability of the required capital funds and resources to sustain adequate maintenance levels for the entire flood protection network. These risks can be mitigated through appropriate ADP allocations and partnerships with international donors, providing the needs of the poor and disadvantaged communities are fully taken into account. Adequate maintenance can be assured by appropriate financial transfers from both GoB and RCC, and conscientious sustained activity by BWDB.

**Rajshahi Flood Protection**

Ref :

**MC 016**

Cluster :	<b>Major Cities</b>	Region(s) :	<b>NW</b>
Focus/Foci :	<b>Flood Protection</b>	Location :	<b>Rajshahi City</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>9 year(s)</b>
		Agency(s) Responsible :	<b>BWDB (Lead)</b> <b>RCC (Supporting)</b>
Short Description :	NWPo states that "Regions of economic importance such as metropolitan areas,...will be fully protected against floods as a matter of first priority" (NWPo §4.2.p.i). Rajshahi already has a flood embankment system; but this needs protection against erosion damage. This programme will deliver suitable remedial measures necessary to ensure the flood embankment groynes remain effective as flood protection for the city of Rajshahi.		

<b>MIS Links</b>	Cost Calculation :	MC Programme costing.xls	Map :	MC 016 Map.jpg
	Disb't Schedule :	MC Programme costing.xls	Description :	MC 016 PgP.doc

Finance																																					
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear																																
	Total Capital <sup>3</sup>	400.00 MTk	0%	100%	0%	9																															
	Ultimate Recurring	20.00 MTk/yr	n/a	85%	15%	10																															
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart																																	
	(dd)	(mm)	(yy)																																		
Status :	Identified																																				
Financial Base Year:	mid-2000																																				
Planned Expenditure (to date) :	0 MTk																																				
Actual Expenditure <sup>4</sup> (to date) :	0 MTk																																				
	<div>Cost (MTk)</div> <div>● Investment    ○ Recurring    — Total</div> <table><caption>Estimated Data for Stacked Cumulative Cash Flow Chart</caption><thead><tr><th>Programme Years</th><th>Investment (MTk)</th><th>Recurring (MTk)</th><th>Total (MTk)</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>5</td><td>150</td><td>0</td><td>150</td></tr><tr><td>10</td><td>400</td><td>0</td><td>400</td></tr><tr><td>20</td><td>400</td><td>200</td><td>600</td></tr><tr><td>30</td><td>400</td><td>450</td><td>850</td></tr><tr><td>40</td><td>400</td><td>650</td><td>1050</td></tr><tr><td>50</td><td>400</td><td>850</td><td>1250</td></tr></tbody></table>					Programme Years	Investment (MTk)	Recurring (MTk)	Total (MTk)	0	0	0	0	5	150	0	150	10	400	0	400	20	400	200	600	30	400	450	850	40	400	650	1050	50	400	850	1250
Programme Years	Investment (MTk)	Recurring (MTk)	Total (MTk)																																		
0	0	0	0																																		
5	150	0	150																																		
10	400	0	400																																		
20	400	200	600																																		
30	400	450	850																																		
40	400	650	1050																																		
50	400	850	1250																																		

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Rajshahi flood protection embankment erosion protection project prepared and agreed	• Signed programme/project documents	NYD
• Rajshahi flood embankments protected from erosion	• Programme/project completion report	NYD
• Rajshahi protected from 1 in 100 year flood	• Physical evidence and hydrological data	

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	MC 016
Title	Rajshahi Flood Protection

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	9.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

### Technical Assistance

Expatriate consultants (all-in rate)  
 Senior National consultants (all-in rate)  
 Mid-level National consultants (all-in rate)  
 Sub-totals  
 Other general TA programme costs  
 Specific other TA programme costs  
**Total TA Costs**

TA costs for this programme are included in the capital costs

<b>Investment items - short term</b>	150.0	5.0%	7.5
--------------------------------------	-------	------	-----

### Investment items - term

Erosion protection and extension of existing embankments	250.0	5.0%	12.5
--	-------	------	------

### Investment items - short term

Erosion protection and extension of existing embankments			-
--	--	--	---

<b>Total Investment Items</b>	<b>400.0</b>	<b>5.0%</b>	<b>20.0</b>
-------------------------------	--------------	-------------	-------------

<b>Overall Programme Costs</b>	<b>400.0</b>		<b>20.0</b>
--------------------------------	--------------	--	-------------

**Rajshahi Stormwater Drainage**Ref: **MC 017****Basic Data**

NWMP Sub-sector	<b>Major Cities</b>
Region(s)	<b>North West Rajshahi SMA</b>

**Relevance to NWPo**

There are no specific policy statements on stormwater drainage in the NWPo. However, there are subsidiary references which indicate that the NWMP should take full account of the need for efficient urban drainage networks to evacuate storm flows and reduce the impact of flood events.

**Purpose of Programme**

Rajshahi is the fourth largest city, and administrative centre of the north west portion of the country. The population is projected to increase four-fold in the next 50 years, from about 700,000 in 2000 to 2.3 million in 2025 and 4 million by 2050. The total area of the city is expected to increase from 50 km<sup>2</sup> in 2000 to 351km<sup>2</sup> by 2025. Therefore, it is important that the city should have an adequate and efficient stormwater drainage system. The existing storm drainage system is poor due to: insufficient drainage network; continuing increase of impermeable surfaces; poor maintenance resulting in loss of capacity and blockages; encroachment onto drainage channels and water bodies; and high water levels at the drainage outfall. In many locations, poorly planned and uncontrolled development has resulted in the obstruction of natural drainage routes, including surface runoff, without replacement by a new drainage system.

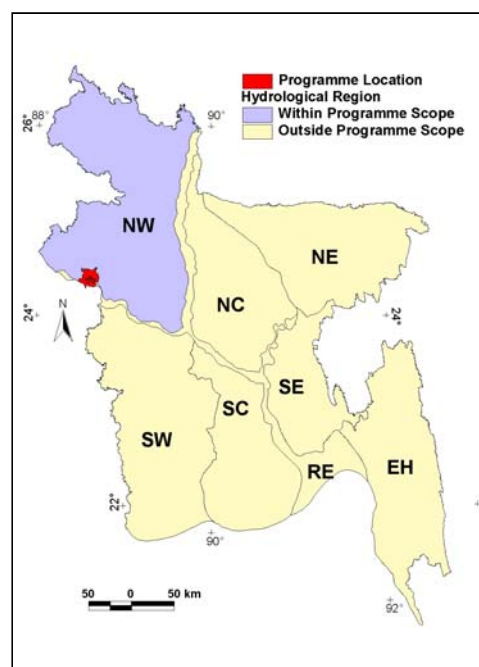
The programme is intended to develop and extend the stormwater drainage network as the city continues to expand and grow. Final option selection will depend on local conditions in each area of the city, including:

- (a) gravity or pumped systems;
- (b) open or covered drainage networks; and
- (c) need to set aside low lying areas for stormwater retention to reduce peak flows.

The Rajshahi Metropolitan Area will require improved and new stormwater drainage facilities and in addition it will require pumping support.

**Programme Outline**

The rehabilitation, improvement and extension of the stormwater drainage system in Rajshahi will be a continuous programme throughout the 25 years of the NWMP.



## Financing Arrangements

The investment requirements will be funded by GoB, possibly with international donor assistance.

RCC is responsible for the operation and maintenance of the city's stormwater drainage facilities. It is essential that this function is carried out diligently and with adequate financial resources if the network is to operate efficiently especially in the wet season.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Rajshahi stormwater drainage programme prepared and agreed	I1	• Programme/project documents agreed	2006
• Rajshahi stormwater drainage programme implemented	I2	• Programme/project completion reports	2028
• Rajshahi served by stormwater drainage facilities	K	• Survey reports	2028
• Statistical Metropolitan Areas protected from flooding and stormwater run-off	D	• Duration of inundation	2028

## Institutional Arrangements

RCC will be the main agency responsible for the implementation of the programme. It is also crucial that RCC inter-links the programme with its parallel responsibilities for supervision and enforcement of planning and building regulations to:

- ensure that private developers and public agencies include appropriate drainage facilities;
- prevent encroachment on open drains and water bodies, and infilling of natural water courses; and
- improve solid waste management, collection and disposal throughout the city.

In the peri-urban and poorer areas of the city, RCC should actively encourage the participation of community based organisations and NGOs to plan, construct and maintain local drainage facilities.

Adequate maintenance, including structural repairs and regular cleaning (especially before and during the rainy season), is essential if the existing and future drainage system is to work efficiently and effectively for all the inhabitants of Rajshahi, especially among the urban poor. RCC should actively develop a strategy which involves maintenance contracts with the private sector and community-based organisations.

## Existing Documentation

- Chapter 8, Development Strategy Report, March 2001
- National Water Resources Database in WARPO

## Linkages

The development programme to augment and improve Rajshahi's stormwater drainage system should be linked and co-ordinated with other NWMP programmes, namely:

- BWDB Capacity Building (ID 010);
- Disaster Management Bureau Capacity Building (ID 008);

- (c) Capacity Building for Other Organisations (ID 009);
- (d) Support to the Preparation of New Legislation (EE 001);
- (e) Water Resources Legislation - Preparation of Supporting Ordinances (EE 003);
- (f) Field Testing & Finalisation of Guidelines for Participatory Water Management (EE 006);
- (g) Raising Public Awareness in the Wise Use and Management (EE 010);
- (h) Rajshahi Bulk Water Supply and Distribution Systems (MC 005);
- (a) Rajshahi Sanitation and Sewerage Systems (MC 009);
- (b) Rajshahi Flood Protection (MC 016);
- (c) National Clean-up of Existing Industrial Pollution (EA 002);
- (d) National Pollution Control Plan (EA 001);
- (e) National Water Quality Monitoring (EA 003); and
- (f) Public Awareness Raising and Empowerment in respect of Environmental Issues (EA 010).

In addition, planning and development should be co-ordinated with Rajshahi City Corporation (RCC), Bangladesh Water Development Board (BWDB), Ministry of Health (MoH), Ministry of Industry (MoI), Department of Environment (DoE), WARPO and other interested parties.

### **Risks and Assumptions**

Risks associated with the implementation of the stormwater drainage programme are social, institutional and financial.

The social risks are that poor and disadvantaged areas of the city will be neglected not only in terms of adequate drainage but also the lack of planned settlement and slum upgrading schemes, which will encourage encroachment over drains and natural water courses. These risks can be mitigated by a more inclusive approach to planning and implementation of drainage facilities, which involves consultation and active participation in both construction and maintenance.

The institutional risks are that RCC will continue to under-perform in this sector due to inadequate funding, lack of enforcement of planning regulations and poor management. These limitations can be overcome with:

- (a) a secure pipeline of funds for capital works and maintenance;
- (b) more effective commitment to and enforcement of planning regulations;
- (c) effective solid waste management; and
- (d) active involvement of the private sector and community-based organisations.

Financial risks relate to the possibility that adequate funds will not be forthcoming for the programme itself and appropriate regular maintenance. Government, in partnership with the responsible agencies, must address this issue to ensure that the necessary funds are committed in accordance with the NWMP strategy.

**Rajshahi Stormwater Drainage**

Ref :

**MC 017**

Cluster :	Major Cities	Region(s) :	NW			
Focus/Foci :	Stormwater Drainage	Location :	Rajshahi City			
Start Year <sup>1</sup> :	2004	Duration <sup>2</sup> :	22 year(s)	Agency(s) Responsible :	RCC	(Lead)
					BWDB	(Supporting)
Short Description :	NWPo states that "Regions of economic importance such as metropolitan areas,...will be fully protected against floods as a matter of first priority" (NWPo §4.2.p.i). The progressive expansion and urbanization of Rajshahi City increases the need for storm drainage as the increase in paved surfaces hastens runoff rates and reduces infiltration thereby causing urban flooding. This programme will mitigate Rajshahis' stormwater drainage problem by ensuring a properly planned, comprehensive drainage system ranging from collection of water at local street level to disposal of accumulated drainage water at pump stations.					

<b>MIS Links</b>	Cost Calculation :	MC Programme costing.xls	Map :	MC 017 Map.jpg
	Disb't Schedule :	MC Programme costing.xls	Description :	MC 017 PgP.doc

Finance							
	Costs	Private	Funding (%)	Beneficiaries	Expected by		
			GoB		ProgrammeYear		
	Total Capital <sup>3</sup>	5,224.00 MTk	0%	100%	0%	22	
	Ultimate Recurring	522.40 MTk/yr	n/a	85%	15%	26	
	Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart		
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring	— Total
Status :	Identified						
Financial Base Year:	mid-2000						
Planned Expenditure (to date) :	0 MTk						
Actual Expenditure <sup>4</sup> (to date) :	0 MTk						

Programme Years	Investment (MTk)	Recurring (MTk)	Total (MTk)
0	0	0	0
5	5000	2500	7500
10	5000	5000	10000
15	5000	7500	12500
20	5000	10000	15000
25	5000	12500	17500
30	5000	15000	20000
35	5000	17500	22500
40	5000	20000	25000
45	5000	22500	27500
50	5000	25000	30000

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Rajshahi stormwater drainage programme prepared and agreed	• Signed programme/project documents	NYD
• Rajshahi stormwater drainage programme implemented	• Programme/project completion reports	NYD
• Rajshahi served by stormwater drainage facilities	• Survey reports	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
 5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	MC 017
Title	Rajshahi Stormwater Drainage

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

### Technical Assistance

Expatriate consultants (all-in rate)	}	TA costs for this programme are included in the capital costs
Senior National consultants (all-in rate)		
Mid-level National consultants (all-in rate)		
Sub-totals		
Other general TA programme costs		
Specific other TA programme costs		
<b>Total TA Costs</b>		

### Investment items - short term

Gravity and pumped drainage infrastructure			3,000.0	10.0%	300.0
--	--	--	---------	-------	-------

### Investment items - term

Gravity and pumped drainage infrastructure			724.0	10.0%	72.4
--	--	--	-------	-------	------

### Investment items - short term

Gravity and pumped drainage infrastructure			1,500.0	10.0%	150.0
--	--	--	---------	-------	-------

### Total Investment Items

			5,224.0	10.0%	522.4
--	--	--	---------	-------	-------

### Overall Programme Costs

			5,224.0		522.4
--	--	--	---------	--	-------



# Disaster Management

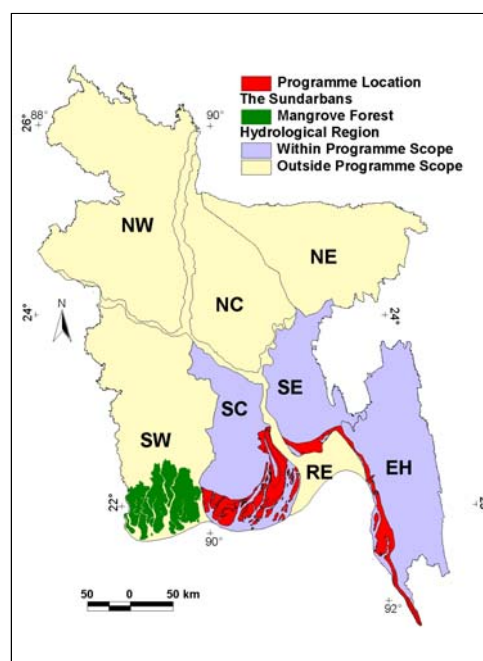
**Cyclone Shelters and Killas**Ref: **DM 001****Basic Data**

NWMP Sub-sector      **Disaster Management**

Region(s)              **South Central, South East and Eastern Hills**

**Relevance to NWPo**

This programme is relevant to the NWPo and the National Goals in that it “takes into account the particular needs of women and children” while providing a means by which the people may “be motivated to develop different flood proofing measures”. The latter is relevant to the broader objectives of institutional reform and the enabling environment, and in this regard is complemented by the considerable opportunities for decentralised implementation that the programme provides.

**Purpose of Programme**

Almost six million people live or subsist in areas exposed to significant risk of destruction and loss of life due to cyclone surge (see below). The Programme is intended to provide safe havens in the form of proven infrastructure comprising cyclone shelters which can also function as school buildings, and killas (raised earth mounds) where both humans and livestock can take refuge. Both shelters and killas will be equipped with water and gender-specific sanitation facilities and, in addition, the shelters will have generators. In some cases the shelters and killas will be constructed on adjacent sites.

**Programme Outline**

A major cyclone hit Bangladesh in 1991, killing some 140,000 people. Following the completion of the Multi-Purpose Cyclone Shelter Programme Study by BUET and BIDS in the following year, the EC-funded Cyclone Shelter Preparatory Study (CSPS) Stage I (1996–1998) undertook a detailed mouza-by-mouza assessment of the present and likely future population at Risk and High Risk from cyclone surges. At present, some 4.8M people are estimated to be at High Risk. Addition of a further 1.1M at Risk results in a total at-risk population of 5.9M, of which 3.6M (61%) are inside coastal embankments and 2.3M are outside. With the anticipated falling off in the rural population growth rate the at-risk population in 2025 would be only slightly higher, at 6.3M.

Almost the whole at-risk population is located in three regions, SC Region, the Chittagong Coastal Plain of EH Region and SE Region. Few people are at risk in the extensive coastal zone of the SW, because of the protection provided by the Sundarbans mangrove forest.

Cyclone shelters are substantial concrete and brick buildings set on columns above cyclone surge level. Maintenance of the shelters has been a major problem. Experience has shown that the best way to overcome this is for shelters to be used also as schools. The main purpose of killas is for the protection of livestock and, outside the coastal embankments, also the human population. They can be either linked with shelters or be on their own.

According to the CSPA Final Report, in 1996 there were 1,816 purpose built-cyclone shelters. There are probably few more than 2,000 at present. Since many shelters are located outside the risk area, the effective shelter provision is less than this total would suggest. CSPA estimates indicate that, based on the projected 2001 population, the existing shelter capacity inside the embankment in 1996 was sufficient to accommodate only 27% of the people at risk from a 1 in 20 year cyclone event.

The need for more safe havens is widely recognised. The CSPA Final Report (1998) recommended that some 1,500-2,000 new multi-purpose shelters (ie incorporating schools), each catering for 2,000 people or their equivalent, should be the target. However, follow-up to these proposals has been limited and the present rate of expansion of safe haven provision is modest. Current activities include a KfW – funded cyclone shelter programme which is just finishing, the Japanese aid – funded construction of about 100 shelters, of which the majority have been completed, and a small USAID – funded shelter construction programme to be executed by World Vision, an NGO. The Comprehensive Disaster Management Programme recently prepared with UNDP assistance is concerned primarily with institutional aspects rather than physical infrastructure like cyclone shelters. Clearly, a major acceleration in new safe haven construction is required for the adequate protection of the 5.9M population in the areas at risk.

The Government's safe haven provision strategy is based on protection against the 1 in 30 year cyclone surge event in the medium term, with provision improving to the 1 in 100 year level in the long term. Population served would be typically 2,000 per shelter and 900 per killa. For the medium term the breakdown of new safe haven provision by population is provisionally estimated as being 47% shelters, 33% killas and 20% the bari-level shelters covered by Programme DM 002; these proportions would change to 33% each in the long term. The population to be sheltered would be 2.15M in the medium term and another 1.59M in the long term. At a cost per head of Tk4,660 for shelters and Tk2,170 for killas, the total capital cost will be Tk9,895M, comprising Tk7,221M for 775 multi-purpose shelters and Tk2,673M for 1,369 killas. At 3% and 6% respectively of capital costs, annual maintenance costs would eventually reach Tk377M. Most of this cost would, however, be borne by the Education budget, in the case of shelters and, in the case of killas, by the local community, in the form of manual earthwork.

Social benefits of the Programme will be high and there will be no substantial adverse environmental impacts. In terms of safe haven provision the net cost of multi-purpose shelters is much less than the Tk4,660/head cost quoted above, because of their normal-time use as schools. Apart from the reduction in human loss of life and injury, killas produce significant agricultural benefits in the form of reduced livestock losses.

Notional regional distribution of the facilities is as follows:

Region	Shelters (including shelters with killas)			Killas only		
	Short term	Medium Term	Long term	Short term	Medium Term	Long term
South Central	109	165	143	117	176	200
South East	37	55	48	77	115	131
Eastern Hills	58	86	74	118	177	202
Total	204	306	265	312	468	533

## Financing Arrangements

The Programme will be funded by GoB, probably with donor assistance. Recurrent funding will be by GoB, through the Education budget (for the schools-cum-shelters), with killa maintenance being the responsibility of the local communities.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Pilot programme in progress	I1	• Signed contracts/work orders	2003
		• Progress reports	
• Pilot programme evaluated	I2	• Evaluation reports	2005
• Modalities accepted	I3	• Signed agreements	2005
• 775 multi-purpose shelters and 1369 killas constructed in cyclone prone areas	K	• Actual numbers of shelters and killas	2016
• Lives and national infrastructure protected against inundation damage	D	• Risk of loss of life (human and livestock) as estimated actuarially	2026
		• Risk of income disruption as estimated actuarially	
		• Risk of damage as estimated actuarially	

## Institutional Arrangements

The programme will be implemented by LGED, in close coordination with local government and with the Directorate of Primary Education, because the normal use of cyclone shelters will be as school buildings. NGOs will be involved for participatory site selection and other community-based activities.

## Existing Documentation

NWMP DSR Sections 9.3 and 9.8, and the National Water Resources Database (NWRD). The whole subject of cyclone risk and protection is described in considerable detail in the CSPS reports of June 1998.

## Linkages

There will be obvious links with the Integrated Coastal Zone Management Programme, as well as with NWMP programmes DM 002: Bari-level Cyclone Shelters, ID 001: Local Government Capacity Building for Water Management and ID 007: Disaster Management Bureau Capacity Building.

## **Risks and Assumptions**

Risks fall into three categories: social, physical and financial. The social risks involve poor locations, lack of access for particular social groups, inadequate social ownership and inadequate maintenance. It is assumed that these risks can be mitigated by the enforcement of strict site selection criteria, the involvement of experienced social facilitators and the adoption of designs that are consistent with easy maintenance (which itself assumes a participatory approach). Physical risks mainly concern cyclone damage during construction and unexpected ground conditions on site. It is assumed that it will be possible to concentrate all construction activities in non-cyclone seasons and that competent pre-qualification of contractors along with thorough site investigations will be possible. Financial risks concern the possibility that adequate operation and maintenance provision will not be forthcoming.

**Cyclone Shelters and Killas**Ref : **DM 001**

Cluster :	Disaster Management		Region(s) :	SC, SE, EH	
Focus/Foci :	Cyclone Protection		Location :	SC, SE and EH Regions	
Start Year <sup>1</sup> :	2002	Duration <sup>2</sup> :	15 year(s)	Agency(s) Responsible :	LGED (Lead) None (Supporting)
Short Description :	This programme is for the cyclone risk areas and is relevant to the NWPo as it provides “flood proofing systems to manage natural disasters: (NWPo §4.2.o) and takes special account the particular needs of women and children (NWPo §3.b) while motivating the people themselves to develop different flood proofing measures. The programme will provide safe havens in the form of proven infrastructure comprising raised and covered cyclone shelters and killas (raised mounds) where both humans and livestock can take refuge. Short to medium term beneficiaries of the programme will comprise some 1.72 million people estimated to be at a risk of serious cyclone threat at least once every 30 years or less. In the long term the programme will be extended to cover lower risk areas corresponding to a maximum return return periods of 1:100 years and will be closely linked with programme DM 002 "Bari-level Cyclone Shelter".				

<b>MIS Links</b>	Cost Calculation :	DM Programme costing.xls	Map :	DM 001 Map.jpg
	Disb't Schedule :	DM Programme costing.xls	Description :	DM 001 PgP.doc

<b>Finance</b>					
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>9,894.60</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>15</b>
Ultimate Recurring	<b>350.30</b> MTk/yr	<b>n/a</b>	<b>85%</b>	<b>15%</b>	<b>16</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Pilot programme in progress	• Signed contracts/work orders	NYD
	• Progress reports	
• Pilot programme evaluated	• Evaluation reports	NYD
• Modalities accepted	• Signed agreements	NYD
• 775 multi-purpose shelters and 1369 killas constructed in cyclone prone areas	• Actual numbers of shelters and killas	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	DM 001
Title	Cyclone Shelters and Killas

*Assumptions:*

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	15.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-	0.0%	-
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Shelters and Killas					7,221.1	3.0%	216.6
2. Killas only					2,673.4	5.0%	133.7
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					9,894.6		350.3
<b>Overall Programme Costs</b>					<b>9,894.6</b>		<b>350.3</b>

<b>DM 001</b>	<b>Shelters + Killas</b>	Short-term	Med Term	Long Term	Total
	People	407,840	611,760	530,000	1,549,600
	Shelters	204	306	265	775
	Cost (TkM)	1,900.5	2,850.8	2,469.8	7,221.1
<b>DM 001</b>	<b>Killas only</b>				
	People	280,800	421,200	530,000	1,232,000
	Shelters	312	468	589	1,369
	Cost (TkM)	609.3	914.0	1,150.1	2,673.4

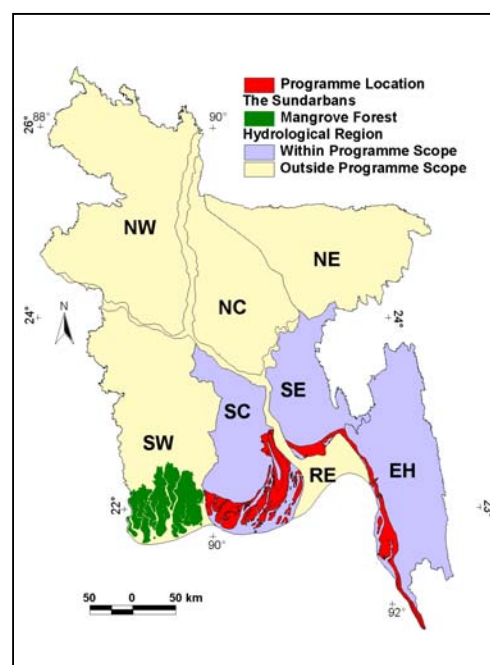
**Bari-Level Cyclone Shelters**Ref: **DM 002****Basic Data**

NWMP Sub-sector      **Disaster Management**

Region(s) and      **South Central, South East**  
                                  **Eastern Hills**

**Relevance to NWPo**

This programme is relevant to the NWPo and the National Goals in that it “takes into account the particular needs of women and children” while providing a means by which the people may “be motivated to develop different cyclone proofing measures”. The latter is relevant to the broader objectives of institutional reform and the enabling environment, and in this regard is complemented by the considerable opportunities for decentralised implementation that the programme provides.

**Purpose of Programme**

Almost six million people live or subsist in areas exposed to significant risk of destruction and loss of life due to cyclone surge (see below). The Programme is intended to provide safe havens in the form of 12m<sup>2</sup> concrete framed buildings on raised 72m<sup>2</sup> earth platforms of 2m height, one in each bari (group of houses or homesteads) in the coastal areas. At this stage the approach remains innovative and in need of piloting but, if successful, could be replicated with considerable savings over more conventional approaches, as well as being far more easily accessible to women.

**Programme Outline**

A major cyclone hit Bangladesh in 1991, killing some 140,000 people. Following the completion of the Multi-Purpose Cyclone Shelter Programme Study by BUET and BIDS in the following year, the EC-funded Cyclone Shelter Preparatory Study (CSPS) Stage I (1996–1998) undertook a detailed mouza-by-mouza assessment of the present and likely future population at Risk and High Risk from cyclone surges. At present, some 4.8M people are estimated to be at High Risk. Addition of a further 1.1M at Risk results in a total at-risk population of 5.9M, of which 3.6M (61%) are inside coastal embankments and 2.3M are outside. With the anticipated falling off in the rural population growth rate the at-risk population in 2025 would be only slightly higher, at 6.3M.

Almost the whole at-risk population is located in three regions, SC Region, the Chittagong Coastal Plain of EH Region and SE Region. Few people are at risk in the extensive coastal zone of the SW, because of the protection provided by the Sundarbans mangrove forest.



Cyclone shelters and killas (large raised earth mounds) are the principal existing means of protection against cyclone surges. Cyclone shelters are substantial concrete and brick buildings set on columns above cyclone surge level. The main purpose of killas is for the protection of livestock and, outside the coastal embankments, also the human population. They can be either linked with shelters or be on their own.

According to the CSPA Final Report, in 1996 there were 1,816 purpose built-cyclone shelters. There are probably few more than 2,000 at present. Since many shelters are located outside the risk area, the effective shelter provision is less than this total would suggest. CSPA estimates indicate that, based on the projected 2001 population, the existing shelter capacity inside the embankment in 1996 was sufficient to accommodate only 27% of the people at risk from a 1 in 20 year cyclone event.

The need for more safe havens is widely recognised. The CSPA Final Report (1998) recommended that some 1,500-2,000 new multi-purpose shelters (ie incorporating schools), each catering for 2,000 people, or their equivalent, should be the target. However, follow-up to these proposals has been limited and the present rate of expansion of safe haven provision is modest. Current activities include a KfW – funded cyclone shelter programme which is just finishing, the Japanese aid – funded construction of about 100 shelters, of which the majority have been completed, and a small USAID – funded shelter construction programme to be executed by World Vision, an NGO. The Comprehensive Disaster Management Programme recently prepared with UNDP assistance is concerned primarily with institutional aspects rather than physical infrastructure like cyclone shelters. Clearly, a major acceleration in new safe haven construction is required for the adequate protection of the 5.9M population in the areas at risk.

Shelter provision by means of conventional multi-purpose cyclone shelter is relatively expensive (an estimated Tk4,660/head). Access can be problematical for some beneficiaries, because of the distance of their dwellings from the nearest shelter. An alternative approach is to decentralise shelter provision and greatly reduce shelter size, by introducing bari-level shelters. These would also be cheaper (an estimated Tk1,820/head). Based on the dimensions listed above, a typical shelter would accommodate 22 people (four families). It would include a 1m high parapet wall, to ensure that the total protection reaches a height 6m above natural ground level. The ground floor area of the building on the raised platform would provide accommodation in normal times for one of the four families of the bari.

The Government's safe haven provision strategy is based on protection against the 1 in 30 year cyclone surge event in the medium term, with provision improving to the 1 in 100 year level in the long term. For the medium term the breakdown of new safe haven provision by population is envisaged as being 47% shelters, 33% killas (these together make up Programme DM001) and 20% bari-level shelters; these proportions would change to 33% each in the long term. Based on these assumptions, some 43,700 bari-level shelters would be constructed, to shelter 960,400 people, at a total capital cost of Tk1,748M. Notional regional distribution of the shelters is as follows:

Region	No. of Shelters		
	Short term	Medium term	Long term
South Central	2756	6431	11,312
South East	1259	2938	5,169
Eastern Hills	1854	4326	7,610
Total	5,869	13,695	24,091

If successful, this type of local-level shelter would be cheaper and also more effective than conventional shelters, because of its close proximity to the beneficiaries' homes. Social benefits would be high and there would be no significant environmental impacts.

## Financing Arrangements

The programme would be funded by GoB, but maintenance should be the responsibility of the beneficiaries. Suitable arrangements would need to be made for the sharing of costs between GoB and the one family per shelter using it as its home, and between this family and the other three families.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"> <li>Pilot programme in progress</li> </ul>	I1	<ul style="list-style-type: none"> <li>Signed contracts/work orders</li> </ul>	2004
<ul style="list-style-type: none"> <li>Pilot programme evaluated</li> </ul>	I2	<ul style="list-style-type: none"> <li>Progress reports</li> </ul>	2006
<ul style="list-style-type: none"> <li>Modalities accepted</li> </ul>	I3	<ul style="list-style-type: none"> <li>Evaluation reports</li> </ul>	2006
<ul style="list-style-type: none"> <li>43776 bari-level cyclone shelters</li> </ul>	K	<ul style="list-style-type: none"> <li>Signed agreements</li> </ul>	2027
<ul style="list-style-type: none"> <li>Lives and national infrastructure protected against inundation damage</li> </ul>	D	<ul style="list-style-type: none"> <li>Actual numbers of bari-level cyclone shelters</li> <li>Risk of loss of life (human and livestock) as estimated actuarially</li> <li>Risk of income disruption as estimated actuarially</li> <li>Risk of damage as estimated actuarially</li> </ul>	2027

## Institutional Arrangements

The programme would be implemented under Disaster Management Bureau through NGOs in close coordination with local government.

## Existing Documentation

NWMP DSR Sections 9.3 and 9.8, the National Water Resources Database (NWRD). The whole subject of cyclone risk and protection is described in considerable detail in the CSPS reports of June 1998.

## Linkages

There would be linkage with the Integrated Coastal Zone Management Programme, as well as with NWMP programmes DM 001: Cyclone Shelters and Killas, ID 001: Local Government Capacity Building for Water Management and ID 007: Disaster Management Bureau Capacity Building.

## Risks and Assumptions

The main risk concerns the feasibility of this type of cyclone shelter, which has yet to be tested. Key factors will include beneficiary organisation, especially regarding the relationship and cost sharing between the family using the shelter as a full-time residence and the other beneficiary families, and the GoB funding support arrangements for NGOs.

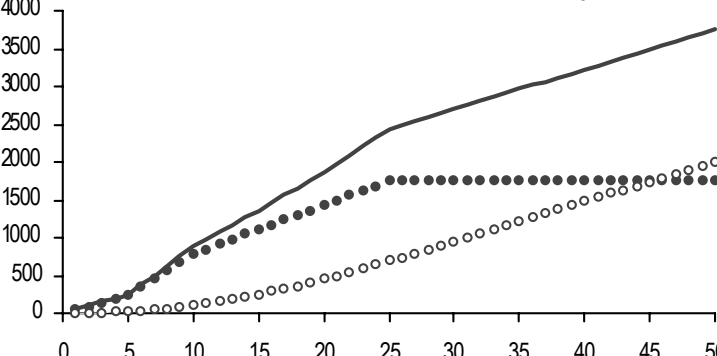
**Bari-level Cyclone Shelters**

Ref :

**DM 002**

Cluster :	Disaster Management		Region(s) :	SC, SE, EH	
Focus/Foci :	Cyclone Protection		Location :	SC, SE, EH	
Start Year <sup>1</sup> :	2003	Duration <sup>2</sup> :	25 year(s)	Agency(s) Responsible :	DMB (Lead) None (Supporting)
Short Description :	This programme is for the cyclone risk areas and is relevant to the NWPo as it provides “flood proofing systems to manage natural disasters: (NWPo §4.2.o) and takes special account the particular needs of women and children (NWPo §3.b) while motivating the people themselves to develop different flood proofing measures. Over three million people live or subsist in areas exposed to significant risk of destruction and loss of life due to cyclone strike. This programme is intended to provide safe havens in the form of 12m2 concrete framed buildings on raised 72m2 earth platforms, one in each bari in the coastal areas. A total of 43,768 bari-level-cyclone-shelters will be raised over 15 years, benefiting some 1.72 million people in the short/medium term.				

<b>MIS Links</b>	Cost Calculation :	DM Programme costing.xls	Map :	DM 002 Map.jpg
	Disb't Schedule :	DM Programme costing.xls	Description :	DM 002 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme		Year	
	Total Capital <sup>3</sup>		1,747.90 MTk	0%	100%	0%	25		
	Ultimate Recurring		52.40 MTk/yr	n/a	0%	100%	26		
	Date of Data :		31 07 01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)					
Status :	Identified			● Investment ○ Recurring — Total					
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :				MTk					
Actual Expenditure <sup>4</sup> (to date) :				MTk					

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Pilot programme in progress	• Signed contracts/work orders	NYD
	• Progress reports	
• Pilot programme evaluated	• Evaluation reports	NYD
• Modalities accepted	• Signed agreements	NYD
• 43,776 bari-level cyclone shelters	• Actual numbers of bari-level cyclone shelters	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates

5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	DM 002
Title	Bari-level Cyclone Shelters

*Assumptions:*

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

**Technical Assistance**

Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-		
Mid-level National consultants (all-in rate)	p-m	-		90	-		
Sub-totals					-		
Other general TA programme costs		25%			-		
Specific other TA programme costs					-		
<b>Total TA Costs</b>					-		

**Other Programme Costs**

1. Bari-level flood protection					1,747.9	3.0%	52.4
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>1,747.9</b>		<b>52.4</b>

<b>Overall Programme Costs</b>					<b>1,747.9</b>		<b>52.4</b>
--------------------------------	--	--	--	--	----------------	--	-------------

		Short-term (first 15 years)	Med Term	Long Term	Total
<b>DM 002</b>	<b>Bari-level Shelters</b>				
	People	129,120	301,280	530,000	960,400
	Shelters	5,869	13,695	24,091	43,655
	Cost (TkM)	235.0	548.3	964.6	1,747.9

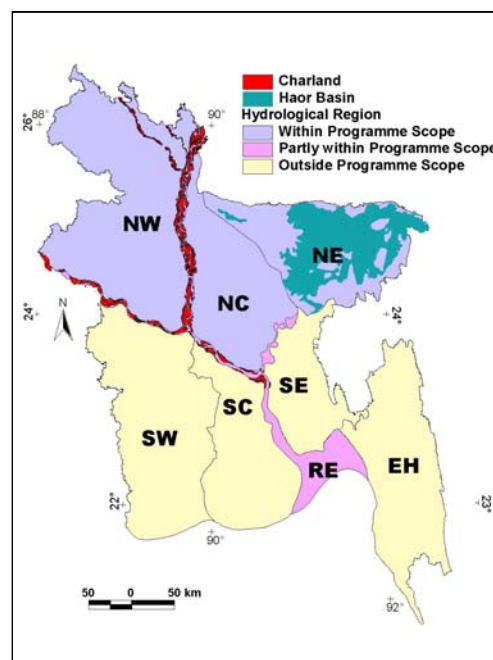
**Flood Proofing in the Charlands and Haor Basin**Ref: **DM 003****Basic Data**

NWMP Sub-sector      **Disaster Management**

Region(s)              **Mainly North West, North Central and North East**

**Relevance to NWPo**

Article 4.02(o) requires the Government, through its responsible agencies, to develop flood proofing systems to cope with natural disasters, and Article 4.2(p) requires that appropriate measures are provided, in designated flood risk zones, to protect life, property and vital infrastructure etc. Equally, the same Article requires that, with the exception of those already covered by existing flood control infrastructure, the people will be motivated to develop flood proofing measures.

**Purpose of Programme**

A basic theme of the NWPo concerns the desirability of coping with inland floods rather than managing them. In recent years populations at risk have come to place greater reliance on embankments and drainage schemes which were designed for agriculture and not human habitation and the like. Flood proofing involves a return to more traditional practices such as building houses on higher ground or stilts and the raising of public infrastructure such as roads, shared areas and water supply/sanitation facilities. The NWMP has three programmes addressing inland flood proofing (DM 003 to 005). This Programme DM 003 is concerned with providing proven, cost-effective, technologies in the form of raised households and communal flood to some 3M people in the main river charlands and some 0.5M people in the Haor Basin of North East Region.

**Programme Outline**

Structural flood proofing is an age-old practice in Bangladesh, whereby houses and homesteads in flood-prone areas are normally raised above flood level. Not all households have the resources to do this, however, especially in the unprotected char areas near the major river channels. Flooding incidence in these areas is high and incomes are low.

Until recently, structural flood proofing has received only limited attention from donors or GoB, but NGOs have been active in this field. Efforts have been concentrated in the charlands of the Brahmaputra and Ganges (the RE Region) and the Haor Basin. The major ongoing public sector project is the USAID – funded Flood Proofing Project, which started in 1999 and is being implemented by CARE and LGED. At a cost of some US\$27M (Tk1,380M) over five years, it is flood-proofing about 1,025 villages in 20 Upazilas in the Brahmaputra and Padma charlands, the Haor Basin and Bhola Island, in SC Region. A Japanese-funded study of flood proofing in four

Districts in the Brahmaputra charlands and four Districts of the Haor Basin is currently in progress.

The NWMPP evaluation carried out of its predecessor, the Flood Proofing Pilot Project, showed that this type of intervention, involving mainly the raising of house plinths and the provision of communal flood shelters, is highly cost-effective and socially beneficial. There are no significant adverse environmental impacts. Sustainability is likely to be high, because of its heavy emphasis on community participation. Including all overhead costs, the capital costs per person, excluding the value of beneficiaries' labour inputs, were estimated to be Tk560-670 at 1998 prices. For the homestead (plinth) raising the beneficiaries contributed about 36% of the base cost, as labour. For the community shelters the only local contribution was the land, although under the project conditions the community was supposed to contribute 5 – 10% of the earthmoving work.

Remaining rural areas considered to need structural flood proofing on a large scale are the Brahmaputra and Padma charlands in Districts left out of the FPP, the Padma right bank, the Ganges charlands and the Haor Basin (there may be some 1,000 villages there, in 22 Upazilas). The distribution of the estimated 3.5M people requiring structural flood proofing by 2025 is as follows:

Area	2025 population requiring flood proofing (000)
<b>1. Main River Charland Flood Proofing</b>	
Brahmaputra (Kurigram, Gaibandha, Jamalpur, Bogra, Sirajganj, Tangail, Pabna and Pabna Dts)	1,921
Ganges (Rajshahi, Kushtia, Natore, Pabna and Rajbari Dts)	496
Padma (Manikganj, Faridpur, Dhaka, Madaripur, Munshiganj and Shariatpur Dts)	582
<b>Total</b>	<b>3,000</b>
<b>2. Haor Basin</b>	
1,000 villages with an average population of 500	500
<b>3. Total</b>	<b>3,500</b>

At an average cost of Tk650/head for the charlands and Tk1,300/head for the Haor Basin, the total capital cost will be Tk2,600M at mid-2000 prices. The approximate breakdown of this cost by region is as follows:-

NW	NC	NE	SW	SE	Total
1,040	520	650	200	190	2,600

### Financing Arrangements

Capital costs will be funded by GoB, probably with donor assistance. Maintenance will be the responsibility of the beneficiaries, as at present.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Quantitative needs assessment	I1	• Needs assessment reports	2005
• Modalities accepted	I2	• Signed agreements	2005
• Programme documents prepared	I3	• Programme documents	2005
• Programmes underway	I4	• Signed contracts/work orders	2006
• 3,500,000 charland and haor basin inhabitants in flood proofed dwellings	K	• Actual number of charland and haor basin inhabitants in flood proofed dwellings	2012
• Lives and national infrastructure protected against inundation damage	D	• Risk of loss of life (human and livestock) as estimated actuarially • Risk of income disruption as estimated actuarially • Risk of damage as estimated actuarially	2027

## Institutional Arrangements

The present arrangement whereby the flood proofing programme is being successfully implemented by major NGOs and LGED should be continued in the future.

## Existing Documentation

NWMP DSR Sections 9.3 and 9.8, the National Water Resources Database (NWRD), the Flood Action Plan (FAP) 14 and 23 studies, and reports of the on-going Flood Proofing Project.

## Linkages

There is little direct linkage with other NWMP Programmes. Main River (MR) development activities could, however, affect flooding conditions in the charlands.

## Risks and Assumptions

Experience with current flood proofing programmes indicates that institutional risks will be less than with many NWMP Programmes, because of the small scale of works involved and the high level of community participation. The main risks are technical in nature. In the charlands the migration of river charlands can result in erosion of house and shelter platforms. In the Haor Basin the strong wave action resulting from the long fetch in many areas can cause severe erosion of village land.

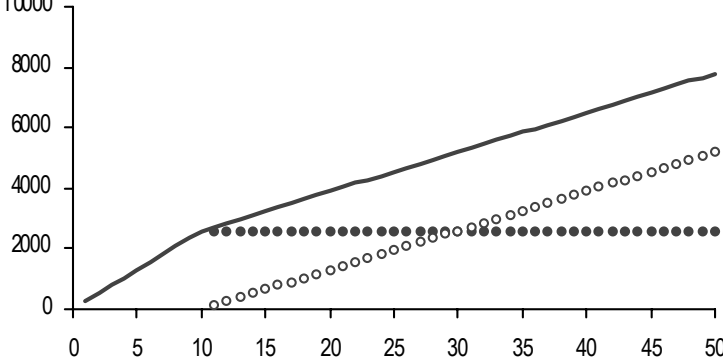
**Flood Proofing in the Charlands and Haor Basin**

Ref :

**DM 003**

Cluster :	Disaster Management	Region(s) :	NW, NE, RE	
Focus/Foci :	Flood Proofing	Location :	NW, NE, & RE regions	
Start Year <sup>1</sup> :	2003	Duration <sup>2</sup> :	10 year(s)	Agency(s) : NGOs (Lead)
				Responsible : LGED (Supporting)
Short Description :	NWPo §4.2.o of the NWPo requires the Government, through it's responsible agencies, to develop flood proofing systems to manage natural disasters, and clause p of the same section requires that appropriate measures are provided, in designated flood risk zones, to protect life, property and vital infrastructure etc. This programme is concerned with providing proven cost effective technologies for flood proofing such as encouraging raised dwellings and the construction of communal flood shelters.			

<b>MIS Links</b>	Cost Calculation :	DM Programme costing.xls	Map :	DM 003 Map.jpg
	Disb't Schedule :	DM Programme costing.xls	Description :	DM 003 PgP.doc

Finance							
	Costs		Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear	
	Total Capital <sup>3</sup>		2,599.40 MTk	0%	100%	0%	10
	Ultimate Recurring		130.00 MTk/yr	n/a	0%	100%	11
	Date of Data :		31 07 01	Stacked Cumulative Cash Flow Chart			
	(dd) (mm) (yy)		Cost (MTk)				
Status :	Identified		<div><div>● Investment</div><div>○ Recurring</div><div>— Total</div></div>				
Financial Base Year:	mid-2000						
Planned Expenditure (to date) :	0 MTk						
Actual Expenditure <sup>4</sup> (to date) :	0 MTk						

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Quantitative needs assessment	• Needs assessment reports	NYD
• Modalities accepted	• Signed agreements	NYD
• Programme documents prepared	• Programme documents	NYD
• Programmes underway	• Signed contracts/work orders	NYD
• 3,500,000 charland and haor basin inhabitants in flood proofed dwellings	• Actual number of charland and haor basin inhabitants in flood proofed dwellings	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done



**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	DM 003
Title	Flood Proofing in the Charlands and Haor Basin

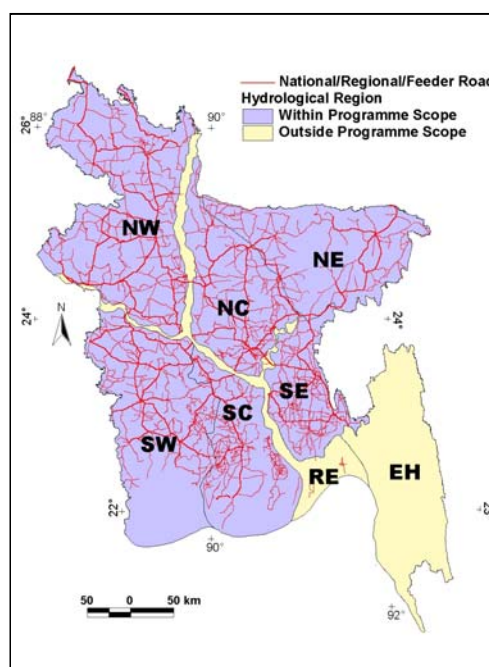
Assumptions:  
Taka/US\$ 51.000 TA duration 0.0 years All prices in mid-2000 values  
Investment duration 10.0 years

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Main River Charland Flood Proofing					1,949.4	5.0%	97.5
2. Haor Basin Flood Proofing					650.0	5.0%	32.5
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					2,599.4		130.0
<b>Overall Programme Costs</b>							
					2,599.4		130.0

	Population	Rate (Tk)	Amount TkM
<b>Main River Charland Flood Proofing</b>			
Brahmaputra	1,921,000	650	1,248.7
Ganges	496,000	650	322.4
Padma	582,000	650	378.3
	2,999,000		1,949
<b>Haor Basin Flood Proofing</b>			
Estimated 1,000 villages at 500 each	500,000	1,300	650.0
<b>Totals</b>	<b>3,499,000</b>		<b>2,599.4</b>

**National, Regional and Key Feeder Roads - Flood Proofing**Ref: **DM 004****Basic Data**NWMP Sub-sector      **Disaster Management**Region(s)      **All regions except RE and EH****Relevance to NWPo**

Article 4.2(o) requires the Government, through its responsible agencies, to develop flood proofing systems as a response to natural disasters, and Article 4.2(p) requires that appropriate measures are provided, in designated flood risk zones, to protect life, property and vital infrastructure etc. This Article also stipulates that national communications infrastructure such as roads and railways should be constructed (whether new or rehabilitated) above the highest ever-recorded flood and provided with adequate cross-drainage facilities.

**Purpose of Programme**

A basic theme of the NWPo concerns the desirability of coping with inland flooding rather than managing it. In line with policy therefore this programme is targeted at the flood proofing needs of key portions of Bangladesh's highway network. Specifically, some 170km of national and regional roads and some 1,643km of feeder and rural roads in high risk areas will be raised by 1m and 124km of national and regional roads in low risk area will be raised by 0.5m. Apart from transport benefits, the raised embankments can act as safe havens and facilitate the movement of relief goods during flood emergencies.

**Programme Outline**

This is a long-term programme with national coverage; but since the costs would be very high if incurred in the context of a stand-alone exercise it has been assumed that embankment raising will be carried out when a particular road is due for major maintenance or re-surfacing, with priority given to high risk areas in the case of national and regional roads. Since the work involves simply the raising of existing roads, environmental impacts would be minimal. The following table shows the Programme's estimated regional distribution. It is intended that all national and regional roads not above flood level at present, and 20% of the feeder and rural roads in high risk areas (only), will have been raised by the end of the Programme.

Road Type	Risk level	Length of road to be raised, by type and region (km)						
		SW	SC	NW	NC	NE	SE	Total
National Highways	High	6.7	15.8	19.4	39.6	0.4	7.3	89.2
" "	Low	10.3	0.6	12.8	12.5	1.4	9.6	47.2
Regional Roads	High	19.9	7.4	16.1	18.6	2.9	14.6	79.5
" "	Low	7.7	4.0	41.1	8.9	5.4	9.9	77.0
Feeder Road Type A	High	17.8	34.8	48.3	94.5	4.2	41.2	240.7
Feeder Road Type B	High	31.9	38.8	62.8	108.8	8.4	26.7	277.5
Rural Roads	High	65.9	271.8	240.0	350.6	37.1	159.6	1124.9

## Financing Arrangements

Total Programme cost has been estimated at Tk10,905M, the breakdown over time being: short and medium term Tk2,181M each, and long term Tk6,543M. Incremental road maintenance costs resulting from the raising are assumed to be 4% of capital costs.

The Programme would be funded by GoB, possibly with donor assistance.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Quantitative needs assessment	I1	• Needs assessment reports	2003
• Programme documents prepared	I2	• Programme documents	2003
• Programmes underway	I3	• Signed contracts/work orders	2004
• 100% of all national and feeder roads raised by 1m in high and .5m in low risk areas; 20% of feeder and rural roads raised by 1m in high risk areas	K	• Construction records • Site visits	2025
• Lives and national infrastructure protected against inundation damage	D	• Risk of loss of life (human and livestock) as estimated actuarially • Risk of income disruption as estimated actuarially • Risk of damage as estimated actuarially	2025

## Institutional Arrangements

In line with current arrangements, GoB's Roads and Highways Department will be responsible for the works on the National Highways, Regional Roads and Type A Feeder Roads. Type B Feeder Roads and Rural Roads will be the responsibility of LGED.

## Existing Documentation

NWMP DSR Section 9.8, the National Water Resources Database (NWRD). Documentation is available with respect to the raising of Dhaka-Comilla-Chittagong road which was carried out after the 1988 flood. More recent documentation is expected to emanate from the raising of the Dhaka-Tangail Road which is currently in progress.

## Linkages

During implementation it will be advantageous if the implementing agencies maintain coordination with BWDB, especially with respect to cross-drainage issues (NWPO Article 4.2(p.iii) refers). An operational linkage should also be established with the Department of Fisheries, as the many borrow-pits which will result from the Programme represent potential

aquaculture sites. Forest Department involvement will be required if tree planting along the raised roads is included.

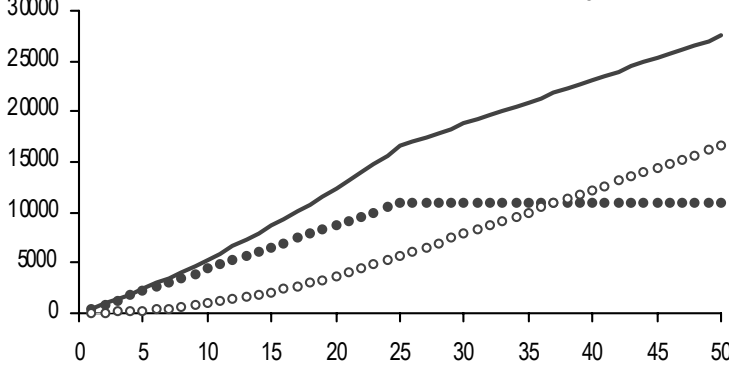
### **Risks and Assumptions**

To keep costs down it has been assumed that the raising will be carried out when roads are due for major maintenance and resurfacing. There is a risk that not all of the target stretches of road will receive major maintenance and resurfacing. Since, however, the overall percentages of each road type that require raising are low, it is reasonable to assume that all target lengths will be scheduled for such works at some point at least in the 25 years allowed for the Programme in the NWMP. There is also a risk that increased cross drainage needs caused by raising the embankments will be ignored.

**National, Regional and Key Feeder Roads - Flood Proofing**Ref : **DM 004**

Cluster :	Disaster Management		Region(s) :	NW, NC, NE, SE, SC,SW	
Focus/Foci :	Flood Proofing		Location :	Regions NW, NC, NE, SE, SC,SW	
Start Year <sup>1</sup> :	2001	Duration <sup>2</sup> :	25 year(s)	Agency(s) Responsible :	RHD (Lead) LGED (Supporting)
Short Description :	In line with Policy's call for coping with floods in relation to vital infrastructure (NWPo §4.2.p.ii), this programme targets the flood proofing needs of key portions of Bangladesh's highway network. As with current practice, the National Highways, Regional Roads and Type A Feeder Roads will be raised by the central Roads and Highways Department (RHD). Type B Feeder Roads and Rural Roads will be raised by the Local Government Engineering Departments (LGEDs). The programme also has collateral benefits since the raised embankments comprise safe havens while facilitating the movement of relief goods during flood emergencies. This is a long term programme with national coverage, however it has been assumed that embankment raising will be carried out when a particular road is due for major maintenance or re-surfacing, with priority given to high risk areas in the case of national and regional roads..				

<b>MIS Links</b>	Cost Calculation :	DM Programme costing.xls	Map :	DM 004 Map.jpg
	Disb't Schedule :	DM Programme costing.xls	Description :	DM 004 PgP.doc

Finance							
	Costs		Private	Funding (%)	Expected by		
				GoB	Beneficiaries	ProgrammeYear	
	Total Capital <sup>3</sup>	10,904.80 MTk	0%	100%	0%	25	
	Ultimate Recurring	436.20 MTk/yr	n/a	100%	0%	26	
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart			
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring	— Total
Status :	Identified						
Financial Base Year:	mid-2000						
Planned Expenditure (to date) :	428 MTk						
Actual Expenditure <sup>4</sup> (to date) :	MTk						

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Quantitative needs assessment	• Needs assessment reports	NYD
• Programme documents prepared	• Programme documents	NYD
• Programmes underway	• Signed contracts/work orders	NYD
• 100% of all national and feeder roads raised by 1m in high and .5m in low risk areas; 20% of feeder and rural roads raised by 1m in high risk areas	• Construction records • Site visits	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	<b>DM 004</b>
Title	<b>National, Regional and Key Feeder Roads - Flood Proofing</b>

*Assumptions:*

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-

**Other Programme Costs**

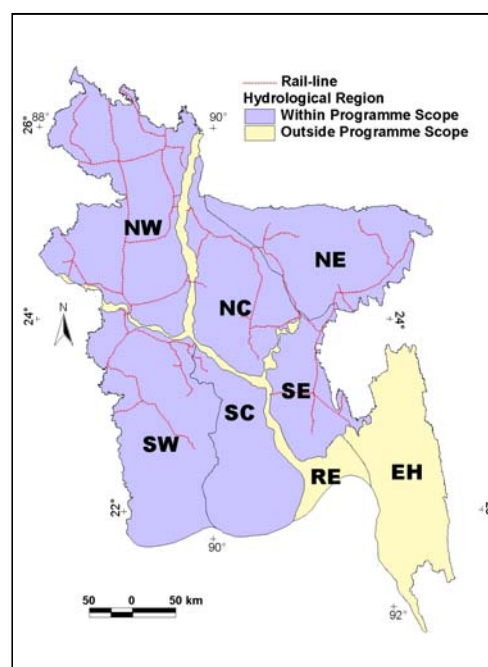
1. National and Regional Roads in high risk areas					1,653.0	4.0%	66.1
2. National and Regional Roads in low risk areas					1,209.0	4.0%	48.4
3. Feeder Roads in high risk areas, allow 20% of total length					8,042.8	4.0%	321.7
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					10,904.8		436.2

<b>Overall Programme Costs</b>					<b>10,904.8</b>		<b>436.2</b>
--------------------------------	--	--	--	--	-----------------	--	--------------

Costs of Raising Roads		Length Km	Protected in 2000	Protected in 2025	Rate TkM/km	Total TkM	Allow for	Net Total TkM
<b>Railways, National and Regional Roads</b>								
<i>In high flood risk Thanas</i>								
Class 1 R&H Roads - National Highway		892	90%	100%	10.00	892	100%	892
Class 2 R&H Roads – Regional Roads		398	80%	100%	9.57	761	100%	761
Sub-totals		1,290	1,121	1,290	9.79	1,653		<b>1,653</b>
<i>In low flood risk Thanas</i>								
Class 1 R&H Roads - National Highway		472	90%	100%	10.00	472	100%	472
Class 2 R&H Roads – Regional Roads		385	80%	100%	9.57	737	100%	737
Sub-totals		857	733	857	9.73	1,209		<b>1,209</b>
<b>Feeder and Rural Roads</b>								
In high flood risk Thanas		25,535	9,820	18,035	4.89	40,214	20%	8,043
In low flood risk Thanas		21,621	8,415	15,328	4.91	33,938	0%	-
<b>Total</b>		47,156	18,235	33,364	4.90	74,152		<b>8,043</b>
<b>Grand Totals</b>		<b>49,303</b>	<b>20,089</b>	<b>35,511</b>	<b>4.99</b>	<b>77,014</b>		<b>10,905</b>

**Railway Flood Proofing**Ref: **DM 005****Basic Data**NWMP Sub-sector **Disaster Management**Region(s) **All regions except RE and EH****Relevance to NWPo**

Article 4.2(o) requires the Government, through its responsible agencies, to develop flood proofing systems as a response to natural disasters, and Article 4.2(p) requires that appropriate measures are provided, in designated flood risk zones, to protect life, property and vital infrastructure etc. This Article also stipulates that national communications infrastructure such as roads and railways should be constructed (whether new or rehabilitated) above the highest ever-recorded flood and provided with adequate cross-drainage facilities.

**Purpose of Programme**

A basic theme of the NWPo concerns the desirability of coping with inland flooding rather than “managing” them. In line with Policy, therefore, this programme is targeted at the flood proofing needs of key portions of Bangladesh’s railway network. Specifically, some 78km of railway lines in high risk areas will be raised by 1m and 47km in low risk areas will be raised by 0.5m. Apart from transport benefits, the raised embankments can act as safe havens and can facilitate the movement of relief goods during flood emergencies.

**Programme Outline**

This is a long-term programme involving six of the country’s eight regions and is expected to proceed as part of the network upgrading programmes. Since the work would involve simply the raising of existing rail lines, environmental impacts would be minimal. The expected regional distribution of the works is shown in the following table:

Risk level	Length of railway raised, by region (km)						Total
	SW	SC	NW	NC	NE	SE	
High	17.1	3.6	22.1	27.1	2.4	5.5	77.8
Low	6.0	0.0	18.4	9.2	3.6	10.0	47.1

Total Programme cost has been estimated at Tk977M. Incremental annual railway maintenance costs resulting from the raising are assumed to be 4% of capital costs.

## Financing Arrangements

The Programme would be financed by GoB, possibly with donor assistance.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Quantitative needs assessment	I1	• Needs assessment reports	2003
• Programme documents prepared	I2	• Programme documents	2003
• Programmes underway	I3	• Signed contracts/work orders	2004
• 100% of all high risk railways raised by 1m and 100% of low risk railway raised by .5m	K	• Construction records	2025
• Lives and national infrastructure protected against inundation damage	D	• Site visits	
		• Risk of loss of life (human and livestock) as estimated actuarially	2025
		• Risk of income disruption as estimated actuarially	
		• Risk of damage as estimated actuarially	

## Institutional Arrangements

Implementation will be the responsibility of the Railways Department.

## Existing Documentation

NWMP DSR Section 9.8, the National Water Resources Database (NWRD). No other relevant existing documentation has been identified.

## Linkages

During implementation it will be advantageous if the implementing agency maintains coordination with BWDB especially with respect to cross drainage issues (NWPO Article 4.2(p.iii) refers). An operational linkage should also be established with the Department of Fisheries, as the many borrow pits which will result from the Programme could be used for aquaculture.

## Risks and Assumptions

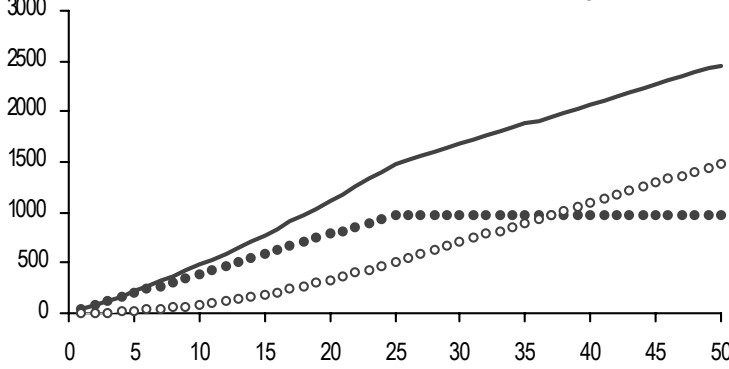
There are three risks associated with this Programme. The first is easily dealt with, however, and concerns the fact that the need for mild gradients along railway lines means that they will have to be raised for much longer distances than suggested by localised topography; this leads to “end effects” which have to be added to target lengths of line. Even so, it is assumed that, since railway alignments will follow largely flat terrain, the ratio of such “end effects” will be low in relation to overall raised lengths and that the extra costs involved can be contained within the 15% cost contingency. The second risk is not so easily addressed, however. The disruption to services that is inevitable when line raising is in progress may well persuade the railway operators that it is cheaper to lose income through flooding for a few days each year than to incur expenditure raising lines while simultaneously losing revenues for extended periods while raising works are in progress. The likelihood of this attitude being adopted is increased by the privatisation of rail transport in Bangladesh. Nonetheless, it is assumed that optimisation on a case-by-case basis, along with the temporary provision of revenue earning alternatives (i.e. road transport), will result in at least significant portions of the Programme being carried out. There is also a risk that increased cross drainage needs caused by raising the embankments will be ignored.



**Railway Flood Proofing**Ref : **DM 005**

Cluster :	Disaster Management		Region(s) :	SW, SC, NW, NC, NE, SE	
Focus/Foci :	Flood Proofing		Location :	Regions SW, SC, NW, NC, NE, SE	
Start Year <sup>1</sup> :	2001	Duration <sup>2</sup> :	25 year(s)	Agency(s) Responsible :	BR (Lead) (Supporting) None
Short Description :	In line with Policy's call for coping with floods in relation to vital infrastructure (NWPo §4.2.p.ii), this programme targets at the flood proofing needs of key portions of Bangladesh's railway network. The Railway Department will be responsible for implementation of this programme. The programme has collateral benefits since the raised embankments comprise safe havens while facilitating the movement of relief goods during flood emergencies. This is a long term programme with coverage in six hydrological regions and work is expected to proceed as part of the network upgrading programmes. However, a significant risk to this programme is that the disruption to services that is inevitable when line raising is in progress, may well persuade the railway operators that it is cheaper to lose income for a few hours or days each year than to incur expenditure raising lines while simultaneously losing revenues for that period.				

<b>MIS Links</b>	Cost Calculation :	DM Programme costing.xls	Map :	DM 005 Map.jpg
	Disb't Schedule :	DM Programme costing.xls	Description :	DM 005 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme		Year	
	Total Capital <sup>3</sup>		977.00 MTk	0%	100%	0%	25		
	Ultimate Recurring		39.10 MTk/yr	n/a	100%	0%	26		
	Date of Data :		31 07 01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment ○ Recurring — Total				
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	33 MTk								
Actual Expenditure <sup>4</sup> (to date) :	MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Quantitative needs assessment	• Needs assessment reports	NYD
• Programme documents prepared	• Programme documents	NYD
• Programmes underway	• Signed contracts/work orders	NYD
• 100% of all high risk railways raised by 1m and 100% of low risk railway raised by .5m	• Construction records • Site visits	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	DM 005
Title	Railway Flood Proofing

*Assumptions:*

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

**Technical Assistance**

Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-

**Other Programme Costs**

1. Raising railways in high risk areas					608.0	4.0%	24.3
2. Raising railways in low risk areas					369.0	4.0%	14.8
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					977.0		39.1

<b>Overall Programme Costs</b>					<b>977.0</b>		<b>39.1</b>
--------------------------------	--	--	--	--	--------------	--	-------------

**Costs of Raising Railways**

	Length Km	% protected in 2000	% protected in 2025	Rate TkM/km	Total TkM	Allow for	Net Total TkM
<b>Railways</b>							
In high flood risk Thanas	77.7	90%	100%	7.83	608	100%	608
In low flood risk Thanas	47.2	90%	100%	7.83	369	100%	369
<b>Total</b>	<b>124.9</b>				<b>977</b>		<b>977</b>

## Supplementary Irrigation and Drought Proofing of Rural Water Supplies.

Ref: DM 006

### Basic Data

NWMP Sub-sector      **Disaster Management**

Region(s)              **Nationwide**

### Relevance to NWPo

Under NWPo Article 4.6(a), it is GoB policy to facilitate the availability of safe and affordable drinking water supplies. Article 4.2(o) requires the development of early warning and flood proofing systems to manage natural disasters like flood and drought.

### Purpose of Programme

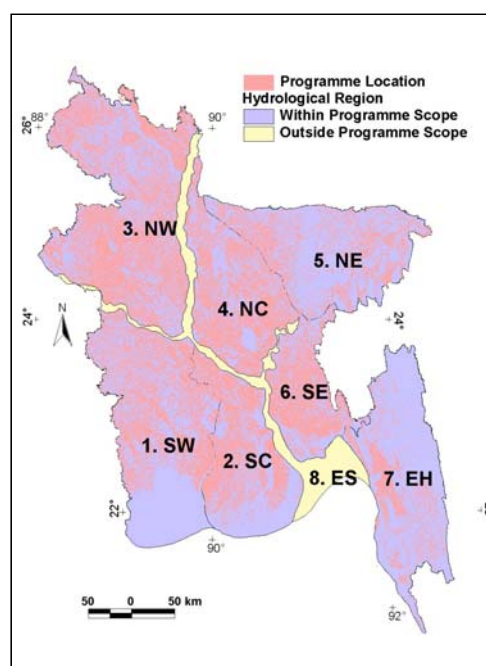
Apart from its effect on surface water availability, lower than average monsoon rainfall, such as occurred over 2 – 3 years in the mid-1990s, often results in reduced aman paddy yields and a fall in groundwater levels, with damaging effects on hand tubewell (HTW) domestic water supplies and shallow tubewell (STW) irrigation pumping costs in the following dry season. Such droughts occur mainly in the western parts of the country.

The purpose of the Programme is to alleviate such impacts by promoting supplementary irrigation of the aman crop and by continuing the present GoB/UNICEF programme of installing force mode Tara HTWs in areas of severe dry season watertable decline. Tara HTWs can pump from as deep as 15m, whereas the standard No. 6 suction mode HTW cannot pump from below 6 – 7m. Quite apart from drought alleviation, the installation of Tara HTWs is a means of mitigating the effects on watertable levels of STW pumping in areas of intensive STW irrigation development such as much of the NW, NC and SW Regions. Neither of the two Programme components would have significant adverse environmental impacts.

### Programme Outline

#### 1. Promotion of Supplementary Irrigation of Aman

Supplementary irrigation of aman can bring two main benefits. First, in dry years aman irrigation in the crucial flowering and grain filling post-monsoon period in late September and October can prevent the substantial yield losses that would otherwise occur. Second, and unrelated to drought, cropping can be intensified by using irrigation to enable land preparation and transplanting of aman to take place in June or early July, before or in the early stages of the monsoon. Farmers in the Kushtia District of South West Region have been observed to be doing this. Aman harvesting can then be completed early, in October, allowing more time for rabi cropping with pulses, oilseeds and other short duration crops before land preparation and transplanting of the important boro paddy crop in January – February.



Despite these advantages few farmers practice supplementary irrigation at present, for various reasons. In 1996-97 and 1997-98 only 5% and 6% respectively of the total irrigated area received supplementary irrigation in the aman season. DAE took up a three year GoB funded project for Supplementary Irrigation in Drought-Affected Transplanted Aman Crop (SIDATAC), in which it was intended to provide diesel fuel and electricity free-of-charge to aman farmers affected by drought. However, no disbursements were made in 1999 as there was no drought.

This programme would build from the experience of SIDATAC and the earlier National Minor Irrigation Development Project, and provide targeted promotional support for aman farmers in drought risk areas. It would complement efforts made under ID 009: Department of Meteorology Capacity Building to improve long-range weather forecasting to enable better anticipation of drought conditions. The programme would undertake research under different soil conditions into different viable choices farmers can make given the expectation of drought, investigate obstacles to employing irrigation equipment outside of the boro season, and prepare advisory packs for farmers to be distributed through DAE's field staff, and other media, including radio and TV.

## **2. Installation of Tara Hand Tubewells**

Three kinds of Tara pumps are in use, the Mini-Tara (maximum pumping depth 15m, cost Tk8,000), the Standard Tara (15m, Tk16,000) and the Super Tara (30m, Tk18,000). NWMP costing has been based on the Standard Tara. Starting in 1987, by mid-1998 almost 152,000 Taras had been installed by DPHE (Department of Public Health Engineering). This has been done free of charge through WATSAN committees organised by the Union Parishads (Councils). One drawback is that the Taras have often been sited inside the courtyards of the local elite, with a consequent reduction in benefit to the poor. With existing models, maintenance and the vertical pumping motion required can cause problems, but improved designs are being developed.

Since Taras are more costly than the standard No. 6 suction mode HTWs, they are installed only where seasonal watertable decline makes their use essential and other force mode options are not appropriate. In the future the main alternative to Taras in rural areas is likely to be small deep tubewell (DTW) – based village piped water systems. Development of such systems is still in the pilot stage in Bangladesh. The NWMP target applied for planning purposes is that by 2025 60% of the rural population will be using such systems (see Programme TR 004). Social, institutional and financial constraints may, however, hold back their rate of adoption. At this stage there is thus uncertainty as to the degree to which this target will be met, and the extent to which DTW-based systems will lessen the requirement for Taras.

The other important uncertainty is the rate of expansion in the area that will be sufficiently affected by seasonal watertable decline as to require the introduction of force mode pumping for village water supplies. DPHE/UNICEF and NWMPP studies indicate that at full irrigation development (100% of the irrigable net cultivable area (NCA) irrigated in the dry season) most of the shallow tubewell (STW) – irrigated areas of NC and SW Region, and much of those areas in NW Region, will need force mode pumping. This is, however, only a projection – only time will tell how much area will actually need force mode pumps. In particular, in most areas 100% irrigation development may never be reached.

The Government's strategy is nevertheless to phase out support for Tara pumps as more appropriate systems are popularised. For the reasons stated above, this needs to be done gradually to avoid unnecessarily disadvantaging those living in areas where seasonal water declines are interfering with use of HTWs. Between 1987 and 1998, on average 14,000 Tara pumps were installed each year, with at least 75% of their cost subsidised by Government. For the future, in line with the stated strategy, it is assumed that this level of subsidy would be progressively reduced, and eliminated after 10 years. On the basis that the rate is reduced progressively to 50% by year 8 and that this reduces demand as the subsidy rate falls, it is provisionally estimated that a further 95,000 Tara pumps would be subsidised over the next 10 years at a cumulative cost of Tk926M.

The programme should be kept under review in the light of actual demand for alternative water supply systems, the numbers of residual HTW affected by seasonal drawdown and the further research on arsenic contamination of aquifers.

Based on the NWMPP estimates of projected seasonal drawdown and the numbers of HTW likely to be affected, the regional distribution of subsidies is estimated to be as follows:

NW	NC	NE	SW	SC	SE	RE
28%	19%	9%	22%	5%	10%	7%

## Financing Arrangements

Both activities are appropriate for Government finance, each possibly with donor support.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• New Tara hand tubewells commissioned	I1	• Physical number of new wells	2011
• Increased area of aman rice under supplementary irrigation	I2	• Areas planted	2012
• Increased quality of life in target areas	K	• Return on family labour	2021
• Climatic threats to life and livelihood mitigated by structural and non-structural measures	D	• Risk of loss of life (human and livestock) as estimated actuarially	2026
		• Risk of income disruption as estimated actuarially	
		• Risk of damage as estimated actuarially	

## Institutional Arrangements

Promotion of aman supplementary irrigation will continue to be undertaken by DAE. The Tara installation programme will continue to be implemented by DPHE, but with increasing private sector participation.

## Existing Documentation

NWMPP DSR Sections 9.8 and 7.7, the National Water Resources Database (NWRD), SIDATAC and DPHE/UNICEF reports.

## **Linkages**

There will be linkage mainly with Programme TR 002: Rural Arsenic Mitigation, TR 004: Rural Water Supply and Distribution Systems and AW 001: Promotion of Expanded Minor Irrigation and Improved On-farm Water Management.

## **Risks and Assumptions**

As explained above, the Tara programme is subject to an unavoidable degree of uncertainty concerning the future level of demand. The same applies to farmer adoption of supplementary aman irrigation. Its advantages are clear, but practical constraints have held back the rate of adoption in the part. The programme allows for this to be investigated and for appropriate action to be taken to adjust the approach to promoting supplementary irrigation for aman.

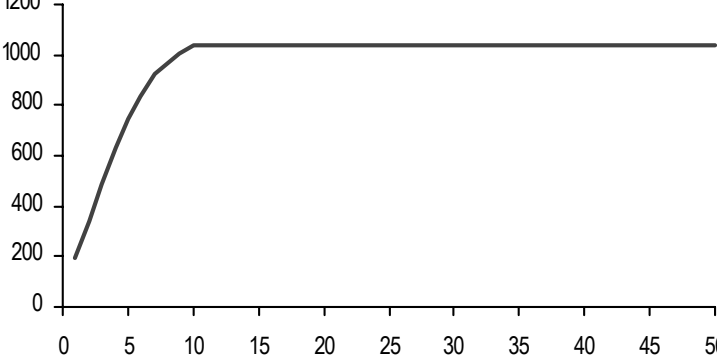
**Supplementary Irrigation and Drought Proofing of Rural Water Supplies**

Ref :

**DM 006**

Cluster :	Disaster Management	Region(s) :	All			
Focus/Foci :	Drought Proofing	Location :	Nationwide but emphasising NW, NC, SE, SW, SC			
Start Year <sup>1</sup> :	2002	Duration <sup>2</sup> :	10 year(s)	Agency(s) :	DAE	(Lead)
				Responsible :	None	(Supporting)
Short Description :	This programme aims to promote supplementary irrigation during the drought-prone aman season, as well as including efforts to drought-proof rural water supplies.					

<b>MIS Links</b>	Cost Calculation :	DM Programme costing.xls	Map :	DM 006 Map.jpg
	Disb't Schedule :	DM Programme costing.xls	Description :	DM 006 PgP.doc

Finance							
	Costs	Private	Funding (%)	Beneficiaries	Expected by		
			GoB		ProgrammeYear		
	Total Capital <sup>3</sup>	1,041.40 MTk	0%	85%	15%	10	
	Ultimate Recurring	0.00 MTk/yr	n/a	n/a	n/a	n/a	
	Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart		
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring	— Total
Status :	Identified						
Financial Base Year:	mid-2000						
Planned Expenditure (to date) :	0 MTk						
Actual Expenditure <sup>4</sup> (to date) :	0 MTk						

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• New Tara hand tubewells commissioned	• Physical number of new wells	NYD
• Increased area of aman rice under supplementary irrigation	• Areas planted	NYD
• Increased quality of life in target areas	• Return on family labour	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates

5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref

DM 006

Title

Supplementary Irrigation and Drought Proofing of Rural Water Supplies

Assumptions:

Taka/US\$ 51.000

TA duration 5.0 years

All prices in mid-2000 values

Investment duration 10.0 years

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
Technical Assistance	Supplementary Irrigation Promotion Support Programme						
Expatriate consultants (all-in rate)	p-m	12.0	20,000		12.2		
Senior National consultants (all-in rate)	p-m	180.0		150	27.0	0.0%	-
Mid-level National consultants (all-in rate)	p-m	364.0		90	32.8	0.0%	-
Sub-totals					72.0		-
Other general TA programme costs		25%			18.0		-
Specific other TA programme costs	Promotion materials				25.0	0.0%	-
Total TA Costs					115.0		-
Other Programme Costs							
1. Tara Pump Subsidies					926.4	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
Total Other Programme Costs					926.4		-
Overall Programme Costs					1,041.4		-

### Provisional Estimate of Tara Pump Subsidies

Year	Pump Demand	Cost Rate (Tk)	Total Cost (TkM)	Subsidy Rate (Tk)	Subsidy TkM
1	14,000	16,000	224.0	75%	168.0
2	12,000	16,000	192.0	65%	124.8
3	12,000	16,000	192.0	65%	124.8
4	12,000	16,000	192.0	65%	124.8
5	10,000	16,000	160.0	55%	88.0
6	10,000	16,000	160.0	55%	88.0
7	10,000	16,000	160.0	55%	88.0
8	5,000	16,000	80.0	50%	40.0
9	5,000	16,000	80.0	50%	40.0
10	5,000	16,000	80.0	50%	40.0
Totals	95,000		1,520.0		926.4



# **Agriculture and Water Management**

## Promotion of Expanded Minor Irrigation and Improved On-farm Water Management

Ref: AW 001

### Basic Data

NWMP Sub-sector **Agriculture and Water Management**

Region(s) **National coverage**

### Relevance to NWPo

This programme would contribute to meeting the NWPo agricultural water use objectives (NWPo Article 4.7) of promoting continued minor irrigation development, including groundwater irrigation, and improving the efficiency of resource utilisation.

### Purpose of Programme

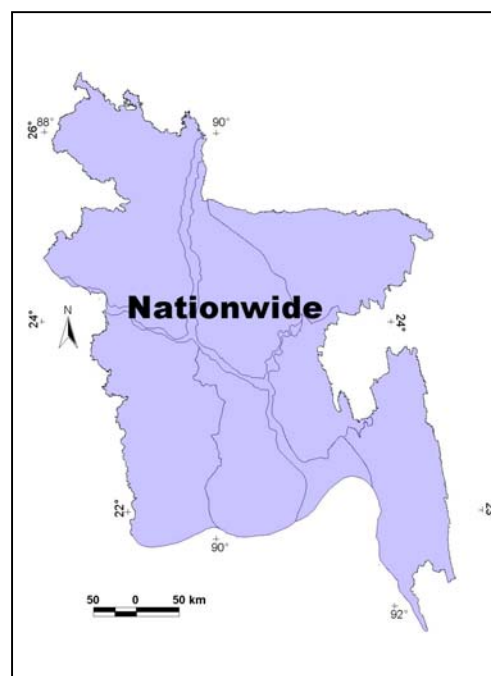
Minor irrigation based on surface water and groundwater pumping will continue to be the main source of irrigation expansion and a key contributor to future agricultural growth. With existing land and water resources the present irrigated area of around 4.3Mha could eventually be expanded to as much as 6.7Mha. The purpose of the Programme would be to support the minor irrigation sector through three activities:

- Improvement of shallow tubewell (STW) and low lift pump (LLP) diesel engine fuel efficiency
- Introduction of lower-cost electric pumpsets for force mode tubewells
- Improved on-farm water management, in the form of improved irrigation distribution to reduce losses in the coastal zone and other water-short areas.

### Programme Outline

The Programme comprises three components:-

- (a) **Pumping Energy Efficiency Improvements:** Most STWs and LLPs are powered by low-cost Chinese 5-7HP diesel engines driving locally made suction pumps. The technology involved is simple but cheap and effective. Nevertheless, there is considerable scope to improve fuel efficiency, as experience with low-cost diesel engine modification on the nearby North Bengal Terai Development Project (NBTDP) in India has shown. The scope for such improvements in Bangladesh will be investigated, with dissemination to irrigation farmers if they are found to be feasible. Close liaison will be maintained with on-going the Dutch-funded pumping energy efficiency improvement programme in Uttar Pradesh, India. With over 0.7M diesel engines in irrigation operation, the potential benefits are large. These are likely to be greatest in NW, NC and SW Regions, where STW irrigation development is most intensive.
- (b) **Introduction of Lower-cost Force Mode Pumps:** Quotations obtained by the NWMP Project indicate that Chinese electric submersible pumps with a discharge of 13-18l/s



and a maximum pumping head of 17-18m could be made available in Bangladesh at a retail price of Tk14,300-18,500. This is far cheaper than the Tk80,000 or so for submersible pumps imported from Western countries. Though still expensive compared to STWs, smaller force mode tubewells equipped with such pumpsets would be affordable to some farmers. Importation of such pumps should be left to the private sector, but GoB should undertake their testing and promotion. This could stimulate force mode TW development; the introduction of Chinese diesel engines at half the cost of Japanese and Western engines was a key factor in the rapid growth of STWs in the past.

- (c) **Structural Improvements in On-farm Water Management (OFWM):** The justification for improved OFWM in the form of masonry-lined channels, buried pipes or canvas hosepipes is weak in tubewell irrigation areas, where water availability is not a constraint (simple improvements to earthen channels, by compaction, stopping up rat holes and similar measures are, however, worth encouraging). OFWM improvements for surface water irrigation in water-short areas such as the coastal zone, where TW irrigation is not feasible, are more worthwhile. The DAE (Department of Agricultural Extension) is currently implementing an OFWM Project. Such efforts will continue, but with more focus on water-short areas.

All three components can be expected to produce high economic returns. If they do not, farmers will not adopt them. Social impacts will be generally positive, because of the increase in rural incomes that will result. Improved pumping energy efficiency will reduce carbon emissions per unit of water pumped but, if it leads to increased STW pumping, because of the reduced costs, will have the adverse environmental impact of lowering dry season watertables. Introduction of lower-cost force mode pumps could have the same effect. Lower watertables in the latter part of the dry season can adversely affect hand tubewell (HTW) domestic water supplies. Programmes to mitigate the impacts on water supplies are included in DM 006 and TR 004.

## Financing Arrangements

Total estimated cost to GoB is Tk310M at mid-2000 prices, for testing, promotion and dissemination to farmers, and other services. The farmers themselves would finance the engine improvements, force mode pumpsets and most of the OFWM works.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Increased diesel pump engine efficiencies	I1	• Sample tests	2016
• Farmers adopt force mode pumpsets	I2	• Farmer survey	
• Irrigation water use efficiencies increased	I3	• Sample tests	
• Average return per unit of water increased in minor irrigation areas	K	• Household surveys and field measurements	2011
• Water related constraints on agricultural production minimised	D	• Extent of flooding on arable land • Annual unsatisfied demand for irrigated land	2026

## **Institutional Arrangements**

The Programme will be implemented by DAE's Water Management and Agricultural Engineering Wing, which is implementing the on-going OFWM Project. The Bogra Metal Engineering and Entrepreneurial Group and the Bangladesh Agricultural University should be involved in Component (a). As noted above, there should be liaison with the Dutch-funded Uttar Pradesh (UP) programme in India.

## **Existing Documentation**

NWMP DSR 10.10, and the National Water Resources Database (NWRD) the reports of the OFWM Project and the North Bengal Terai Development Project and UP programme in India are relevant. More information on the low-cost Chinese-made electric submersible pumpsets can be obtained from the manufacturers in China.

## **Linkages**

Mitigation measures against increased seasonal drawdown are included in Programmes DM 006 and TR 004, and controls over expansion of tubewell irrigation are covered under AW 004. EE 010: Raising Public Awareness in the Wise Use and Management of Water, is also relevant. If successful, however, Components (a) and (b) could have a significant impact on the minor irrigation sector, through the resultant cost reductions and increased profitability of irrigation.

## **Risks and Assumptions**

The main risks are that (i) the diesel engine efficiency improvements achieved in the NBTDP will not be achievable under Bangladesh conditions, (ii) the Chinese pumpsets will not be suitable and, even if they are, few farmers will be willing or able to purchase them or electricity may not be sufficiently widely available, and (iii) farmers will consider the returns from OFWM improvement to be insufficient to justify the investment required.

## Promotion of Expanded Minor Irrigation and Improved On-farm Water Management

Ref : **AW 001**

Cluster :	Agriculture and Water Management		Region(s) :	All	
Focus/Foci :	Irrigation		Location :	Nationwide	
Start Year <sup>1</sup> :	2002	Duration <sup>2</sup> :	15 year(s)	Agency(s) Responsible :	DAE (Lead) None (Supporting)
Short Description :	It is the policy of the Government to "Encourage and promote continued development of minor irrigation" (NWPo §4.7.a) and to "Encourage future groundwater development for irrigation by both the public and the private sectors" (§4.7.b). With the ultimate goal of increased agricultural productivity, this programme involves the improvement of irrigation pumping efficiency, promotion of lower cost force-mode tubewell pumps, and a farmer education/training component to improve on-farm water management and the wise use of water				

<b>MIS Links</b>	Cost Calculation :	AW Programme costing.xls	Map :	AW 001 Map.jpg
	Disb't Schedule :	AW Programme costing.xls	Description :	AW 001 PgP.doc

<b>Finance</b>	<b>Costs</b>		<b>Funding (%)</b>		<b>Expected by Programme Year</b>
		<b>Private</b>	<b>GoB</b>	<b>Beneficiaries</b>	
Total Capital <sup>3</sup>	<b>310.00</b> MTk	<b>0%</b>	<b>85%</b>	<b>15%</b>	<b>15</b>
Ultimate Recurring	<b>7.20</b> MTk/yr	<b>n/a</b>	<b>0%</b>	<b>100%</b>	<b>16</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

## Monitoring

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Increased diesel pump engine efficiencies	• Sample tests	NYD
• Farmers adopt force mode pumpsets	• Farmer survey	NYD
• Irrigation water use efficiencies increased	• Sample tests	NYD
• Average return per unit of water increased in minor irrigation areas	• Household surveys and field measurements	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design, supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	<b>AW 001</b>
Title	<b>Promotion of Expanded Minor Irrigation and Improved On-farm Water Management</b>

*Assumptions:*

Taka/US\$	51.000	Duration of (1) and (2)	5.0	years	All prices in mid-2000 values
		Duration of (3)	15.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-	0.0%	-
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Irrigation Pumping Energy Efficiency Improvement (research and promotional costs)					50.0	0.0%	-
2. Introduction of lower cost force mode irrigation pumps (testing and promotional costs)					20.0	0.0%	-
3. Structural improvements to on-farm water management (in water short areas)					240.0	3.0%	7.2
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					310.0		7.2
<b>Overall Programme Costs</b>							
					310.0		7.2

Notes:

1. Allow for 15,000 ha of OFWM at typical cost of Tk 16,000 per hectare
2. Excludes the cost of accompanying tariff reductions on approved types of imported submersibles, over a window period of 5 years.

## Improved Performance of Existing Public Surface Water Irrigation Schemes

Ref: **AW 002**

### Basic Data

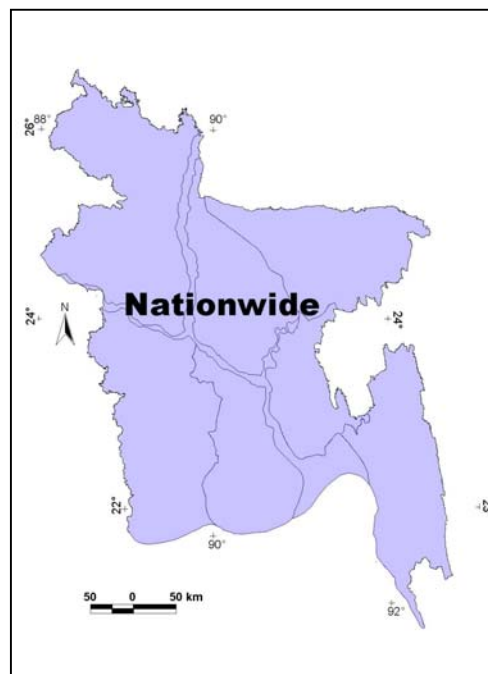
NWMP Sub-sector      **Agriculture and Water Management**

Region(s)              **National coverage**

### Relevance to NWPo

NWPo Article 4.4 envisages the decentralisation and transfer of “public water scheme management”, including irrigation schemes, increased water use efficiency (Article 4.7) and a major increase in cost recovery (Article 4.14). A pre-requisite for the achievement of all these Policy aims is improved scheme performance, present standards being generally low.

### Purpose of Programme



There is a total of 15 existing major (over 2,000ha) BWDB surface water formal (ie with BWDB distribution systems) irrigation schemes, covering 480,000ha NCA, and a further 211,000ha in over 200 smaller schemes. The latter are not formal schemes and usually involve simple interventions such as a water control structure or excavation of a channel, for LLP pumping by farmers. In line with Policy, most such schemes will eventually be transferred to beneficiary organisations or Local Government. The one major groundwater irrigation scheme, the North Bengal Tubewell Project, is already in the process of partial handover to beneficiaries.

Present irrigation intensities are low. In the 1996-98 period with only 46% of the 15 major schemes' NCA was irrigated from BWDB sources in the main irrigation season, the rabi (winter), and only another 7% in the Kharif I (pre-monsoon) season. Many schemes are in a poor state of repair, a result mainly of inadequate O&M. Beneficiary participation is unsatisfactory. Cost recovery is extremely low, with the maximum total annual revenue actually collected during the 1994 – 98 period being only about Tk10/ha.

Urgent action is required to improve scheme performance, in order to raise agricultural output and rural incomes. This will entail a mix of structural improvements and steps to improve scheme management and cost recovery. A key component of this process will be increased beneficiary participation and, where possible, the transfer of management from BWDB to beneficiary organisations, local government and the private sector, in accordance with Policy.

## Programme Outline

A single strategy should not be adopted for all the major schemes, because of differences in performance and condition, the “without project” irrigation potential, and the level of O&M, replacement and rehabilitation costs. The schemes can be divided into three categories:

- **Gravity supply schemes in areas with no significant STW potential:** Bhola Irrigation Project, Muhuri Irrigation and Manu River Project, with a total area of 112,800ha, and Karnaphuli Irrigation project with a total area of 14,830ha, part of which is gravity irrigation.
- **Pumped supply (BWDB primary pumping) schemes in areas without significant STW potential:** Barisal, Chandpur and Meghna-Dhonagodha schemes, with a total area of 108,200ha. The last two are comparatively successful, whereas Barisal (72,100ha of the 108,200ha total), in South Central Region, has serious shortcomings.
- **Gravity or pumped supply schemes in areas with STW potential:** GK, Teesta Barrage, Pabna, the Greater Dinajpur Projects, Dhaka-Narayanganj-Demra (DND), North Rupganj and Buri Teesta Project, with a total area of 244,400ha (counting 91,100ha for Teesta Barrage). All these schemes are in the North West and North Central Regions, except GK, in SW Region. GK is by far the most expensive to run. Moreover, it needs its pumping equipment replaced, with a reported cost of Tk2104M.

On economic and financial grounds the highest priority should be given to the first category and the lowest to the third category. Present performance and condition will be key factors influencing the policy to be adopted for any particular scheme. On many schemes rehabilitation will be necessary for long-term sustainability. This should be undertaken only if improved O&M and performance can be assured, with beneficiary contribution to rehabilitation and O&M costs, and costs are not excessive.

The first step will be an audit of each scheme, covering technical, institutional, environmental and other key aspects, and a feasibility assessment of its rehabilitation and improvement, in line with the existing Guidelines for Project Assessment (GPA). Where this type of intervention is considered to be justified, planning, design and implementation will then go ahead. The process will be linked with the management transfer activities in Programme ID 003, cost recovery measures in EE 005 and the rationalisation of FCD infrastructure and management in AW 007 (most major irrigation schemes also have FCD); the approach adopted for FCD schemes will be very similar to that for irrigation schemes.

Command Area Development (CAD), involving scheme rehabilitation and improvement, is in progress on Meghna – Dhonagodha, Pabna and Teesta schemes but is relatively expensive (Tk60,000/ha for the first two schemes). A provisional estimate of Tk3275M at mid-2000 prices has been made for the overall Programme, assuming that not all scheme areas would be rehabilitated and the CAD approach would not be widely adopted.

Based on the distribution of the 480,000ha scheme area between the regions, the capital cost per region would be as follows:-

NW	NC	NE	SW	SC	SE	EH	Total
811	61	82	792	1,025	402	102	3,275

Scheme rehabilitation and improvement costs and economic returns will be highly variable, being dependent on the present condition of each scheme, the physical environment (hydrology, river regimes, siltation etc), the scope for private STW irrigation, farmer attitudes and capabilities,



social constraints and other factors. Long-term sustainability will be a key factor. Unless cost recovery is greatly improved, the Programme would have adverse impacts on GoB finances, if post-rehabilitation O&M funding is raised to the level required. Successful rehabilitation would bring substantial social benefits, as a result of increased rural incomes. Adverse social and environmental impacts would be minimal, especially as little land acquisition would be necessary.

## Financing Arrangements

Capital funding will be by GoB, with appropriate beneficiary contributions being made in accordance with Policy (Programme EE 005).

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Sustainable operation and maintenance	I1	• User group records	2013
• Public irrigation schemes rehabilitated and upgraded	I2	• Long term O&M expenditure trends	2023
• Increased returns per unit of water and labour on public irrigation areas	K	• Construction records	2023
• Water related constraints on agricultural production minimised	D	• On site verification	2023
		• Household surveys and field measurements	2028
		• Extent of flooding on arable land	2028
		• Annual unsatisfied demand for irrigated land	

## Institutional Arrangements

Implementation would be undertaken by BWDB in cooperation with scheme beneficiaries, NGOs and, wherever appropriate and feasible, local government and the private sector.

## Existing Documentation

NWMP DSR §10.10, and the National Water Resources Database (NWRD) numerous reports on individual schemes are available, especially those on the on-going CADP and the previous GK rehabilitation project.

## Linkages

As described above, the main linkages are with the Programmes concerning scheme management transfer (ID 003), cost recovery (EE 005) and FCD rationalisation (AW 007).

## Risks and Assumptions

Risks of shortfalls in Programme performance and impacts are high, with a danger of rehabilitated schemes subsequently declining to their pre-rehabilitation performance due to inadequate O&M. The principal risks are that (i) beneficiaries will be unwilling or unable to provide the necessary commitment and contributions to programme implementation and to meet the full scheme O&M costs, the eventual target, and (ii) GoB is unable to provide effective O&M, due to funding and other constraints. Certain technical risks are also present (e.g. siltation, river bank erosion) but are less important than the “institutional” risks above.

## Improved Performance of Existing Public Surface Water Irrigation Schemes

Ref : **AW 002**

Cluster :	<b>Agriculture and Water Management</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Irrigation</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2004</b>	Duration <sup>2</sup> :	<b>20 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>BMDA, CBOs, LGIs, NGOs, Private Sector</b> (Supporting)
Short Description :	It is the policy of the government to "encourage future groundwater development for irrigation by both the public and private sectors" (NWPo §4.7.b). Even so experience confirms that current performance of existing public irrigation schemes is not satisfactory. This programme is intended to address both challenges by means of the following approaches: full participation of beneficiaries; command area development; conjunctive use of surface and groundwater; rehabilitation; improved O&M and appropriate beneficiary contributions to both capital and recurring costs.		

### MIS Links

Cost Calculation :	AW Programme costing.xls	Map :	AW 002 Map.jpg
Disb't Schedule :	AW Programme costing.xls	Description :	AW 002 PgP.doc

### Finance

	Costs	Private	Funding (%)		Expected by
			GoB	Beneficiaries	ProgrammeYear
Total Capital <sup>3</sup>	<b>3,275.00</b> MTK	<b>0%</b>	<b>85%</b>	<b>15%</b>	<b>20</b>
Ultimate Recurring	<b>98.30</b> MTK/yr	<b>n/a</b>	<b>25%</b>	<b>75%</b>	<b>21</b>

Date of Data : **31 07 01**  
(dd) (mm) (yy)

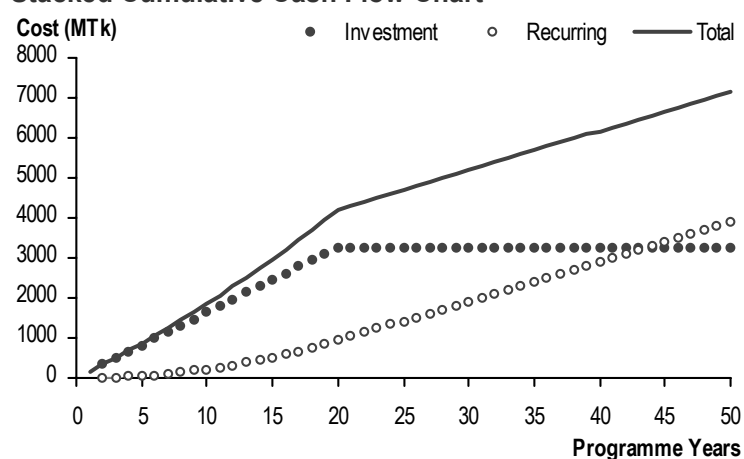
Status : **Identified**

Financial Base Year: **mid-2000**

Planned Expenditure (to date) : **0** MTk

Actual Expenditure<sup>4</sup> (to date) : **0** MTk

### Stacked Cumulative Cash Flow Chart



### Monitoring

Objective	Indicator	Present Status <sup>5</sup>
• Sustainable operation and maintenance	• User group records • Long term O&M expenditure trends	NYD
• Public irrigation schemes rehabilitated and upgraded	• Construction records • On site verification	NYD
• Increased returns per unit of water and labour on public irrigation areas	• Household surveys and field measurements	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref

AW 002

Title

Improved Performance of Existing Public Surface Water Irrigation Schemes

Assumptions:

Taka/US\$ 51.000

TA duration

0.0

years

All prices in mid-2000 values

Investment duration

20.0

years

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			

### Technical Assistance

Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-		
Mid-level National consultants (all-in rate)	p-m	-		90	-		
Sub-totals					-		
Other general TA programme costs		25%			-		
Specific other TA programme costs					-		
<b>Total TA Costs</b>					-		

### Other Programme Costs

1. Rehabilitation investment (inclusive of engineering and overheads)					3,275.0	3.0%	98.3
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>3,275.0</b>		<b>98.3</b>

### Overall Programme Costs

3,275.0 98.3

Notes:

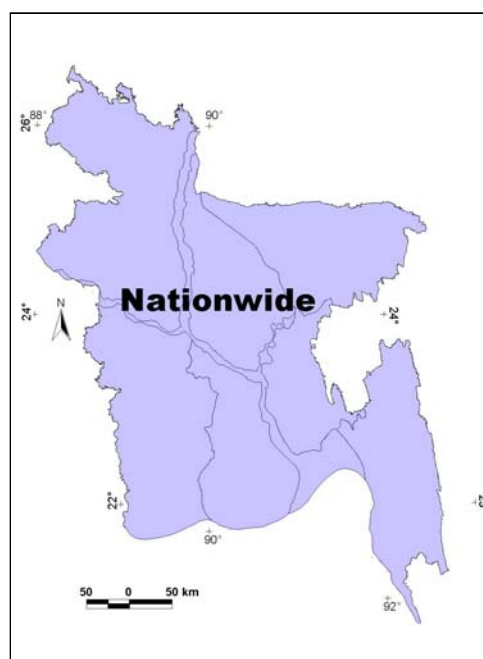
Allow for 163,750 ha rehabilitated at typical cost of Tk 20,000 per hectare

**New Public Surface Water Irrigation Schemes**Ref: **AW 003****Basic Data**

NWMP Sub-sector	<b>Agriculture and Water Management</b>
Region(s)	<b>Nationwide, but mainly the coastal zones of SW, SC, SE and EH Regions, and NE Region</b>

**Relevance to NWPo**

NWPo Article 4.7 states that surface water development for irrigation will continue and Article 4.2(k) stipulates that the major rivers will be developed for multi-purpose use, including irrigation. An important point concerning future public sector irrigation development is the NWPo Article 4.14(a) policy that water rates will be charged for O&M on irrigation (FCD/I) projects. At present, water rates are levied on very few BWDB irrigation schemes.

**Purpose of Programme**

Within the overall goal of increasing agricultural production, the objective of the Programme is to expand surface water irrigation. It involves two types of intervention, large-scale development by BWDB, and smaller-scale development of rubber dam schemes by LGED and BWDB. Both would be based on existing surface water resources; i.e. not dependent on main river barrages. Rubber dams are located on rivers and inflated during the dry (low flow) season, to act as weirs, and are then deflated in the monsoon season of high river flows. Present policy is that irrigation development should be left largely to the private sector, but GoB has a role in constructing surface water irrigation projects, principally in areas where there is little groundwater irrigation potential. The main such areas are the coastal zone, where the groundwater is saline, and most of NE Region, where aquifer conditions are difficult.

There are two main types of potential BWDB surface water irrigation development. The first is the conventional type of formal irrigation scheme, whereby (GoB) provides an irrigation distribution system down to the secondary or tertiary canal level. The 15 existing major (over 2,000ha) BWDB schemes are of this type. The second type is a lower-cost development involving simple earthworks and structures, possibly with some limited pumping, to increase surface water availability for low lift pumping and distribution by farmers. New formal irrigation scheme development is not proposed, because of its high costs, O&M problems and other drawbacks, but development of the lower cost type will continue in the future. Provided that this is confined largely to areas where the tubewell irrigation alternative is not available, it can yield satisfactory economic and social benefits.

Rubber dam irrigation is still in its early stages in Bangladesh. Existing experience indicates that rubber dams can provide attractive direct economic returns but can cause adverse social, environmental and economic impacts because of the reduction in river flows downstream. For this reason they should be confined mainly to the coastal zone. EH Region is the major region of potential.

## Programme Outline

1. **New BWDB Irrigation Development:** The present level of BWDB new irrigation development (rather than rehabilitation) activity is low, the only on-going project of any size being the Matamuhuri Irrigation Project in EH Region. This is in its pilot phase. There is, however, a substantial number of new projects in BWDB's list of potential new projects for the 2000 – 2010 period, but many are relatively small.

The principal major potential projects are: Matamuhuri (16,000ha), in EH Region; South Comilla and North Noakhali Project (320,000ha, feasibility study in progress), Chandpur – Comilla Integrated FCD/I (45,000ha) and Dakatia – Little Feni (200,000ha), all in SE Region, in much of which tubewell irrigation potential is limited; Gorai Augmentation – Kamarkhali Weir, and Mathabanga (45,000ha), both in the northerly part of SW Region, where there is widespread shallow tubewell (STW) irrigation; North Rajshahi (62,000ha), Pabna Integrated Rural Development Project II (19,000ha), Teesta Barrage Phase II (330,000ha) and the irrigation component of the existing Kurigram FCD (32,800ha in the North Unit), all located in NW Region in areas of widespread STW irrigation; Narayanganj – Narsingdi Phase II (60,000ha), in an area of NC Region with intensive STW development; and Upper Surma – Kushiya Project (49,000ha), in NE Region, where there is little STW potential.

At this stage the precise scale and phasing of future new BWDB irrigation development cannot be finalised, because of the need for more detailed studies and consideration by GoB. Particular attention will be given to assessing the justification and feasibility of proposed projects, especially those serving areas of substantial existing STW irrigation development. Economic returns from such projects will generally be low, because of the modest increase in irrigated area which is likely to be achieved. Another key parameter will be capital cost per hectare. Based on the data available, this varies enormously from project to project. S Comilla / North Noakhali is estimated to cost less than Tk20,000/ha whereas Pabna II and North Rajshahi are over Tk100,000/ha. Financial viability is likely to be low on many projects, because of the practical difficulty of recovering O&M costs where a project augments water supplies into existing rivers and khals.

On economic and financial grounds some of the currently proposed BWDB new surface water irrigation projects may thus not be viable. For Plan costing purposes the assumption made is that the total net cultivable area (NCA) of such projects over the next 25 years will be comparatively modest, at 200,000ha, with only the lower-cost projects such as S Comilla/N Noakhali being implemented. At an average cost of Tk30,000/ha the total Plan investment would be Tk6,000M at mid-2000 prices, spread evenly over the first 15 years, by which time the limited number of suitable projects would have been developed. Taking account of STW potential and currently proposed projects, the regional breakdown of this expenditure is expected to be as follows in Tk Million:-

<b>NW</b>	<b>NC</b>	<b>NE</b>	<b>SW</b>	<b>SC</b>	<b>SE</b>	<b>EH</b>	<b>Total</b>
300	300	1,200	600	300	2,400	900	6,000

Annual O&M costs are taken to be 5% of the capital costs, assuming that some schemes will involve pumping.

Apart from economic and financial considerations, new BWDB irrigation development of the type would produce positive social benefits, due to the increase in rural incomes. Since water distribution would be based largely on the existing river and khal network, land acquisition requirements would be low. Environmental impacts would not be substantial.

## 2. Rubber Dam Projects

LGED is currently engaged in a programme involving construction of 13 rubber dams on small and medium rivers, to irrigate 9,000ha and extending to 2004. Total estimated cost of the 10 to be funded by GoB is Tk785M. Three have been completed so far, two in EH Region and one in NC Region.

Given the limited number of suitable sites, in terms of there being adequate dry season stream flows and little danger of significant adverse downstream effects, it is envisaged that there would be only another 5,000ha of rubber dam development. This would be completed within 15 years. Average capital cost would be Tk25,000/ha.

Of the 10 proposed rubber dams, four are in NW Region, three in NC Region and one each in NE, SE and EH Regions. Thus only two, at the most, are in the coastal zone. The other eight may have undesirable downstream impacts. As explained above, future rubber dam development should be concentrated in the coastal zone. In line with this approach, and taking account of technical feasibility, the regional breakdown of this expenditure is envisaged to be as follows, in Tk million at mid-2000 prices:-

<b>EH Region</b>	<b>SE Region</b>	<b>Total</b>
80	45	125

Annual O&M costs would be 5% of capital costs. Cost recovery would be more practicable than for the BWDB schemes, because of the much small scheme size and the resultant ability to clearly identify the beneficiaries. Water charges are being levied on the two existing pilot schemes in EH Region.

Long-term sustainability is an important consideration for both Programme components, because of the risks of inadequate O&M. Increased beneficiary participation, a key NWMP aim, should reduce this risk.

## Financing Arrangements

Capital funding would be by GoB, possibly with donor assistance, but with appropriate beneficiary contributions being made in accordance with Policy. Full O&M cost recovery is the aim with rubber dams but, as noted above, will be difficult to achieve on new BWDB schemes.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Plans prepared	I1	• Project documents	2009
• Projects in progress	I2	• Funding in place	2010
		• Signed contracts/work orders	
• Increased area under public surface water irrigation	K	• Construction records	2029
		• On-site verification	
• Water related constraints on agricultural production minimised	D	• Extent of flooding on arable land	2029
		• Annual unsatisfied demand for irrigated land	

## Institutional Arrangements

Implementation would be undertaken by BWDB and LGED in cooperation with scheme beneficiaries, NGOs and, wherever appropriate and feasible, local government and the private sector.

## Existing Documentation

NWMP DSR Section 10.11, and the National Water Resources Sector Database. Numerous reports on individual schemes are available.

## Linkages

The main linkages are with the Programmes concerning scheme management transfer (ID 003), cost recovery (EE 005) and FCD scheme management (AW007). There may also be linkage with main river barrage development (MR 002 to 009).

## Risks and Assumptions

Risks of shortfalls in Programme performance and impacts are high, due to the danger of inadequate O&M. The principal risks are that (i) beneficiaries will be unwilling or unable to provide the necessary commitment and contributions to Programme implementation and to meet the full scheme O&M costs, the eventual target, and (ii) effective O&M is not achieved, due to funding, institutional and other constraints. Certain technical risks are also present (eg siltation, reduced surface water availability in the future, river bank erosion) but are less important than the “institutional” risks above.

**New Public Surface Water Irrigation Schemes**Ref : **AW 003**

Cluster :	Agriculture and Water Management		Region(s) :	All	
Focus/Foci :	Irrigation		Location :	Nationwide	
Start Year <sup>1</sup> :	2005	Duration <sup>2</sup> :	15 year(s)	Agency(s) Responsible :	BWDB (Lead) LGED (Supporting)
Short Description :	The preamble NWPo §4.7 requires government to continue promoting the development of surface water irrigation where feasible and to focus where practical on the conjunctive use of groundwater and surface water. The overall objective of this programme is to increase agricultural production and reduce demand on groundwater abstraction by promoting and implementing new surface water irrigation schemes.				

<b>MIS Links</b>	Cost Calculation : AW Programme costing.xls	Map : AW 003 Map.jpg
	Disb't Schedule : AW Programme costing.xls	Description : AW 003 PgP.doc

Finance					
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	6,125.00 MTk	0%	85%	15%	15
Ultimate Recurring	306.30 MTk/yr	n/a	25%	75%	16
Date of Data :	31 07 01	<div>Stacked Cumulative Cash Flow Chart</div> <div>Cost (MTk)</div> <div><div>● Investment</div><div>○ Recurring</div><div>— Total</div></div> <div>20000</div> <div>15000</div> <div>10000</div> <div>5000</div> <div>0</div> <div>0 5 10 15 20 25 30 35 40 45 50</div> <div>Programme Years</div>			
Status :	Identified				
Financial Base Year:	mid-2000				
Planned Expenditure (to date) :	0 MTk				
Actual Expenditure <sup>4</sup> (to date) :	0 MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Plans prepared	• Project documents	NYD
• Projects in progress	• Funding in place • Signed contracts/work orders	NYD
• Increased area under public surface water irrigation	• Construction records • On site verification	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done



# National Water Management Plan

## Programme Costing Sheet

Programme Ref	<b>AW 003</b>
Title	<b>New Public Surface Water Irrigation Schemes</b>

### Assumptions:

Taka/US\$	51.000	TA duration	<b>0.0</b>	years	All prices in mid-2000 values
		Investment duration	15.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. New BWDB public irrigation schemes (inclusive of engineering and overheads)					6,000.0	5.0%	300.0
2. New rubber dam irrigation schemes (inclusive of engineering and overheads)					125.0	5.0%	6.3
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					6,125.0		306.3
<b>Overall Programme Costs</b>					6,125.0		306.3

### Notes:

Allow for	200,000 ha of new BWDB schemes at	Tk	30,000	per hectare
Allow for	5,000 ha rubber dam schemes at	Tk	25,000	per hectare

**New Public Deep Tubewell Irrigation Schemes**Ref: **AW 004****Basic Data**

NWMP Sub-sector      **Agriculture and Water Management**

Region(s)                **NW Region**

**Relevance to NWPo**

Under NWPo §4.7(a) the continued development of minor irrigation is to be encouraged. For some years GoB policy has been that tubewell irrigation development should be left largely to the private sector. Nevertheless, §4.7(b) does provide for such development by the public sector as well as the private sector.

**Purpose of Programme**

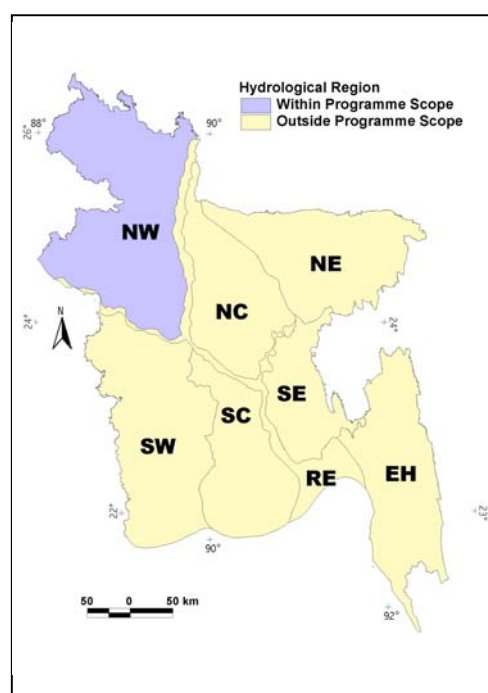
In the High Barind and limited parts of the extreme north of NW Region the watertables are too deep and, in some cases, drilling difficulties too great, for STW irrigation to be feasible. Available dry season surface water resources there are already fully exploited. Deep tubewells (DTWs) are thus the only means of expanding irrigation in such areas. Such expansion merits high priority, because these parts of NW Region are some of the driest and most economically deprived areas of Bangladesh.

Irrigation DTWs are at present too large and costly to be attractive to most private operators, even with GoB subsidies. They command an area that is too large and has too many farmers for a private operator to manage easily. If lower cost small submersible pumpsets become readily available (part of Programme AW 001), the attractiveness of DTWs to private investors will increase, but the extent of such private development will still be limited by its high capital cost. Public sector intervention is therefore essential for effective DTW irrigation development in areas of need.

**Programme Outline**

There are two major existing public sector DTW projects in Bangladesh, the North Bengal Tubewell Project (NBTP) under BWDB and the DTW component of the Barind Integrated Agricultural Development Project (BIADP), part of the Barind Multi-purpose Development Authority (BMDA), under the Ministry of Agriculture (MoA). A limited programme of rehabilitation of existing GoB DTWs which have not yet been disposed of to the private sector is being implemented by the Bangladesh Agricultural Development Corporation (BADC) and the Department of Agricultural Extension (DAE). A process of hand-over of NBTP wells to the beneficiaries has been initiated, and no new BWDB DTW development is envisaged.

Started in 1985, the BIADP now has some 6,000 DTWs in operation (some are in lower-lying areas where STW irrigation is feasible). Average command areas are typically around 20ha. This



development has been relatively successful in social and economic terms and has demonstrated that public sector DTW irrigation can be developed in such areas in an efficient and cost-effective way, with the right management. Agricultural benefits have been high, principally because of the high boro yields and low rainfed cropping potential. Despite its high capital cost of Tk54,000-58,000/ha, the Barind DTW development has, as a result, given attractive returns to investment, with EIRRs of between 17% and 31%, depending on the amount of land irrigated per DTW. Adverse environmental impacts from lowering watertables have not been serious. BMDA has been successful in involving women in operating its DTWs.

In contrast to most public sector irrigation in Bangladesh, cost recovery performance has also been satisfactory, with BMDA recovering through irrigation charges its total direct costs incurred on DTW O&M. This has been achieved by BMDA adopting a strict attitude to O&M cost recovery right from the outset. Capital cost recovery is, however, negligible, so GoB funding will be required for the occasional replacement of major DTW items like pumpsets. In view of the satisfactory economic and social benefits from the DTW programme, this situation is acceptable for the time being, but the aim for new DTW development will be to introduce a degree of capital cost recovery for replacement cost items.

There are three ongoing BMDA DTW development projects in progress, BIADP Phase II (2000/01 ADP budget Tk190M), Irrigation Area Development Project (Barind Area), Tk110M in 2000/01, and the Electrification of Barind DTW Project (Tk150M in 2000/01). All three are due to be completed soon.

Future public sector DTW irrigation development will be implemented by BMDA and will follow its existing well-proven approach, especially with its emphasis on full O&M cost recovery. Its pilot programme of village piped water supply based on irrigation DTWs will be extended where feasible. New DTWs will be powered by electricity rather than diesel engines. A new five year DTW programme has been proposed by BMDA, but full details are not yet available. For Plan costing purposes it is envisaged that a total of 2,000 new DTWs will be installed under the NWMP, all in the first 10 years. At an average capital cost of Tk1.1M per DTW the total GoB investment will be Tk2,200M at mid-2000 prices. An important part of the Programme will be to increase the degree of beneficiary participation in the siting and planning of each tubewell and its subsequent O&M.

Provided that DTW installation is restricted to areas which are unsuitable for STW irrigation and the current high levels of BMDA management performance are replicated on new DTW development, economic returns should be attractive and the Programme should be financially viable in terms of O&M funding. Social benefits will be high, as a result of the increase in rural incomes. Adverse environmental impacts will result from the lowering of dry season watertable levels and its effects on hand tubewell (HTW) domestic water supplies. These effects will be mitigated under Programmes DM 006 and TR 004, and by the extension of BMDA's DTW-based village piped water supply pilot programme into new areas.

### **Financing Arrangements**

Capital costs will be funded by GoB, possibly with donor assistance, but the full O&M costs will be recovered through the existing charging systems (several alternative systems are in use). A programme of gradually increasing the charges in order to provide for periodic replacement costs should be introduced.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Plans prepared	I1	• Project documents	2007
• Projects in progress	I2	• Funding in place	2008
		• Signed contracts/work orders	
• Increased area under public deep tubewell irrigation	K	• Construction records	2027
		• On-site verification	
• Water related constraints on agricultural production minimised	D	• Extent of flooding on arable land	2027
		• Annual unsatisfied demand for irrigated land	

## Institutional Arrangements

As at present, implementation will be undertaken by BMDA, in cooperation with the beneficiaries. If GoB decide to extend development beyond the High Barind to further north in NW Region, consideration will need to be given to how best to organise and manage this. Eventual handover to beneficiaries and/or privatisation of BMDA operating wing is a possibilities, provided that effective O&M can be assured.

## Existing Documentation

NWMP DSR §10.10, and the National Water Resources Database (NWRD) various reports are available on the existing BMDA DTW development, and BMDA maintain an effective monitoring and reporting system.

## Linkages

The main linkages are with the Programmes concerning scheme management transfer (EE 002) and cost recovery (EE 005). If a Ganges Barrage were built (Programme MR 003), there might be increased surface water deliveries to some Barind areas of DTW development.

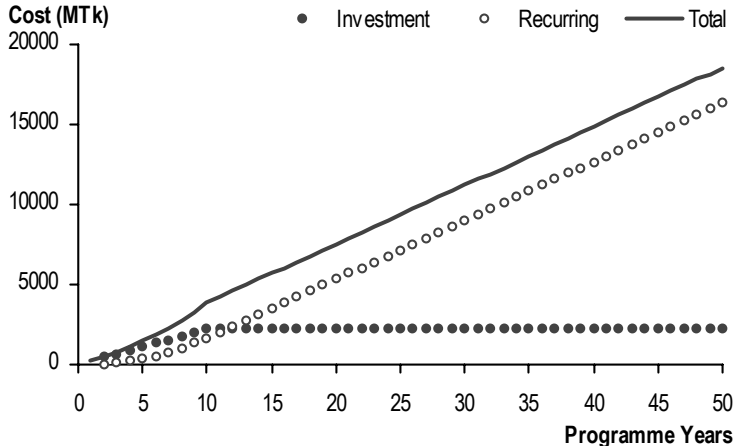
## Risks and Assumptions

The key assumption is that BMDA will maintain its present relatively high standards of management, O&M and cost recovery. Performance will suffer if these are allowed to slip as a result of socio-political or institutional factors. This is the main area of risk. Other risks include a repeat of the design problems encountered with the installation of some existing DTWs, due to difficult aquifer conditions, and environmental problems resulting from excessive watertable lowering towards the end of the dry season. As noted above however, mitigatory measures such as the replacement of No. 6 suction handpumps by Tara force mode handpumps in order to alleviate adverse impacts on domestic water supplies are available however.

**New Public Deep Tubewell Irrigation Schemes**Ref : **AW 004**

Cluster :	Agriculture and Water Management		Region(s) :	NW	
Focus/Foci :	Irrigation		Location :	NW region	
Start Year <sup>1</sup> :	2003	Duration <sup>2</sup> :	10 year(s)	Agency(s) Responsible :	BMDA (Lead) None (Supporting)
Short Description :	It is the policy of the Government that "support of private development of groundwater irrigation for promoting agricultural growth will continue" (NWPo §4.7). GoB policy is that TW irrigation should be a private rather than a public sector activity. However, subsidised DTW irrigation development in socially-deprived areas where irrigation is otherwise unaffordable may be justified on social and economic grounds; where drilling is difficult or costly and where surface water is limited. This programme will deal with the installation of an estimated 2000 new deep tube wells to meet these needs.				

<b>MIS Links</b>	Cost Calculation : AW Programme costing.xls	Map : AW 004 Map.jpg
	Disb't Schedule : AW Programme costing.xls	Description : AW 004 PgP.doc

Finance					
	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	2,200.00 MTk	0%	85%	15%	10
Ultimate Recurring	367.40 MTk/yr	n/a	0%	100%	11
Date of Data :	31 07 01	<div>Stacked Cumulative Cash Flow Chart</div> <div>Cost (MTk)</div> <div><div>● Investment</div><div>○ Recurring</div><div>— Total</div></div>  <div>20000</div> <div>15000</div> <div>10000</div> <div>5000</div> <div>0</div> <div>0 5 10 15 20 25 30 35 40 45 50</div> <div>Programme Years</div>			
Status :	Identified				
Financial Base Year:	mid-2000				
Planned Expenditure (to date) :	0 MTk				
Actual Expenditure <sup>4</sup> (to date) :	0 MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Plans prepared	• Project documents	NYD
• Projects in progress	• Funding in place • Signed contracts/work orders	NYD
• Increased area under public deep tubewell irrigation	• Construction records • On site verification	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	AW 004
Title	New Public Deep Tubewell Irrigation Schemes

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	10.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Expanded BMDA programmes					2,200.0	16.7%	367.4
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					2,200.0		367.4
<b>Overall Programme Costs</b>							
					2,200.0		367.4

### Notes:

Allow for 2,000 new DTW installed at typically Tk 1,100,000 per well  
Operational costs paid by DTW users

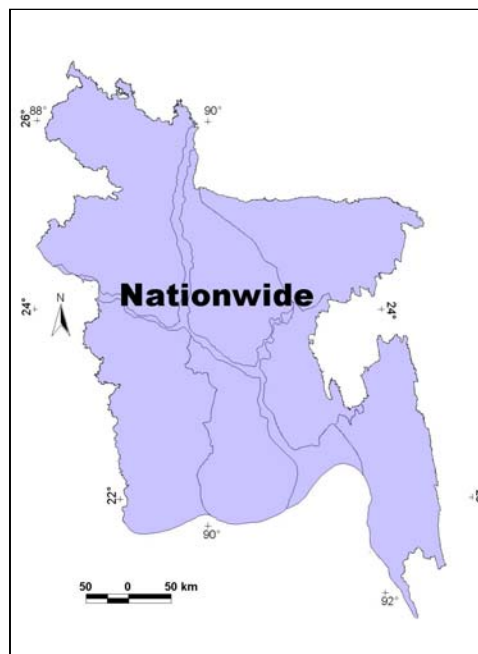
**Improved Water Management at Local Government Level**Ref: **AW 005****Basic Data**

NWMP Sub-sector      **Agriculture and Water Management**

Region(s)              **Nationwide coverage**

**Relevance to NWPo**

To local government institutions the NWPo represents a wide range of new challenges and opportunities. §2 of the Policy sets the foundation for this by referring to “management of the country’s water resources by all the concerned ministries, agencies, departments and local bodies”. Equally, Article 4.2.d requires local bodies to “prepare and implement sub-regional and local water management plans”. But not only are planning and implementation roles foreseen for Local Government Institutions (LGI’s); they will also become responsible for scheme management. Article 4.2.e requires local governments to coordinate the “planning, design, implementation and operation and maintenance of publicly funded surface water projects”; while 4.4.d states that “the management of public water schemes, barring municipal schemes, with command area of 5000ha or less will be gradually made over to local and community organisations” Finally, ownership of certain kinds of scheme will actually be transferred to the LGI’s. In particular, Article 4.4.f requires ownership of FCD and FCD/I projects with a command area of 1000ha less to be “gradually transferred to the local governments”.

**Purpose of Programme**

These requirements are pivotal to the Policy’s success and hence to the attainment of the National Goals in that they demand key institutional changes associated not only with scheme ownership and management, but also with the maintenance of local water resource systems. A three pronged strategy will be required to overcome the challenges involved. The first prong concerns the maintenance of the natural channels within the area controlled by a particular LGI; the second has to deal with the condition and coverage of physical water management infrastructure and the third with LGI abilities to make best use of them. Furthermore, this strategy should be formulated in the context of a new institutional paradigm as follows:

- BWDB retaining responsibility for main and regional rivers
- LGI’s assuming responsibility for small scale water resources management within their areas with support from LGED, and
- Communities assuming responsibility for field level systems and local channels.

This programme is targeted at the second issue and is intended to cover the rehabilitation and or upgrading as appropriate of the natural and man-made waterways and drains within LG’s jurisdiction. These channels lie between those that are managed by BWDB and those that are the devolved responsibility of community organisations. The programme builds upon the knowledge

that will be gained from ID 001: Local Government Needs Assessment, and runs in parallel to ID 005: Local Government Capacity Building for Water Management.

## Programme Outline

The programme provides for the necessary investment in local river system management, and acknowledges that fully replicable models will take some years more to develop into sustainable development process. The nature of the investments will cover those works required to improve management of small rivers and channels that are beyond local communities' ability to do for themselves (see Programme AW 006, which provides seed funding and support to community initiatives). The programme will be responsive to beneficiary demands, which are expected to include water conservation for supplementary and rabi season irrigation and culture fisheries and improved water management in shallow flooded areas in support of agriculture, fisheries and enhanced transportation access.

It encompasses therefore channel desilting, drainage and flood management improvements, improved water distribution for multi-purpose use and, where required, minor control or drainage structures. These investments are to be demand driven by the community, and will be developed and managed through participatory procedures established under Programmes EE 002 and EE 006.

The programme needs to be coordinated with BWDB's development of the main and regional river systems to ensure mutual advantage is taken of each organisation's work. A component of ID 004: BWDB Regional and Sub-Regional Management is to facilitate this coordination.

## Financing Arrangements

Capital costs would be funded by GoB, possibly with donor assistance, while O&M will be funded from local resources. Programme EE 013: Alternative Financing Methods for Water Management will be looking into ways by which local generation of funds can be assured.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"> <li>Sustainable management and ownership models in place</li> </ul>	I1	<ul style="list-style-type: none"> <li>Reports</li> </ul>	2010
<ul style="list-style-type: none"> <li>Local rivers, feeder canals and main drains transferred to LGI's for management/ownership as per policy</li> </ul>	I2	<ul style="list-style-type: none"> <li>Legal instruments</li> <li>Instruments of transfer ratified and promulgated</li> <li>Title deeds</li> </ul>	2010
<ul style="list-style-type: none"> <li>Local rivers, feeders canals and main drains restored, rehabilitated, upgraded as appropriate</li> </ul>	K	<ul style="list-style-type: none"> <li>Project completion reports</li> <li>Physical surveys</li> <li>Hydrological records</li> </ul>	2025
<ul style="list-style-type: none"> <li>Water related constraints on agricultural production minimised</li> </ul>	D	<ul style="list-style-type: none"> <li>Extent of flooding on arable land</li> <li>Annual unsatisfied demand for irrigated land</li> </ul>	2025

## Institutional Arrangements

The institutional arrangements will reflect those required by the NWPo. The programme will be implemented through Local Government with support from the LGED. BWDB will be responsible for ensuring adequate coordination with their programmes. Scheme management will be on a basis to be decided, but will involve community representation.



## **Existing Documentation**

Documents emanating from the ongoing Second Small-scale Water Resources Development Sector Project will provide useful information while other sources will include NWMP DSR Section 10.13, and the National Water Resources Database (NWRD).

## **Linkages**

This programme's success will depend very much on that of programmes ID 001 and 005 (Local Government Needs Assessment for Water Management and Local Government Capacity Building for Water Management respectively), as well as of EE 013 (Alternative Financing Methods for Water Management). Equally, since the LGI's will effectively bridge the gap between communities and the BWDB's regional offices, there are also clear linkages with Programmes ID 004 (BWDB Regional and Sub-regional Management Strengthening) and AW 006 (Improved Water Management at Community Level), as well as to Programmes EE 002 and 006 on participatory planning and management. Programmes MR 007, 008 and 009 (Ganges Dependent Area Regional Surface Water Distribution Networks; North East and South East Regional Surface Water Distribution Networks and North Central and North West Regional Surface Water Distribution Networks) are also of particular relevance.

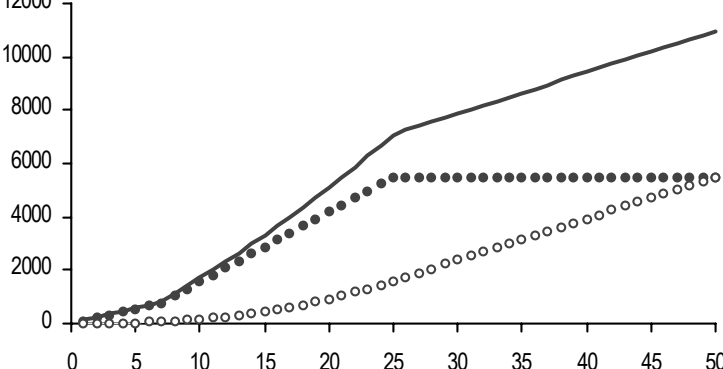
## **Risks and Assumptions**

The programme has two obvious risks and they are related. The first concerns long term sustainability the second concerns the relationship between LGI's as intermediary water managers and the downstream users (whether of irrigation or drainage services). Sustainable decentralisation requires a shift in accountability from upwards to higher levels of the civil administrative hierarchy to downwards where it is manifested in the fulfilled expectations of the water users. This has the potential effectively to establish buyer/seller relationships between the water users and water suppliers. Given that the over-riding cause of unsustainable operation and maintenance is lack of revenue, it is reasonable to assume that satisfactory buyer/seller relationships and participatory water tariffs should solve that problem. It is more difficult however to be overconfident about the rapid shifts in accountability necessary to facilitate timely and reliable water fee revenues. It is hoped nonetheless that the long-term nature of the programme provides sufficient time for the advantages to made clear to all involved.

**Improved Water Management at Local Government Level**Ref : **AW 005**

Cluster :	Agriculture and Water Management		Region(s) :	All	
Focus/Foci :	Water Management		Location :	Nationwide	
Start Year <sup>1</sup> :	2001	Duration <sup>2</sup> :	24 year(s)	Agency(s) Responsible :	LGED (Lead) None (Supporting)
Short Description :	Implementation of the NWPo will result in a four tiered civil-administrative hierarchy for the water sector: central, regional, local and community. The BWDB will remain responsible for water management issues as they affect or occur in the main and regional rivers. Equally, management of certain schemes below 5000ha will become the responsibility of community based organisations. Water courses, whether natural or man-made, that will be the management responsibility of neither BWDB nor community organisations will become the responsibility of LGI's. Furthermore, actual ownership of all schemes except municipal water schemes will be transferred to the LGI's. This programme is intended to rehabilitate, upgrade and restore as appropriate, the water courses involved as well as to provide the LGI's with the necessary appurtenant equipment and facilities.				

<b>MIS Links</b>	Cost Calculation : AW Programme costing.xls	Map : AW 005 Map.jpg
	Disb't Schedule : AW Programme costing.xls	Description : AW 005 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme		Year	
	Total Capital <sup>3</sup>		5,495.00 MTk	0%	85%	15%	24		
	Ultimate Recurring		156.00 MTk/yr	n/a	25%	75%	26		
	Date of Data :		31 07 01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment ○ Recurring — Total				
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Sustainable management and ownership models in place	• Reports • Legal instruments	NYD
• Local rivers, feeder canals and main drains transferred to LGI's for management/ownership as per policy	• Instruments of transfer ratified and promulgated • Title deeds	NYD
• Local rivers, feeders canals and main drains restored, rehabilitated, upgraded as appropriate	• Project completion reports • Physical surveys • Hydrological records	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	<b>AW 005</b>
Title	<b>Improved Water Management at Local Government Level</b>

**Assumptions:**

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Project investments: Phase 1 (inclusive of engineering & overheads)					700.0	3.0%	21.0
2. Project investments: Phase 2 (inclusive of engineering & overheads)					4,500.0	3.0%	135.0
3. Phase 1 Programme management cost @ 10.0% of above					70.0	0.0%	-
4. Phase 1 Programme management cost @ 5.0% of above					225.0	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					5,495.0		156.0
<b>Overall Programme Costs</b>							
					5,495.0		156.0

**Notes:**

**Phase 1**

Assume 10,000 ha pa developed on average nationally over 7.0 years  
at a unit cost of typically Tk 10,000 per ha, equivalent to 700 TkM overall, and  
developing a total of 70,000 ha, being 1% of total NCA.

**Phase 2**

Assume 25,000 ha pa developed on average nationally over 18.0 years  
at a unit cost of typically Tk 10,000 per ha, equivalent to 4,500 TkM overall, and  
developing a total of 450,000 ha, being 5% of total NCA.

Reference preparation material for Second Small Scale Water Resources Management Project (LGED/ADB)

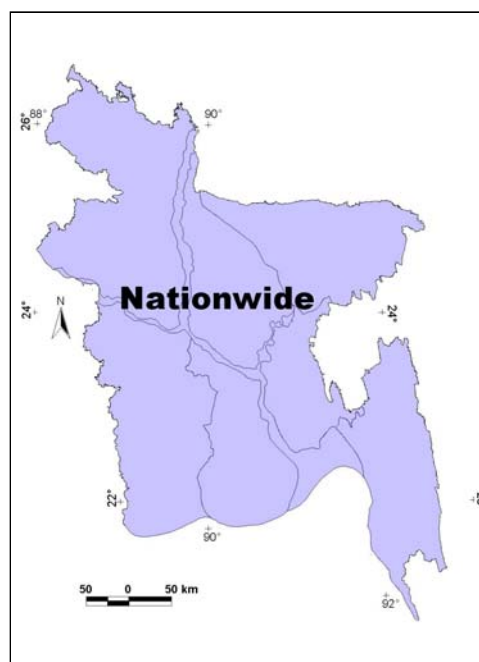
**Improved Water Management at Community Level**Ref: **AW 006****Basic Data**

NWMP Sub-sector      **Agriculture and Water Management**

Region(s)              **Nationwide coverage**

**Relevance to NWPo**

In the Preamble to §4.4 the NWPo acknowledges that “the ultimate success and effectiveness of public water resources management projects depends on the people’s acceptance and ownership of each project”. Despite the challenge that this embodies, in Article 4.4.d, Policy requires that management responsibility of public water schemes under 5000ha will be transferred to local and community organisations members of which: i) according to Article 4.2.p “will be motivated to develop different flood proofing measures”; ii) according to §4.7, itself focused on “increasing efficiency of water use,” will be expected to “improve efficiency of resource utilisation through conjunctive use of all forms of surface and groundwater” and by “crop diversification”

**Purpose of Programme**

These requirements are absolutely pivotal to the Policy’s success and hence to the achievement of the National Goals in that they address:

- the institutional changes associated with scheme ownership and management
  - increased water use efficiencies
- and
- increased returns per unit of water.

To address these challenges requires a two pronged strategy, one prong dealing with the condition and coverage of physical infrastructure, the other with community level abilities to make best use of them, and of the water on which they depend. Furthermore, this strategy should be formulated in the context of a new institutional paradigm which has three issues:

- BWDB retaining responsibility for main and regional rivers
  - LGI’s assuming responsibility for water resources management within their areas
- and,
- Communities assuming responsibility for field level systems and local channels.
  - Community based organisation taking up the small scale earth works (eg. khal excavation/re-excavation) mainly by labour intensive methods. Communities could be

motivated to take up these works as a social movement towards ensuring efficient use of their human resources.

This programme is targeted at the third issue works.

As far as physical infrastructure is concerned, as well as the new schemes envisaged under programmes AW 003 and AW 004, a wide range of benefits will accrue rapidly to the re-excavation of silted-up khals in terms of surface water irrigation, flood season drainage, navigation, fisheries, and domestic and livestock water supply. Without augmented river flows, and given existing institutional constraints, a total initial development of only 10,000ha is envisaged. But as the benefits of institutional change and capacity building start to emerge this area can be expanded, especially if any of the large river barrages are constructed under Programmes MR 007 to MR 009.

The benefits of capital investment along these lines are certain to be limited however, without parallel activities which transfer water rights and user obligations to community interests along with support services to:

- facilitate improved water management, which in many locations is likely to require capital investment in flow measurement and control infrastructure;

and

- crop diversification; which may need to be complemented by strengthened extension services and improved, or more flexible rural credit facilities.

## **Programme Outline**

Emerging global experience confirms that the sustainability of scheme management is directly linked to the level of ownership acknowledgement among its users. The programme will therefore begin with widespread consultation and sensitisation activities among potential communities which will be shown the benefits of self determinant scheme management and the wise use of water. This is intended to generate local demand for schemes implemented under the programme which will in turn result in a list of potential interventions ranked according to enthusiasm for change and willingness to **contribute** to it (in line with NWPo Article 4.16 d: community contributions to capital works) and **maintain** it (NWPo Section 4.4: cost recovery through user pays principles). Qualifying communities will then be assisted to develop upgrading projects for their schemes and thence to implement them. Such interventions will necessarily be holistic if they are to result in attractive models which inspire neighbouring communities to line up for inclusion in the Programme. Peer level sensitisation benefits such as this will be complemented by study tours further a-field within Bangladesh. But if it is to be convincing at this level, this means that the programme should be characterised by a broad range of soft support packages (ideally delivered by domestic NGO's). Inter-alia, these will include training schemes focussing on accounting, scheme management and conflict resolution, as well as other issues which may be identified during field testing of participatory models and guidelines (see Linkages below).

## **Financing Arrangements**

Capital costs would be funded by GoB, possibly with donor assistance, but with a substantial contribution from the beneficiaries. O&M would be entirely the beneficiaries' responsibility and significant opportunities for NGO cost participation are foreseen.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"> <li>Effective community based water management organisations</li> </ul>	I1	<ul style="list-style-type: none"> <li>Field evaluations</li> </ul>	2010
<ul style="list-style-type: none"> <li>Khals re-excavated over 10,000ha</li> </ul>	I2	<ul style="list-style-type: none"> <li>Physical survey</li> </ul>	2015
<ul style="list-style-type: none"> <li>Sustainable sub-secondary water use efficiencies of 60% for paddy and 75% for dryfoot crops</li> </ul>	K	<ul style="list-style-type: none"> <li>Field tests</li> </ul>	2025
<ul style="list-style-type: none"> <li>Water related constraints on agricultural production minimised</li> </ul>	D	<ul style="list-style-type: none"> <li>Extent of flooding on arable land</li> <li>Annual unsatisfied demand for irrigated land</li> </ul>	2025

## Institutional Arrangements

The institutional arrangements will reflect the three tier model required by the NWPo. At central level the MoA will be involved (especially as regards its extension strategies) along with WARPO; at the intermediate level will be the LGI's newly responsible as "owners" of many schemes involved in the programme (Programme AW 005 refers); while at the grass roots level will be the communities themselves, ideally supported by NGO's and field level technical service suppliers.

## Existing Documentation

NWMP DSR §10.10, the National Water Resources Database (NWRD) and the NMIDP reports concerning this development mode.

## Linkages

There are obvious linkages with several other NWMP programmes. These include ID 001 (Local Government Needs and Assessment for Water Management); ID 003 (FCD and FCD/I Management Rationalisation); ID 005 (Local Government Capacity Building); EE 002 (Field Testing of Participatory Management Models) - for which this programme represents an ideal test bed, similarly EE 006 (Field Testing and Finalisation of the Guidelines for Participatory Water Management); EE 010 (Raising Public Awareness in the Wise Use and Management of Water); Programmes MR 002 through 009, all of which concern increased surface water availability. Finally, the programme will be inextricably linked conceptually and operationally with AW 005 (Improved Water Management at Local Government Level).

## Risks and Assumptions

Inadequate O&M is the greatest threat to success, as with most public sector and community-based irrigation and FCD interventions in Bangladesh. However, if scheme level interventions are kept small and consistent with beneficiary communities' spatial conceptions and if beneficiary participation can be maximised, the chances of O&M success are higher than with most other public sector developments in the sector. The risk of failure is nonetheless still substantial, as past experience with FFW khal re-excavation has shown. But on the reasonable assumption that with thorough needs assessment and expert facilitation, robust and widely replicable institutional models can be "sold" both to communities and to the civil administrative and line agencies involved, then there is a good expectation of success, especially if the promoters are prepared to take a long view and work towards it in a comprehensively participatory fashion.

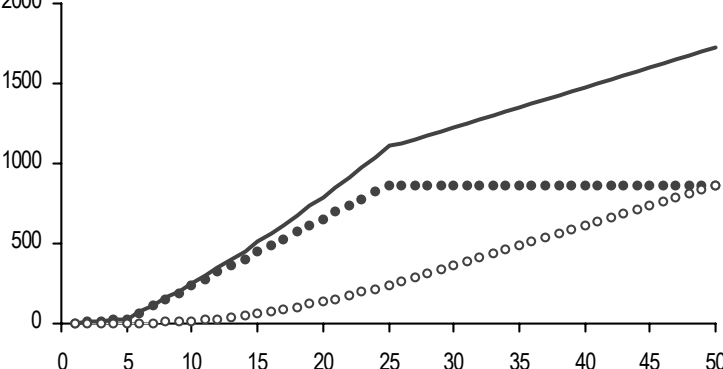
**Improved Water Management at Community Level**

Ref :

**AW 006**

Cluster :	<b>Agriculture and Water Management</b>		Region(s) :	<b>All</b>	
Focus/Foci :	<b>Water Management</b>		Location :	<b>Nationwide</b>	
Start Year <sup>1</sup> :	<b>2001</b>	Duration <sup>2</sup> :	<b>24 year(s)</b>	Agency(s) :	<b>LGED</b> (Lead)
				Responsible :	<b>LGI's, DAE</b> (Supporting)
Short Description :	Implementation of the NWPo will result in a four tiered civil-administrative hierarchy for the water sector: central, regional, local and community. The BWDB will remain responsible for water management issues as they affect or occur in the main and regional rivers. Local rivers and scheme delivery systems will become the management (and in some cases property) of LGI's while management of certain schemes below 5000ha will become the responsibility of community based organisations. This programme is intended to rehabilitate, upgrade and restore as appropriate, the water courses and field distribution/collection systems involved as well as to assist in providing with the necessary appurtenant equipment and facilities.				

<b>MIS Links</b>	Cost Calculation :	AW Programme costing.xls	Map :	AW 006 Map.jpg
	Disb't Schedule :	AW Programme costing.xls	Description :	AW 006 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme		Year	
	Total Capital <sup>3</sup>		865.00 MTk	0%	15%	85%	24		
	Ultimate Recurring		24.60 MTk/yr	n/a	0%	100%	26		
	Date of Data :		31 07 01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment ○ Recurring — Total				
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Effective community based water management organisations	• Field evaluations	NYD
• Khals re-excavated over 10,000ha	• Physical survey	NYD
• Sustainable sub-secondary water use efficiencies of 60% for paddy and 75% for dryfoot crops	• Field tests	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	AW 006
Title	Improved Water Management at Community Level

### Assumptions:

Taka/US\$	51.000	TA duration	0.0	years	All prices in mid-2000 values
		Investment duration	25.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Project investments: Phase 1 (inclusive of engineering & overheads)					20.0	3.0%	0.6
2. Project investments: Phase 2 (inclusive of engineering & overheads)					800.0	3.0%	24.0
3. Phase 1 Programme management cost @ 25.0% of above					5.0	0.0%	-
4. Phase 1 Programme management cost @ 5.0% of above					40.0	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					865.0		24.6
<b>Overall Programme Costs</b>							
					865.0		24.6

### Notes:

#### Phase 1

Assume 2,000 ha pa developed on average nationally over 5.0 years  
at a unit cost of typically Tk 2,000 per ha, equivalent to 20 TkM overall, and  
developing a total of 10,000 ha, being 0% of total NCA.

#### Phase 2

Assume 20,000 ha pa developed on average nationally over 20.0 years  
at a unit cost of typically Tk 2,000 per ha, equivalent to 800 TkM overall, and  
developing a total of 400,000 ha, being 5% of total NCA, contingent upon augmentation of GDA

Reference preparation material for Second Small Scale Water Resources Management Project (LGED/ADB)



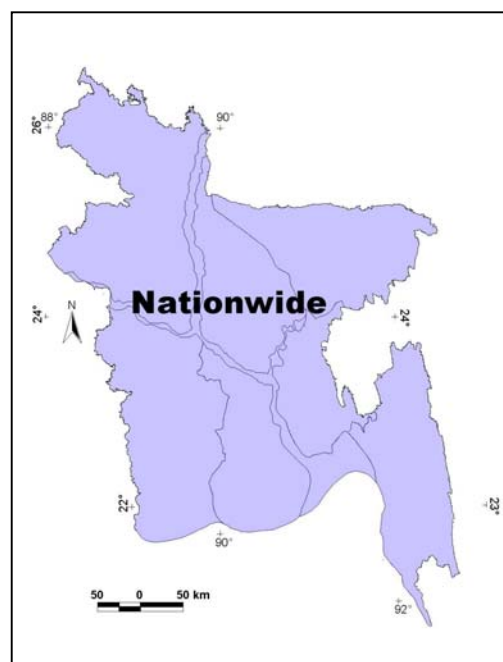
**Rationalisation of Existing FCD Infrastructure**Ref: **AW 007****Basic Data**

NWMP Sub-sector      **Agriculture and Water Management**

Region(s)                **Nationwide**

**Relevance to NWPo**

NWPo Article 4.2(p) stipulates that flood risk zones should be designated and appropriate measures should be taken to provide protection for life, property, infrastructure and agriculture in such zones. Article 4.4 sets out the management transfer policy for “public water schemes”, which includes FCD (flood control and drainage) schemes. Since the ownership of schemes under 1,000ha will be gradually transferred to local government, this Programme AW 007 does not cover these small schemes. Under Article 4.15, research will be undertaken into flood control and management and sociological issues affecting water projects.

**Purpose of Programme**

The purpose of the Programme is to help rationalise the large stock of existing FCD schemes and put them on a more successful and sustainable basis, within the context of the GoB policy for management transfer. It covers all the 465 existing BWDB FCD (flood control and drainage) schemes, except those under 1,000ha in Programme AW 005 and the 15 major irrigation (FCD/I) schemes in Programme AW 002. Both coastal and inland FCD will be included, although the former will generally receive higher priority. The table below shows the numbers and regional distribution of the existing BWDB FCD schemes. Their total area is 4.6Mha.

FCD type	NW Region	NC Region	NE Region	SW Region	SC Region	SE Region	Eastern Hills Region	TOTAL
Inland FCD								
No	53	54	59	33	8	9	7	223
Area (000ha)	1,324	208	466	315	27	309	37	2,686
Coastal FCD								
No	-	-	-	45	56	5	33	139
Area (000ha)	-	-	-	465	442	103	110	1,120
Drainage only schemes								
No	18	7	6	27	8	34	3	103
Area (000ha)	31	45	48	415	27	205	42	813
<b>TOTAL</b>								
No	<b>71</b>	<b>61</b>	<b>65</b>	<b>105</b>	<b>72</b>	<b>48</b>	<b>43</b>	<b>465</b>
Area (000ha)	<b>1,355</b>	<b>253</b>	<b>514</b>	<b>1,195</b>	<b>496</b>	<b>617</b>	<b>189</b>	<b>4,619</b>

Many schemes are not performing satisfactorily and are not producing the benefits expected. Beneficiary participation in O&M is negligible and lack of funds to maintain schemes severely threatens their sustainability. Many are in need of rehabilitation. There are no cost recovery charges for BWDB FCD schemes; these are specifically excluded under the NWPo.

Complete or partial transfer of scheme management is the Policy aim, but this is likely to be a slow process, because of social, institutional and financial constraints. In the meantime, there are two options for existing BWDB schemes:-

1. **Scheme rehabilitation and re-modelling:** In addition to deferred maintenance, the term rehabilitation includes here the improvements that might typically form part of the normal rehabilitation process. Repair of embankments and structures and drainage improvements are the main physical works involved. This option applies to two distinct situations, either as a necessary prelude to and integral part of scheme handover or for continued GoB operation of either those schemes which are unsuitable for handover or those for which handover will be considerably delayed.

Rehabilitation would have to be justified on social, economic, environmental and affordability grounds. It could be viable if beneficiaries are willing and demonstrably able, together with local government, to take on the future maintenance of schemes (up to 5000ha). For those that are to be continued under central Government management, pre-requisites to rehabilitation should be an environmental audit, clear evidence of participatory planning of the works, a commitment to adequately finance future O&M from the Revenue Budget, and establishment of a satisfactory mechanism for scheme management on a participatory basis, with transparent accountability for project funds.

2. **Phased GoB disengagement** is a possibility for certain sick inland FCD schemes (on social grounds, withdrawal from coastal FCD schemes would not be acceptable, because of the cyclone danger and the more damaging effects of marine flooding). Before withdrawal, active measures could be taken such as removing structures and other infrastructure that cause drainage congestion, and raising awareness amongst farmers about the likely changes in flood regime.

Conditions vary widely from scheme to scheme and there is no universal solution. A scheme-by-scheme approach, in close consultation with the beneficiaries and other stakeholders, is essential. Based on this approach, the Programme will prepare and implement a management plan for the stock of existing FCD schemes.

## **Programme Outline**

This programme represents the investment component that is associated with and downstream of Programme EE 002: Field Testing of Participatory Management Models. The latter provides, *inter alia*, for pilot testing of different management models for flood control and drainage schemes to determine the means by which to set the management of FCD schemes on a more sustainable basis. Programme EE 002 costs cover WARPO oversight of the participatory and planning processes. This programme AW 007 covers those actions to be undertaken by BWDB, including associated civil works.

The rationalisation programme will be phased over 20 years. The principle steps in the programme are:

1. **Establishment of a full inventory of BWDB schemes:** This will build on the work done by the WMIP preparation team, the NWMPP listing and mapping of scheme locations (held on NWRD), asset surveys conducted by BWDB under CERPII, and BWDB's information holdings. The objective will be to establish the physical condition of all schemes.
2. **Preparation of a Management Plan:** On the basis of the inventory, and in the light of all other available information, a plan of action can be prepared. The plan will identify priority

schemes for attention, taking account of other ongoing and planned NWMP programmes, and will set out a realistic programme of work, in detailed form for the first five years and indicative thereafter. It would be updated every 5 years.

3. **Environmental audit:** Under NEMAP requirements, all FCD schemes are required to be subjected to environmental audit, with environmental management plans prepared. Few such audits have been carried out to date (if any).
4. **Participatory Planning:** Policy requires that all stakeholders are engaged in the process of planning what to do with each scheme, and it will be incumbent on BWDB to ensure that this is followed in a thorough and transparent manner. The Guidelines for Participatory Water Management (GPWM) will provide guidance on how this is to be achieved. This may lead to decisions to rehabilitate, remodel or actively disengage from schemes. Any new works must be subjected to assessment under the Guidelines for Project Assessment (GPA) before being taken up. Environmental Management Plans must also be in place at this stage.
5. **Establishment of future management structure:** It will be essential to agree and have in place the future management structure with posts filled prior to commencement of civil works. The type of structure will be determined under Programme EE 002, which may include alternatives depending on circumstances. The future management must agree the works to be done, and acknowledge their own responsibilities and commitments. O&M arrangements, responsibilities and funding must also be clarified at this stage.
6. **Civil Works and Hand-over:** With all of the above in place, civil works will be undertaken on the agreed basis and on completion handed-over to the new management. Management training will be conducted in parallel to the civil works programme.

During the first five years of the programme, whilst field testing of participatory planning models is being conducted, the number of schemes taken up for rehabilitation will be limited to those required under Programme EE 002. Provisionally, eight schemes, one in each region, are planned for this period. The balance of schemes will be progressively taken up in the ensuing 15 years.

The programme will cover both inland FCD and coastal polders. With regard to the former, actions will need to be coordinated with river development programmes MR 006, MR 010 and MR 011. For the coastal polders, in addition to these programmes, particular attention will have to be given to the outcome of studies on drainage congestion relief, to be undertaken as part of the GDA development programmes (MR 001, 003, 006 and 007).

Costs of the programme are provisionally estimated to be an overall Tk21,472M over 20 years, with O&M on the incremental works rising to Tk1153M per year. During the first 5 years, TA costs are estimated as Tk100M for plan preparation support, with a further Tk1710M spent on environmental audits, consultations and scheme management training.

The total existing stock of schemes is tentatively estimated to represent Tk75,000M of capital investment. At 6% pa this would represent a commitment of Tk4500M per annum, well over three times that which was spent in 1995/5-1997/98. Whilst a process of disengagement in some schemes would serve to somewhat reduce the annual budget requirements for O&M, a key element of the management plan must be to reach agreement with the Ministry of Finance over sustainable funding levels for O&M.

## Financing Arrangements

Capital cost financing will be from GoB, with scope for donor assistance. Opportunities should be taken to obtain beneficiary contributions in accordance with Article 4.16(e) of the NWPo. Policy excludes cost recovery on FCD schemes, but requires that O&M is financed through local resources for those schemes up to 5000ha that are transferred to Local Government and community organisations (NWPo, Article 4.4(d)). Issues of alternative financing arrangements will be addressed under Programme EE 013.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"><li>Sustainable operation and maintenance on 50% of all existing inland and coastal FCD/I schemes</li></ul>	I1	<ul style="list-style-type: none"><li>User group records</li><li>Long term O&amp;M expenditure trends</li></ul>	2011
<ul style="list-style-type: none"><li>Inland and coastal FCD/I rehabilitated and upgraded on a participatory basis</li></ul>	I2	<ul style="list-style-type: none"><li>Participatory agreements</li><li>Project completion reports</li></ul>	2011
<ul style="list-style-type: none"><li>Increased returns per unit of water and labour in public irrigation areas</li></ul>	K	<ul style="list-style-type: none"><li>Household surveys and field measurements</li></ul>	2011
<ul style="list-style-type: none"><li>Water related constraints on agricultural production minimised</li></ul>	D	<ul style="list-style-type: none"><li>Extent of flooding on arable land</li><li>Annual unsatisfied demand for irrigated land</li></ul>	2026

## Institutional Arrangements

The programme will be implemented by BWDB. Close co-operation will be needed with Local Government and community groups. Many of the skills needed to see through the programme successfully are not within BWDB at present. Programme ID 010 is designed to fill these gaps.

## Existing Documentation

There are many previous studies of existing FCD and FCD(I) schemes in both WARPO and BWDB archives. The BWDB Act 2000 defines the responsibilities and mandate of the organisation. The GPWM is available from WARPO. Specific other reports include DSR §10.13 and 10.14, NWRD, WSIP preparation reports (BWDB/WB), CERPII reports, CZWMP and ICZM reports..

## Linkages

This programme has many linkages with other programmes. The most important ones are: ID 003: FCD and FCDI Management Rationalisation; ID 010: BWDB Capacity Building; EE 002: Field Testing of Participatory Management Models; EE 003: Water Resources Legislation – Preparation of Supporting Ordinances; EE 006: Field Testing and Finalisation of the Guidelines for Participatory Water Management; EE 013: Alternative Financing Methods; MR 003, 006, 007 010, 011 all to do with river improvements; AW 005 and AW 006: Improved Water Management at Local Government and at Community levels; AW 008: Coastal Protection and Afforestation; EA 004 and EA 005: National Fisheries Master Plan and National Fish Pass Programme; and EA 010: Public Awareness Raising and Empowerment in respect of Environmental Issues.

## **Risks and Assumptions**

Four main areas of risk can be seen in this programme. Firstly and foremost, the issue of financing O&M of FCD works has to be resolved in a credible manner. There is little point in embarking on a rationalisation programme if there is no commitment to finance O&M at sustainable levels. The programme encourages BWDB to enter into dialogue with the Ministry of Finance and to look into alternative means of financing.

Secondly, notwithstanding Policy, sustainable management systems have yet to be field-tested and evaluated, and there is some uncertainty over how long it will take to arrive at an answer. Imaginative thinking and open-mindedness are needed to resolve this issue.

Thirdly, there is a risk that the programme will lose focus and delivery of capital works will become the central theme and driving force, as has happened many times before. The responsibility for not losing sight of the main aims will lie primarily with BWDB Board of Directors. However, WARPO as monitor of the NWMP will also need to carefully assess progress towards the central goals.

Finally, if BWDB does not acknowledge and fill the skills gaps likely to constrain programme implementation, there is a grave risk that it will not achieve its objectives. Provision is made under ID 010 to resolve this, and due importance should be given to this linkage.

**Rationalisation of Existing FCD Infrastructure**Ref : **AW 007**

Cluster :	<b>Agriculture and Water Management</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Coastal Protection, AND Flood Control and Drainage</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2007</b>	Duration <sup>2</sup> :	<b>20 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>LGED</b> (Supporting)
Short Description :	The NWPo states that "Ownership of FCD and FCDI projects with command area of 1000 ha or less will gradually be transferred to the local governments, beginning with the ones that are being satisfactorily managed and operated by the beneficiary/ community organisations." (§4.4.f) and that is also the policy of the government to "Investigate thoroughly, important flood control and management issues, such as the efficacy of coastal polders, for guiding future policy on structural interventions" (§4.15.c). This programme will assess and rationalise all existing FCD schemes by specifying and implementing the appropriate course of action for each scheme according to the following options: a) continuation of the present situation; b) handover to beneficiaries or local govt.; c) rehabilitation and improvement; d) complete withdrawal.		

**MIS Links**

Cost Calculation :	AW Programme costing.xls	Map :	AW 007 Map.jpg
Disb't Schedule :	AW Programme costing.xls	Description :	AW 007 PgP.doc

**Finance**

	Costs	Private	Funding (%)	Expected by	
			GoB	Beneficiaries	ProgrammeYear
Total Capital <sup>3</sup>	<b>21,471.70</b> MTk	<b>0%</b>	<b>85%</b>	<b>15%</b>	<b>20</b>
Ultimate Recurring	<b>1,152.80</b> MTk/yr	<b>n/a</b>	<b>50%</b>	<b>50%</b>	<b>21</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Sustainable operation and maintenance on 50% of all existing inland and coastal FCD/I schemes	• User group records • Long term O&M expenditure trends	NYD
• Inland and coastal FCD/I rehabilitated and upgraded on a participatory basis	• Participatory agreements • Project completion reports	NYD
• Increased returns per unit of water and labour in public irrigation areas	• Household surveys and field measurements	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	<b>AW 007</b>
Title	<b>Rationalisation of Existing FCD Infrastructure</b>

*Assumptions:*

Taka/US\$	51.000	TA duration	5.0	years	All prices in mid-2000 values
		Investment duration	20.0	years	
		During TA phase	8%	of investment	

Item	Unit	Quantity	Rate		Amount	O&M	O&M/yr
			US\$	Tk'000	TkM	%	TkM
<b>Technical Assistance</b>							
<i>Specialist support for BWDB to prepare management plan</i>							
Expatriate consultants (all-in rate)	p-m	24.0	20,000		24.5		
Senior National consultants (all-in rate)	p-m	96.0		150	14.4	0.0%	-
Mid-level National consultants (all-in rate)	p-m	190.0		90	17.1	0.0%	-
Sub-totals					56.0		-
Other general TA programme costs		25%			14.0		-
Specific other TA programme costs	Equipment etc				30.0	0.0%	-
<b>Total TA Costs</b>					<b>100.0</b>		<b>-</b>
<b>Other Programme Costs</b>							
				<i>Tk/ha</i>			
1. Preparation of environmental audits & EMPs	'000ha	4,619		150	692.9	0.0%	-
2. Participatory planning & management training	'000ha	4,619		150	692.9	0.0%	-
3. Rehabilitation of Inland FCD	'000ha	2,015		5,000	10,072.5	6.0%	604.4
4. Rehabilitation of Coastal FCD	'000ha	1,120		6,800	7,616.0	6.0%	457.0
5. Rehabilitation of Drainage only	'000ha	610		2,500	1,524.4	6.0%	91.5
6. Disengagement from Inland FCD	'000ha	672		1,000	671.5	0.0%	-
7. Disengagement from Coastal FCD	'000ha	-		1,800	-	0.0%	-
8. Disengagement from Drainage only	'000ha	203		500	101.6	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>21,371.7</b>		<b>1,152.8</b>
<b>Overall Programme Costs</b>					<b>21,471.7</b>		<b>1,152.8</b>

	NW	NC	NE	SW	SC	SE	EH	Total	
<b>Existing BWDB Schemes, '000ha</b> <i>excludes schemes below 1,000ha and 15 major irrigation schemes</i>									
Inland FCD	1,324	208	466	315	27	309	37	2,686	
Coastal FCD	-	-	-	465	442	103	110	1,120	
Drainage only	31	45	48	415	27	205	42	813	
<b>Assumed to be rehabilitated</b>									<i>Assumed:</i>
Inland FCD	993	156	350	236	20	232	28	2,015	75%
Coastal FCD	-	-	-	465	442	103	110	1,120	100%
Drainage only	23	34	36	311	20	154	32	610	75%
<b>Assumed to be disengaged from</b>									
Inland FCD	331	52	117	79	7	77	9	672	25%
Coastal FCD	-	-	-	-	-	-	-	-	0%
Drainage only	8	11	12	104	7	51	11	203	25%

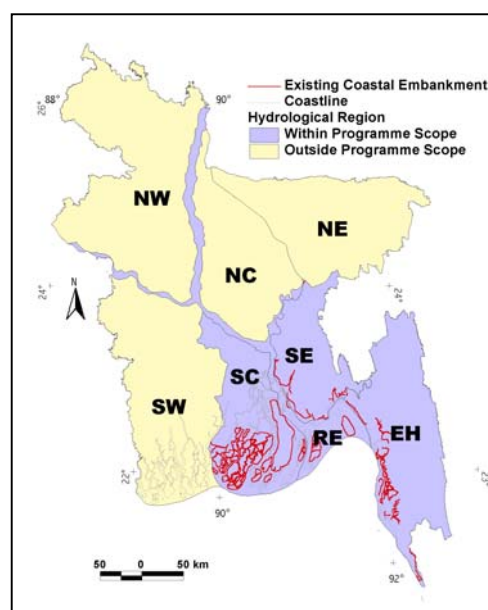
**Land Reclamation, Coastal Protection and Afforestation**Ref: **AW 008****Basic Data**

NWMP Sub-sector      **Agriculture and Water Management**

Region(s)              **Rivers and Estuary Region plus those parts of the SC and SE regions in which the Lower Meghna River and estuary are located**

**Relevance to NWPo**

NWPo Article 4.2(r) states that the Government will "Plan and implement schemes for reclamation of land from the sea and rivers". In line with this Article, studies will be undertaken for reclamation of land from sea and estuary. NWPo Article 4.2(p) stipulates that flood risk zones should be designated and appropriate measures should be taken to provide protection for life, property, infrastructure and agriculture in such zones. In view of its highly damaging nature, protection against marine flooding should be provided to the population and assets on newly accreted land which does not have embankments and associated protection measures.

**Purpose of Programme**

It has been estimated that there will be some 1,550km<sup>2</sup> of new accretion (ie 155,000ha of new land) and estuary by 2025. Some limited areas of existing coastal land do not have proper protection. One purpose of the Programme would be to empolder such lands by means of embankments, internal drainage and other works, wherever this is appropriate and justifiable.

It is possible to accelerate the land accretion process in the estuary and sea by technical interventions like cross dams. To meet the land demand for increasing population of the country, land reclamation from estuary and sea offers a good opportunity.

Experience has shown that afforestation of coastal land with mangrove species provides protection against cyclone storm surges and embankment erosion and helps to stabilise newly accreted land. As a result, during the past 30 years GoB has carried out a major mangrove afforestation programme, with over 56,000ha of protection plantation belts outside embankments having been successfully established. Financial and other constraints have prevented the full potential area being afforested yet. Thus the second purpose of the Programme would be to plant up existing coastal lands, where feasible, and to plant up newly accreted land as it reaches the stage where afforestation will be viable and effective.

These two measures will bring major benefits to the coastal population in such areas, by eliminating normal tidal flooding and reducing the height and impact of cyclone storm surges. Adequate drainage both inside and outside the polders is, however, essential, in order to avoid the severe drainage congestion experienced in much of the existing coastal defence system.



## **Programme Outline**

Study will be carried out for identification and acceleration of land reclamation from estuary and sea. A provision of Tk1,142M is made for this study and related works. Embanking of accreted coastal areas should be undertaken within the context of the integrated management of the local and regional hydrological regime, in order to minimise drainage problems. Integrated planning and management is a key theme of the recently started Integrated Coastal Zone Management (ICZM) Programme and the Meghna Estuary Study (MES), now nearing completion. It is also the main theme of the proposed developments for the GDA.

At present, little new empoldering of coastal land is taking place. The extent, location and phasing of future construction of new polders will be defined in the course of future ICZM and other studies and should not be taken up until a clear understanding has been reached of the long-term implications of further embankments. For costing purposes provision is made. For half of the 155,000ha of new land accreted over the next 25 years (ie 75,000ha) to be empoldered, but not commencing until the medium term. At an average cost of Tk28,000/ha, the total Plan investment would be Tk2,205M at mid-2000 prices; spread evenly over the 20 years. The works carried out may be similar to those of the existing polder system, but with more attention being given to beneficiary participation, O&M and internal and external drainage. Based on the GPA (Guidelines for Project Assessment) guidelines, annual O&M costs would be 6% of capital costs.

Coastal afforestation is currently being undertaken by the ongoing ADB Coastal Green Belt Project (1996 – 2002), the Coastal Embankment Rehabilitation Project (CERP) II (1995 – 2002) and other entities. Where there is a coastal embankment, a belt of mangroves, usually of the Keora species and 200m or more wide, is planted on the seaward side. Establishment success rates are highly variable and replanting is often required. MES (1998) estimated there to be some 70,000ha of existing non-forested land outside embankments. Examples of existing areas where plantations could be established include the environs of Hatia and Sandwip islands and, further west, Char Montaz and Char Biswas. The extent, location and phasing of future coastal afforestation will be determined and regularly updated in the course of future studies, in the light of observed accretion rates and other factors.

For costing purposes the assumption made is that some 50,000ha of plantations would be established over the next 25 years, at an average cost, allowing for replanting, over Tk48,000/ha plus 5% management cost. Total investment would thus be Tk2,520M at mid-2000 prices, spread evenly over the 24 years. GoB maintenance costs would be minimal. Under the type of agreement developed under the Coastal Green Belt Project, local communities undertake the limited amount of maintenance required, in exchange for thinnings and other plantation outputs.

Coastal afforestation with mangroves provides much needed protection and is environmentally beneficial. NWMP analyses indicate that new empoldering of coastal lands is economically justifiable, quite apart from its high social benefits. Benefits will, however, be considerably reduced if adequate drainage is not achieved. Drainage congestion has major adverse environmental impacts. Regional and sub-regional drainage in the coastal zone will be addressed in Programme AW 007.

## **Financing Arrangements**

GoB will finance afforestation activities, as at present. The Government will undertake the land reclamation study and the coastal polder construction, possibly with donor assistance. A limited degree of beneficiary contribution to the polders development is intended. In line with the NWPs, cost recovery from beneficiaries would not be attempted, but beneficiary participation in and contribution to O&M will be a key aim.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"><li>Coastal protection programme prepared and agreed</li></ul>	I1	<ul style="list-style-type: none"><li>The programme document</li></ul>	2003
<ul style="list-style-type: none"><li>Study for land reclamation from sea and estuary undertaken; and</li></ul>	K	<ul style="list-style-type: none"><li>Formal agreements</li><li>Study document</li></ul>	2025
<ul style="list-style-type: none"><li>1550 km<sup>2</sup> of new coastal land protected</li></ul>	D	<ul style="list-style-type: none"><li>On site verification</li></ul>	2025
<ul style="list-style-type: none"><li>Water related constraints on agricultural production minimised</li></ul>		<ul style="list-style-type: none"><li>Extent of flooding on arable land</li><li>Annual unsatisfied demand for irrigated land</li></ul>	

## Institutional Arrangements

BWDB will be the implementing agency for the land reclamation, new embankments and polders.

The Department of Forest (DoForest) will be responsible for plantation establishment and management, under the existing arrangement whereby it has been granted the right to do so by the Ministry of Lands, which controls the coastal *kehas* (Government) lands. Local participation along the lines being pioneered by the CERP II Project and Char Development and Settlement Project will be developed as rapidly as practicable.

## Existing Documentation

NWMP DSR Section 10.12, the National Water Resources Database (NWRD), BWDB Study reports on Sandwip Cross Dams, Meghna Estuary Study reports, reports of the Coastal Green Belt, Forest Resource Management and other relevant projects, the Coastal Zone Water Management Programme December 2000 report, CERP II reports etc. The ICZM Programme will be a key data source in the future.

## Linkages

There will be a direct linkage with Programme AW 007: Rationalisation of Existing FCD Infrastructure, and ID 003: FCD and FCD/I Management Rationalisation because, together, these will determine the institutional arrangements for future FCD planning, implementation and management. ID 010: BWDB Capacity Building, will strengthen the Board's ability to implement coastal FCD.

## Risks and Assumptions

The main assumption made concerns the future rate of land accretion and the proportion of new land where embanking may be appropriate and justified.

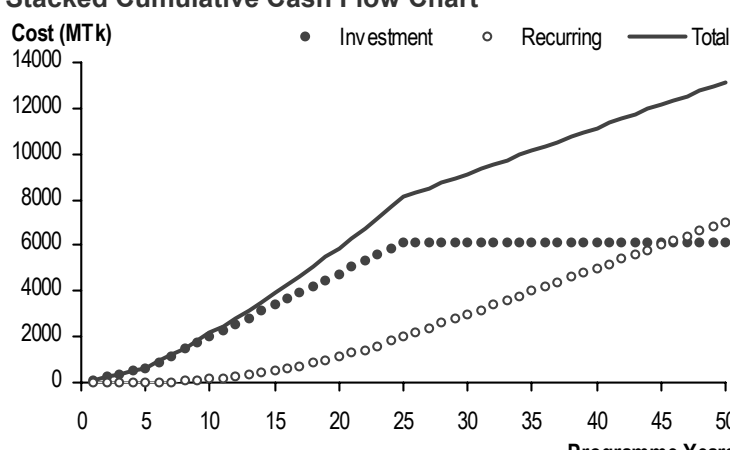
As regards risks, newly accreted land may be embanked before it has been allowed to accrete to its full level; this has happened frequently in the past. Drainage and flood protection effectiveness may be adversely affected as a result. Inadequate O&M may also reduce effectiveness, and drainage congestion within the protected area may cause waterlogging, as has happened in many existing polders. Sea level rise resulting from global climate change may be greater than currently predicted.

The effects of accelerated land reclamation on other islands and migration routes of fishes are to be assessed carefully.

**Land Reclamation, Coastal Protection and Afforestation**Ref : **AW 008**

Cluster :	<b>Agriculture and Water Management</b>	Region(s) :	<b>RE, SC, SE, EH</b>
Focus/Foci :	<b>Coastal Protection</b>	Location :	<b>Regions RE, SC, SE, EH</b>
Start Year <sup>1</sup> :	<b>2001</b>	Duration <sup>2</sup> :	<b>24 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>DoForest</b> (Supporting)
Short Description :	NWPo Article 4.2(r) states that the Government will "Plan and implement schemes for reclamation of land from the sea and rivers". In line with this Article, studies will be undertaken for reclamation of land from estuary region and sea. The NWPo also recognises the importance of coastal embankments/polders with the statement that it is the policy of the government to "Investigate thoroughly, important flood control and management issues, such as the efficacy of coastal polders, for guiding future policy on structural interventions." (§4.15.c). Another purpose of this programme is to embank and where necessary provide arborial protection to accreted land thereby protecting life/property/livelihoods from tides, or scend.		

<b>MIS Links</b>	Cost Calculation : AW Programme costing.xls	Map :	AW 008 Map.jpg
	Disb't Schedule : AW Programme costing.xls	Description :	AW 008 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme		Year	
	Total Capital <sup>3</sup>		5,866.90 MTk	0%	100%	0%	24		
	Ultimate Recurring		201.00 MTk/yr	n/a	15%	85%	26		
	Date of Data :		31 07 01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment ○ Recurring — Total				
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Coastal protection programme prepared and agreed	• The programme document • Formal agreements	NYD
• 1550km <sup>2</sup> of new coastal land protected	• On site verification	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design ,supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref

AW 008

Title

Land Reclamation, Coastal Protection and Aforestation

Assumptions: TA costs are included in the investment costs

Taka/US\$ 51.000

TA duration 0.0 years

All prices in mid-2000 values

Investment duration 24.0 years

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Study on land accretion and reclamation					1,141.9	0%	-
2. Project investments: Foreshore afforestation					2,400.0	3%	76.4
3. Project investments: Provision for future coastal embankments					2,100.0	6%	124.6
4. Phase 1 Programme management cost @ 5.0% of above	5.0%	of above			120.0	0%	-
5. Phase 1 Programme management cost @ 5.0% of above	5.0%	of above			105.0	0%	-
6.					-	0%	-
7.					-	0%	-
8.					-	0%	-
9.					-	0%	-
10.					-	0%	-
<b>Total Other Programme Costs</b>					5,866.9		201.0
<b>Overall Programme Costs</b>					5,866.9		201.0

### Notes

Provision made for foreshore afforestation on 50,000 ha at typical cost of Tk 48,000 per ha including replanting costs.

Provision made for Coastal embankments on 75,000 ha of newly accreted land, after studies completed on coastal strategies and if and when the land is ready for emporment , ie not starting before 6 year  
Assumed average cost ofTk 28,000 per ha for embankments

# **Environment and Aquatic Resources**

**National Pollution Control Plan**Ref: **EA 001****Basic Data**

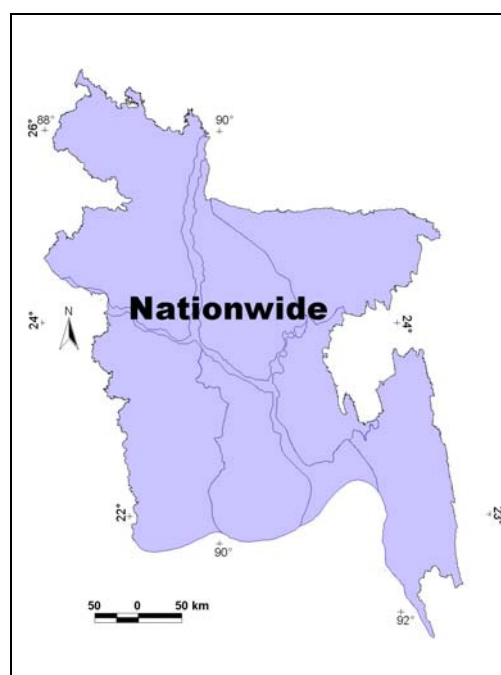
NWMP Sub-sector      **Environment and Aquatic Resources**

Region(s)              **Nationwide**

**Relevance to NWPo and other Policies:**

§4.2.k of the NWPo requires that rivers are developed for multipurpose use including irrigation, fisheries, navigation, forestry and aquatic wildlife, whilst §4.2.n requires that steps are taken to protect water quality.

§4.8.a requires zoning regulations for industry; §4.8.b calls for effluent disposal monitoring and §4.12.i demands that polluters pay clean up costs. These dictates are complemented by the **5th Five Year Plan**, which calls for the control and prevention of environmental pollution and degradation related to water and the **Fisheries and Environment Policies**, both of which call for the maintenance of an appropriate environment for conservation and development of fisheries.

**Purpose of Programme**

Water pollution (especially from industrial effluent, but also from urban wastes and sewage) is a major problem affecting thousands of people and critically endangering aquatic ecosystems. Without urgent action, the problems will increase greatly over the next 25 years with the predicted growth of industry and drift of population to the urban centers. As a precursor to the major clean-up activities, the programme is intended to produce in the very short term a widely-agreed and politically-endorsed Pollution Control Plan, with clear, time-bound deliverables based on progressive compliance with anti-pollution regulations, notably the national Water Quality Standards (WQS). The aim is to focus initially on the most polluted waters around the urban areas, not least because the impacts are greatest and affect the most people. Subsequently, the work will extend to the smaller urban areas, but parallel actions will be taken throughout to maintain the quality of existing 'clean' and cleaned-up waters. Clean water sources for actual and potential human use (especially potable water supplies) and for ecologically-sensitive areas will be the priorities. The ultimate goal is the restoration of multi-purpose water functions to the nation's waterbodies and maintenance of the good water quality conditions achieved.

**Programme Outline**

This programme is a precursor to the clean-up activities in EA 002 and 003. Its emphasis will be on surface water, as this is also the source of much - if not most - of the groundwater pollution. The pace of change will be realistic and synchronised with essential supporting measures, notably: the strengthening of political will; institutional reform; development of anti-pollution

incentives and a suitable regulatory environment and the growth of people's awareness, choice and empowerment on the user side. Given the size of the problem and the socio-political difficulties associated with clean-up, the aim is to use non-regulatory measures as the preferred means of obtaining compliance. In the short term, the programme will concentrate initially of 'fast-track' pilot clean-up projects for major pollution hot-spots and the establishment of suitable non-regulatory and regulatory instruments to assist the general clean-up process. It will set priority water quality indicators, notably pollutant parameters, for 'clean' and dirty water, to be refined with location-specific thresholds in EA 002 and 008 as well as any additional measures to safeguard the water resources of ecologically-critical areas from further water quality deterioration. Particularly important will be plans addressing people's awareness and empowerment (EA 010) and appurtenant institutional reform programmes (ID 007). In the medium term, the Action Plan and its dependent activities will be reviewed and modified as necessary as an integral part of the five-yearly reformulations of the NWMP. As the programme gains momentum, the Plan will give an indication of how the increased public and political actions can be effectively harnessed. In the long term, the emphasis of the Plan will shift from cleaning-up of polluted waters to monitoring and maintenance of clean waters. A key part of each Plan formulation will be the assignment of detailed responsibilities for implementation, supervision and review of the programme, with particular attention to overall management of the many participating agencies and, not least, the inter-ministerial issues raised.

## **Financing Arrangements**

Total costs for preparing the pollution control have been estimated to be Tk1100M; these will be disbursed at Tk500M, Tk300M and Tk300M in the short, medium and long terms respectively. The programme is suitable for GoB funding, possibly with donor assistance.

## **Objectives and Indicators**

<b>Objective</b>	<b>Suffix</b>	<b>Indicators/Mean of Verification</b>	<b>Due</b>
• National Pollution Control Plan published	I1	• The Plan document	2001
• National Pollution Control Plan agreed	K	• Ratification by stakeholder agencies	2008
• Wide stakeholder participation	I2	• Independent evaluation reports	2011
• Sufficient clean water for multi-purpose use	D	• Quality of water	2026
		• Quantity of water	

## **Institutional Arrangements**

MoI, DoE and WARPO - suitably strengthened - will share responsibility for preparation of the Plan, with wide stakeholder participation, including DoF, DAE, municipal authorities, water utilities (supply and sanitation) local government, NGOs and specialist pollution / environment / legal organisations and individuals.

## **Existing Documentation**

Bkh Consulting Engineers prepared (1994-96) the Industrial Control Management Project for which documentation is available at the Department of Environment and Ministry of Industries.

## **Linkages**

It is essential that Plan preparation and implementation are co-ordinated with existing clean-up and protection plans, as above, and with other NWMP programmes, notably clean-up (MC 006, 007, 008 and 009), ecologically-sensitive areas (EA 007, 008, 008) essential supporting

institutional strengthening (ID 006, 007), and public awareness/empowerment (EA 010). Equally, the three lead agencies need to form strong linkages with each other and the other stakeholders, as above.

### **Risks and Assumptions**

The inclusion of a wide range of proactive stakeholders is intended to reduce the risk that the planning might be seen as just another paper exercise, and hence that efforts to produce a meaningful Plan would be dissipated in discussion. The main assumption is that all the stakeholders would actively participate in genuine joint action; this might take time, but should ultimately be possible through political and popular pressure. The political process is less certain, as interested parties (eg industrialists running economically important - but highly polluting - enterprises) might well manipulate the process to maintain or increase their immediate benefit, rather than promote the clean-up objectives. The risk then is that the clean-up programme would be delayed and/or far less effectual.



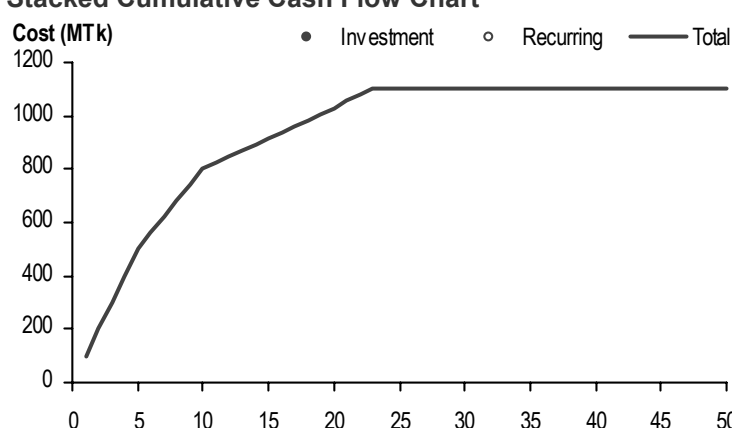
**National Pollution Control Plan**Ref : **EA 001**

Cluster :	<b>Environment and Aquatic Resources</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Pollution Clean Up and Control</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>23 year(s)</b>
		Agency(s) Responsible :	<b>Mol</b> (Lead) <b>DoE, WARPO</b> (Supporting)
Short Description :	NWPO states that "pollution of both surface and groundwater around various industrial centres of the country by untreated effluent discharge into water bodies is a critical water management issue." This programme is intended to result quickly in a widely-agreed and politically-endorsed Pollution Control Plan, with clear, time-bound deliverables based on progressive compliance with anti-pollution regulations, notably the national Water Quality Standards (WQS. )For the short term, the anticipated Plan is expected to concentrate on 'fast-track' pilot clean-up projects for major pollution hot-spots and the establishment of suitable non-regulatory and regulatory instruments to assist the general clean-up process. It will set priority water quality indicators, notably pollutant parameters, for 'clean' and dirty water. The Action Plan and its dependent activities will be reviewed and modified as necessary as an integral part of the five-yearly reformulations of the NWMP and implemented over the medium and long term accordingly.		

**MIS Links**

Cost Calculation :	EA Programme costing.xls	Map :	EA 001 Map.jpg
Disb't Schedule :	EA Programme costing.xls	Description :	EA 001 PgP.doc

**Finance**

Finance			Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	1,100.00	MTk		75%	25%	0%	23
Ultimate Recurring	0.00	MTk/yr		n/a	n/a	n/a	n/a
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart			
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring	— Total
Status :	Identified						
Financial Base Year:	mid-2000						
Planned Expenditure (to date) :	0 MTk						
Actual Expenditure <sup>4</sup> (to date) :	0 MTk						

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• National Pollution Control Plan published	• The Plan document	NYD
• Wide stakeholder participation	• Independent evaluation reports	NYD
• National Pollution Control Plan agreed	• Ratification by stakeholder agencies	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	EA 001
Title	National Pollution Control Plan

*Assumptions:*

Taka/US\$	51.000	TA duration	23.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	250.0	20,000		255.0	0.0%	-
Senior National consultants (all-in rate)	p-m	750.0		150	112.5	0.0%	-
Mid-level National consultants (all-in rate)	p-m	1,250.0		90	112.5	0.0%	-
Sub-totals					480.0		-
Other general TA programme costs		25%			120.0		-
Specific other TA programme costs	Research studies, surveys, consultation etc				500.0	0.0%	-
<b>Total TA Costs</b>					<b>1,100.0</b>		-
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-
<b>Overall Programme Costs</b>							
					<b>1,100.0</b>		-

**National Clean-up of Existing Industrial Pollution**

Ref: EA 002

**Basic Data**

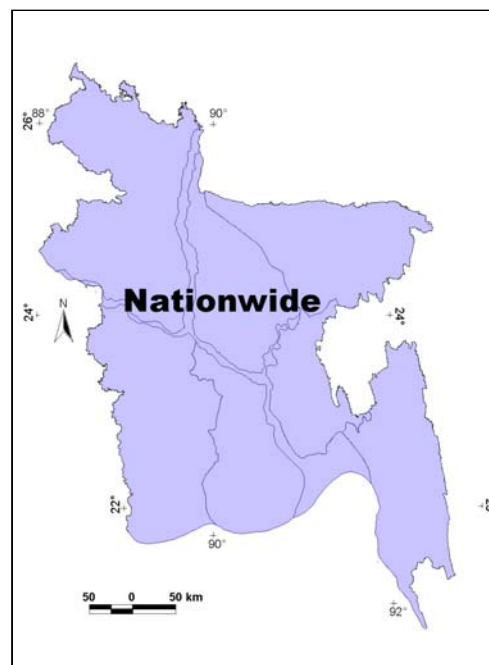
NWMP Sub-sector      **Environment and Aquatic Resources**

Region(s)              **Nationwide**

**Relevance to NWPs and other Policies:**

§4.2.k of the NWPo requires that rivers are developed for multipurpose use including irrigation, fisheries, navigation, forestry and aquatic wildlife, while §4.2.n requires that steps are taken to protect water quality.

These dictates are complemented by the **5th Five Year Plan** which calls for the control and prevention of environmental pollution and degradation related to water; the **Fisheries Policy** and **Environment Policy** both of which inter-alia call for the maintenance of an appropriate environment for conservation and development of fisheries.

**Purpose of Programme**

This programme follows the Pollution Control Action Plan (EA 001) and will implement, developing in more detail where necessary, the planned measures. The programme's background is the same as that for EA 001, along with its main aim of progressive, site-specific water pollution reduction to restore multi-purpose water functions to the nation's waterbodies.

**Programme Outline**

In the short-term, pilot schemes will be identified and initiated for clean-up of the major pollution 'hot-spots' around Dhaka (with the River Buriganga as the first target) and Chittagong (R Karnaphuli). Realistic, time-bound clean-up indicators and thresholds for specific locations and pollutants will be specified. As a precursor, appropriate non-regulatory incentives will be established; these, and the overall programme measures, will be widely publicised. In parallel, site-specific actions for preservation of 'clean' water will be specified, especially for ecologically-sensitive areas - again with wide publicity and improved water quality monitoring will start. Broad participation will be a major feature, involving local people and the main polluters from the target areas as well as relevant national and local government agencies, NGOs and environmental pollution specialists. Additional regulatory measures will be drawn up. These will include specifications for a new national water quality standard (WQS) for ambient (i.e. receiving) waters, in order to deal with cumulative impacts of polluting discharges; establishment of criteria, locations and schedules for zoning of new industries, and preparation of new EA Guidelines for the water sector. However, none of these regulatory activities will affect the short term progress of the clean-up programme. By the middle of the medium term, the more promising anti-pollution measures introduced during the short term will be continued and

extended to remaining grossly polluted waters around the major cities and those of smaller urban localities. Priorities are Khulna, Rajshahi and Mongla (because of its proximity to the Sundarbans). Increased people's participation will be actively sought across the board. Institutional reform will be addressed. A start will be made on regulation-based enforcement of WQs, with the establishment and training of a special anti-pollution enforcement unit. Prominently publicised pilot test-case prosecutions of gross and persistent polluters will be pursued in the environmental courts. Additional measures needed (e.g. for agro-chemical pollution control) will be reviewed and implemented as necessary. Recommendations on policy, strategy and programmes will be made for the five-yearly NWMPs. In the long term, the emphasis will shift from clean-up to monitoring and maintenance of clean waters.

## Financing Arrangements

Tk1800M, Tk1800M and Tk900M have been budgeted respectively for the short, medium and long terms of the programme which is suitable for Government financing with donor support. Fines resulting from successful prosecution of polluters, and/or a "polluters' tax" could be used for programme funding purposes.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• GoB legally and politically committed to a clean aquatic environment	I1	• Number of non-regulatory measures satisfactorily operating • Number of prosecutions under the revised regulations	2004
• Public demand for aquatic pollution control	I2	• Number of public inspired actions • Media reports	2011
• Demand driven voluntary maintenance of favourable water quality	I3	• Reducing prosecutions with no deterioration in water quality	2016
• Multi-purpose water use not constrained by quality considerations	K	• Number of key concentrations below water quality standard thresholds • Status of indicator species <sup>1</sup> • Human health statistics <sup>1</sup>	2026
• Sufficient clean water for multi-purpose use	D	• Quality of water • Quantity of water	2026

*Note 1 provided that impact of water sector measures can be distinguished from other impacts*

## Institutional Arrangements

Subject to detailed agreement and appropriate strengthening, MoI, DoE and WARPO will assume joint overall responsibility for plan preparation, with NGOs in key roles in the public awareness/empowerment campaigns and MoI actually implementing the programme. Organisations like BELA will assume proactive advocacy roles. DoE will gazette new regulations and the EA Guidelines after WARPO preparation with DoE and MoI assistance, and set up the anti-pollution enforcement unit. Municipal authorities; water sector utilities and other organisations will be involved in urban sanitation, effluent and waste clean-up. DAE will continue IPM initiatives.

## **Existing Documentation**

Bkh Consulting Engineers prepared (1994-96) the Industrial Control Management Project for which documentation is available at the Department of Environment and Ministry of Industries. Equally, the FPCO (1993) produced the North East Regional Water Management and the North East Regional Water Management Project (FAP 6).

## **Linkages**

Effective operational links need to be established between the three lead agencies, and between them and other stakeholders as mentioned above. Equally, technical linkages must be established and coordinated with other NWMP programmes such as EE 005, 006, 007, 008, 010, 012 and ID 001, 002, 005, 007 as well as existing initiatives such as BEMP of the DoE.

## **Risks and Assumptions**

The wide stakeholder involvement will maintain public vigilance and active participation, thereby reducing the risk that Government commitment will be stifled as a result of polluter resistance and/or inadequate public sensitisation. It also provides a basis to prevent the programme dealing only with minor polluters and failing to tackle the major pollution targets. It is also assumed that increasingly visible and empowered lobbying will catalyse government reform and establish environmental issues (including water pollution) as political priorities.

**National Clean-up of Existing Industrial Pollution**

Ref :

**EA 002**

Cluster :	<b>Environment and Aquatic Resources</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Pollution Clean Up and Control</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2004</b>	Duration <sup>2</sup> :	<b>25 year(s)</b>
		Agency(s) Responsible :	<b>Mol</b> (Lead) <b>DoE, WARPO</b> (Supporting)
Short Description :	NWPo states that "pollution of both surface and groundwater around various industrial centres of the country by untreated effluent discharge into water bodies is a critical water management issue." Furthermore, "Industrial polluters will be required under law to pay for the cleanup of water-body polluted by them." (§4.8.d). Based on the National Pollution Control Plan (Programme EA 001), this programme will address directly the clean-up of existing pollution black spots and the enforcement of the polluter-pays principle.		

<b>MIS Links</b>	Cost Calculation :	EA Programme costing.xls	Map :	EA 002 Map.jpg
	Disb't Schedule :	EA Programme costing.xls	Description :	EA 002 PgP.doc

Finance	Funding (%)					Expected by ProgrammeYear	
	Costs	Private	GoB	Beneficiaries			
	Total Capital <sup>3</sup>	4,500.00 MTk	75%	25%	0%		25
	Ultimate Recurring	0.00 MTk/yr	n/a	n/a	n/a		n/a
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart			
	(dd)	(mm)	(yy)	Cost (MTk)	● Investment	○ Recurring	— Total
Status :	Identified			5000			
Financial Base Year:	mid-2000			4000			
Planned Expenditure (to date) :	0 MTk			3000			
Actual Expenditure <sup>4</sup> (to date) :	0 MTk			2000			
				1000			
				0			
				0 5 10 15 20 25 30 35 40 45 50			Programme Years

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• GoB legally and politically committed to a clean aquatic environment	• Number of non-regulatory measures satisfactorily operating	NYD
	• Number of prosecutions under the revised regulations	
• Public demand for aquatic pollution control	• Number of public inspired actions	NYD
	• Media reports	
• Demand driven voluntary maintenance of favourable water quality	• Reducing prosecutions with no deterioration in water quality	NYD
• Multi-purpose water use not constrained by quality considerations	• Number of key concentrations below water quality standard thresholds	NYD
	• Status of indicator species <sup>1</sup>	
	• Human health statistics <sup>1</sup>	

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

## National Water Management Plan Programme Costing Sheet

Programme Ref  
Title

EA 002

National Clean-up of Existing Industrial Pollution

### Assumptions:

Taka/US\$ 51.000

TA duration 0.0 years

Investment duration 25.0 years

All prices in mid-2000 values

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-		
Mid-level National consultants (all-in rate)	p-m	-		90	-		
Sub-totals					-		
Other general TA programme costs		25%			-		
Specific other TA programme costs					-		
<b>Total TA Costs</b>					-		
<b>Other Programme Costs</b>							
1. Provision for measures in short-term					1,800.0	0.0%	-
2. Provision for measures in medium term					1,800.0	0.0%	-
3. Provision for measures in the long term					900.0	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					4,500.0		-
<b>Overall Programme Costs</b>							
					4,500.0		-

Note

Utilisation of the above funds will be determined on the basis of the Pollution Control Plan (EA 001)

**National Water Quality Monitoring**

Ref: EA 003

**Basic Data**

NWMP Sub-sector      **Environment and Aquatic Resources**

Region(s)              **Nationwide**

**Relevance to NWPo and other Policies:**

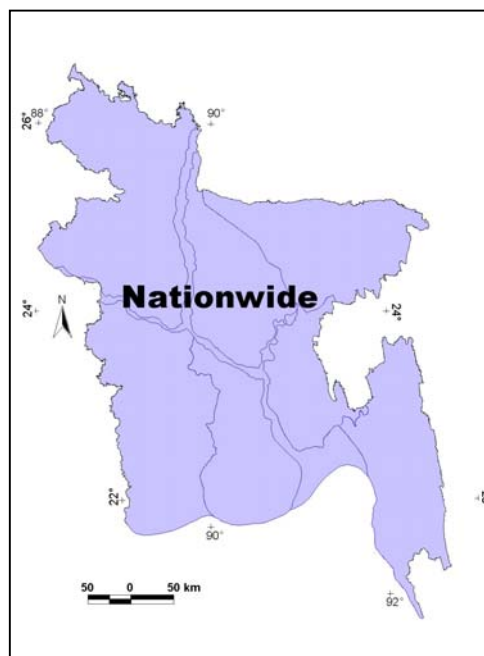
§4.2.n of the NWPo requires that steps are taken to protect water quality, §4.6.a demands safe drinking water, §4.7.e calls for the regulation and reduction of agro-chemical pollution and §4.8.b requires the monitoring of effluent pollution. These dictates are complemented by the **5th Five Year Plan** which calls for the control and prevention of environmental pollution and degradation related to water.

**Purpose of Programme**

Programmes EA 001 and 002 are concerned with the preparation and execution of a clean-up initiative for the country's aquatic environment. A key impact indicator of the success or otherwise of these initiatives will be changes in water quality. This programme will provide the means by which water quality is monitored during and after the clean-up plan. As such it will necessarily address also existing deficiencies including: (i) inadequate identification and characterisation of 'hot spots' caused by industrial pollution; (ii) inadequate (or non-existent) monitoring of waters that are (potential) major sources of potable water supply and/or sources for ecologically-sensitive areas, including habitats for fish and other aquatic fauna and flora; (iii) inadequate coverage of seasonal variations; lack of standard methods and procedures (and hence variable quality) of sampling, analysis and interpretation; (iv) lack of a suitable laboratory (or suitable laboratory facilities and trained staff) to act in reference / accreditation roles; (v) poorly-defined institutional responsibilities and co-ordination; (vi) inadequate long-term funding committed to national water quality monitoring.

**Programme Outline**

The programme will span the short, medium and long terms of the NWMP. The first step in the short term will to formulate and agree an integrated sampling, analysis and interpretation programme which focuses on: industrial pollution control; protection of the natural aquatic environment (especially ecologically-sensitive areas) and promotion of a coordinated approach to water quality monitoring and improvement. Institutional and standard methodological frameworks, including links to the NWRD, will be established. Once this preparatory stage is complete, the monitoring activities can begin. Implementation will involve identifying sites that represent particularly severe pollution risks or sensitivity (such as pollution hot-spots) waters which are actual or potential sources of major potable water supplies, and ecologically-sensitive areas. As priorities for early action, the sites will therefore include not only polluted waters scheduled for clean-up, but also clean waters requiring preservation. At sites of gross pollution,





sampling efforts will at first concentrate less on the receiving waters and more on obvious major polluting effluents, for use as evidence in persuading polluters to clean up - and, if subsequently necessary, as the basis for prosecutions. These strategically focused activities will be complemented by submission to the NWRD of regular, systematic and quality-assured water quality data for the key sites throughout the country. The resulting data will be used to facilitate early identification of sites at risk of actual or future pollution and of key sites where water quality problems are worsening and early action is needed to prevent further degradation. Finally, capacity building initiatives within the programme will develop mechanisms for improved use of monitoring data in implementation of clean-up and protection activities. The programme will be reviewed and revised as necessary by the participating bodies, in line with the regular updates of the Pollution Control Plan (EA 001).

## Financing Arrangements

The programme is expected to cost Tk6225M over 25 years with an initial Tk1,656M spent on establishing the programme, testing facilities and training staff and will be suitable for GoB funding, perhaps with donor support.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Water quality monitoring capacity strengthened technically and geographically	I1	• Number of accredited institutions participating	2003
• Quality assured water quality data available to all stakeholder	I2	• Number of stakeholders requesting data	2005
• Reduction of gross/persistent pollution	K	• Number of pollution sources cleaned up	2025
• Sufficient clean water for multi-purpose use	D	• Spot checks	
		• Quality of water	2025
		• Quantity of water	

## Institutional Arrangements

An executive body will be needed to plan, supervise and monitor the programme with the active participation of all stakeholder institutions. The lead organisation will be DoE, who will coordinate the work with BWDB and the latter's water level and discharge monitoring network. The AEC or a new central laboratory will act in accreditation and quality control roles; even so participation of private-sector laboratories and major government laboratories (BWDB, DoE, DoF, WASAs, BIWTA, universities etc) will be essential. WARPO will be responsible for storing data in the NWRD and will participate in the preparatory studies.

## Existing Documentation

There are several documents of potential relevance. The document "Water Quality Data of Rivers (1981-1990)" was issued by the DoE in 1993. In 1995 the Ministry of Agriculture produced a Baseline Survey of Water Quality. An environmental mapping and GIS was prepared by Mott MacDonald for the Department of Shipping in (1999). The British Geological Survey prepared a regional arsenic survey for the Department of Public Health Engineering (also in 1999).

## **Linkages**

Links with all major water sampling and institutional capacity building programmes will be necessary as well as with project planners. DoE, together with BWDB and WARPO, would provide the key central links at the operational level.

## **Risks and Assumptions**

The main assumption is that the various organisations will be willing and able to co-operate and co-ordinate their activities, although committed long-term funding is intended to provide the underpinning incentive. Long-term funding must therefore be confirmed for all the routine operations and the monitoring/supervision system. There will inevitably be difficulties over inter-organisational (even inter-ministry) accountability, especially over the acceptability and effectiveness of the umbrella body, but the direct involvement of all the stakeholder agencies in the process is designed to minimise the problems. A major risk is that any new system will fail to maintain standards and that the scope, quality and effectiveness of the programme will consequently deteriorate over time - with the usual problems of equipment maintenance and maintenance of high operating standards. However, strict quality control activities with regular independent audit should be sufficient to prevent major deterioration.

**National Water Quality Monitoring**Ref : **EA 003**

Cluster :	Environment and Aquatic Resources		Region(s) :	All	
Focus/Foci :	Pollution Clean Up and Control		Location :	Nationwide	
Start Year <sup>1</sup> :	2001	Duration <sup>2</sup> :	24 year(s)	Agency(s) Responsible :	DoE (Lead) None (Supporting)
Short Description :	This programme is intended to spread the water quality monitoring effort away from known pollution black-spots towards prevention of pollution of clean and relatively clean water. This approach is justified because time and resources are better spent providing an early warning of pollution problems at vulnerable sites where remedial action is possible before ecological damage becomes irreversible. Prime targets for this water quality monitoring will be water sources with potential for supplying large scale potable water supply and ecologically sensitive areas.				

<b>MIS Links</b>	Cost Calculation : EA Programme costing.xls	Map : EA 003 Map.jpg
	Disb't Schedule : EA Programme costing.xls	Description : EA 003 PgP.doc

<b>Finance</b>	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>6,225.40</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>24</b>
Ultimate Recurring	<b>27.50</b> MTk/yr	<b>n/a</b>	<b>100%</b>	<b>0%</b>	<b>25</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Water quality monitoring capacity strengthened technically and geographically	• Number of accredited institutions participating	NYD
• Quality assured water quality data available to all stakeholder	• Number of stakeholders requesting data	NYD
• Reduction of gross/persistent pollution	• Number of pollution sources cleaned up	NYD
	• Spot checks	

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	EA 003
Title	National Water Quality Monitoring

### Assumptions:

Taka/US\$	51.000	TA duration	5.0	years	All prices in mid-2000 values
		Investment duration	23.0	years	

Item	Unit	Quantity	Rate		Amount	O&M	O&M/yr
			US\$	Tk'000	TkM	%	TkM

<b>Technical Assistance</b>		<i>Preparatory TA leading to site prioritisation and a capacity building plan</i>					
Expatriate consultants (all-in rate)	p-m	200.0	20,000		204.0		
Senior National consultants (all-in rate)	p-m	600.0		150	90.0	0.0%	-
Mid-level National consultants (all-in rate)	p-m	1,800.0		90	162.0	0.0%	-
Sub-totals					456.0		-
Other general TA programme costs		25%			114.0		-
Specific other TA programme costs	Consultations, sampling and testing etc				500.0	0.0%	-
<b>Total TA Costs</b>					<b>1,070.0</b>		<b>-</b>

<b>Other Programme Costs</b>							
1. Capacity building: training programmes					35.8	0.0%	-
2. Capacity building: equipment and upgraded testing facilities					550.0	5.0%	27.5
3. Testing (20 years)					3,369.6	0.0%	-
4. Miscellaneous research studies					1,200.0	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>5,155.4</b>		<b>27.5</b>

<b>Overall Programme Costs</b>					<b>6,225.4</b>		<b>27.5</b>
--------------------------------	--	--	--	--	----------------	--	-------------

<b>Capacity Building</b>		Unit	Quantity	Unit rate	Total (TkM)	O&M
1. Training programmes	Observers		270	20,000	5.4	0.0%
	Technicians		270	75,000	20.3	0.0%
	Senior staff		67.5	150,000	10.1	0.0%
2. Equipment and upgraded testing facilities						
	Regional testing facilities	No.	8	25,000,000	200.0	5.0%
	Central testing facility	No.	1	50,000,000	50.0	5.0%
	Equipment (field and lab)	PS			300.0	5.0%
					<b>585.8</b>	
<b>Testing</b>						
		Per year	Unit rate	TkM/year	TkM (20 years)	
	Samples	28,080	6,000	168.5	<b>3,369.6</b>	
		<i>104 tests per observer per year</i>				

**National Fisheries Master Plan**

Ref: EA 004

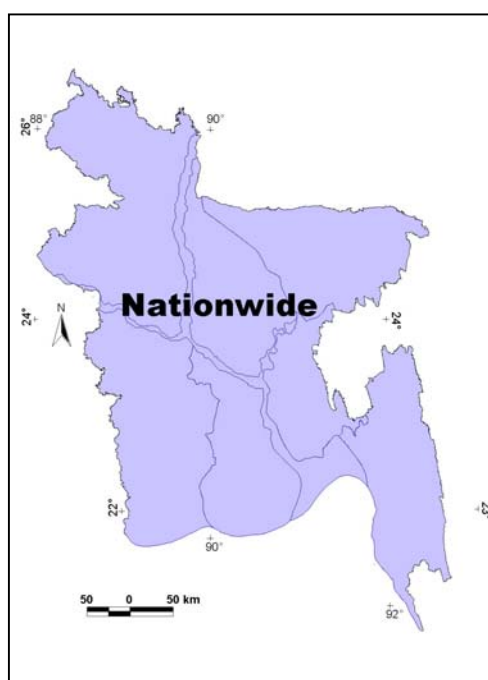
**Basic Data**

NWMP Sub-sector      **Environment and Aquatic Resources**

Region(s)              **Nationwide**

**Relevance to NWPo and other Policies:**

§4.9 of the NWPo makes it clear that fisheries and wildlife are integral aspects of economic activity in Bangladesh and strongly linked to advancement of target groups, poverty alleviation, nutrition and employment generation. Availability of sufficient clean water for fisheries is thus important for both subsistence and commercial activities. Equally NWPo §4.9 requires that water bodies like baors, haors, beels, roadside borrow pits, etc. will as far as possible, be reserved for fish production and development while §4.9.f requires that brackish aquaculture will be confined to specific zones designated by the Government. These dictates are complemented by the **Fisheries and Environment Policies** in respect of fish habitat conservation and development.

**Purpose of Programme**

The country's inland fisheries, which provide employment for some 2M full-time and 12M part-time fishermen, account for 3% of total GDP and 60% of the animal protein intake. Yet wild fish stocks, the key to capture fisheries resources, are at great and increasing risk from both social and commercial pressures and from habitat degradation. Even at present catch rates, there is a real danger that the stocks will be exhausted within as little as 10 to 20 years. One alternative, the expansion of culture fisheries is unlikely to make up the shortfall in production and will not be available as a free resource to the rural poor and under-privileged. Not least amongst the problems are fragmentation and reduced water availability for natural water bodies, disrupted hydraulic connections between them and physical structures that constrain fish movements. Following the 1999 National Fisheries Policy, a national fisheries strategy and sector development programme are urgently required to address these threats. The purpose of this programme is to develop a fisheries development plan which will include provisions for protection of fish stocks, and of other important aquatic species, and for prevention or mitigation of the above negative impacts. Apart from issues outside the water sector (eg net mesh sizes, fish sanctuary designation etc) the plan will also contain measures to guarantee an adequate supply of clean water for the long term sustainability of both capture and culture fisheries, whilst also addressing key issues of water availability, such as hydraulic connectivity between floodplain water bodies and the main river system (see EA 005).

## Programme Outline

Given the need for urgent conservation measures, the Programme is intended for fast-track completion within the NWMP short term. It will be characterised by contributions from people's participation and expert opinion and will address the following issues:

- establishment of ecological parameters and thresholds necessary for a sustainable and diverse fish population
- identification of key aquatic habitats, water-related needs and site specific thresholds and indicators
- identification and quantification of threats to fish habitats and measures by which to combat them;
- identification, delineation and gazetting of recommendations for fish conservation sites (including mother-fish sites; fish sanctuaries, breeding grounds, larvae/hatchling development areas etc);
- specification of water management requirements for fisheries resources; and,
- strengthening of research activities to facilitate the above and, in particular, to fill gaps in knowledge of fundamental fish needs.

In addition, the programme will address institutional capacity building needs of the DoF.

## Financing Arrangements

The programme, which is suitable for GoB financing perhaps, is expected to cost Tk300M, all of which will be needed in the short term.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Fisheries Master Plan published	I1	• The Plan document	2004
• Wild fish stocks conserved or increasing	K	• Status of indicator species <sup>1</sup>	2008
• Sustainable and productive inland fisheries	I2	• Catch statistics <sup>1</sup>	2011
• Quality, size and connectivity of water bodies adequate for the restoration and preservation of aquatic biomes	D	• Status of indicator species <sup>1</sup>	2026

*Note 1 provided that impact of water sector measures can be distinguished from other impacts*

## Institutional Arrangements

The DoF will prepare the Plan in close association with WARPO and BWDB. Implementation will be largely the responsibility of the DoF, with the assistance of the DoE in gazetting of conservation sites. Equally, the programme will benefit from full people's participation and from the cooperation of BIWTA, LGED and HDB etc.

## Existing Documentation

The only existing documentation comprises the Fourth Fisheries Project Pro-forma, prepared by the Department of Fisheries in 1999.

## **Linkages**

There will be crucial operation and technical linkages with NWMP programmes EA 005, the National Fish Pass Programme, EA 006 to 008 (water management for ECAs) and well as the 4<sup>th</sup> Fisheries and other DoF programmes.

## **Risks and Assumptions**

The main assumption is that the Master Plan will not be too late to protect wild fish stocks; however, it is earmarked for fast-tracking within the overall NWMP programme. There are risks that the recommendations will be based on an inadequate needs assessment (simply from lack of knowledge of basic fish ecology) and that conservation measures will not be obeyed. The latter include risks associated with overfishing by both commercial and subsistence fishermen and land-use conflicts between fishermen and farmers. Wide-ranging stakeholder participation will help reduce these risks, provided that small fishermen, the rural poor and disadvantaged are adequately represented. Participatory and needs assessment activities will, however, be facilitated by the broader processes of water sector reform and the institutional reform and capacity building for the DoF under this programme.

**National Fisheries Master Plan**Ref : **EA 004**

Cluster :	<b>Environment and Aquatic Resources</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Water Management for Fisheries</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>3 year(s)</b>
		Agency(s) Responsible :	<b>DoFish</b> (Lead) <b>None</b> (Supporting)
Short Description :	The country's inland fisheries, which provide employment for some 2M full-time and 12M part-time fishermen, account for 3% of total GDP and 60% of the animal protein intake. Following the 1999 National Fisheries Policy, a national fisheries strategy and sector development programme are urgently required to address the threats to the fisheries industry including such problems as fragmentation and reduced water availability for natural water bodies, disrupted hydraulic connections between them and physical structures that constrain fish movements. The purpose of this programme is to develop a fisheries development plan which will include provisions for protection of fish stocks, and of other important aquatic species, and for prevention or mitigation of the above negative impacts.		

<b>MIS Links</b>	Cost Calculation : EA Programme costing.xls	Map : EA 004 Map.jpg
	Disb't Schedule : EA Programme costing.xls	Description : EA 004 PgP.doc

<b>Finance</b>	Funding (%)					Expected by
	Costs	Private	GoB	Beneficiaries		ProgrammeYear
Total Capital <sup>3</sup>	<b>300.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>		<b>3</b>
Ultimate Recurring	<b>0.00</b> MTk/yr	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>		<b>n/a</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>				
Status :	<b>Identified</b>					
Financial Base Year:	<b>mid-2000</b>					
Planned Expenditure (to date) :	<b>0</b> MTk					
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk					

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Fisheries Master Plan published	• The Plan document	NYD
• Sustainable and productive inland fisheries	• Catch statistics (provided that impact of water sector measures can be distinguished from other impacts)	NYD
• Wild fish stocks conserved or increasing	• Status of indicator species (provided that impact of water sector measures can be distinguished from other impacts)	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done



**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	EA 004
Title	National Fisheries Master Plan

*Assumptions:*

Taka/US\$	51.000	TA duration	3.0	years	All prices in mid-2000 values
		Investment duration	0.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	100.0	20,000		102.0		
Senior National consultants (all-in rate)	p-m	170.0		150	25.5	0.0%	-
Mid-level National consultants (all-in rate)	p-m	361.0		90	32.5	0.0%	-
Sub-totals					160.0		-
Other general TA programme costs		25%			40.0		-
Specific other TA programme costs	Surveys and sub-contracts				100.0	0.0%	-
<b>Total TA Costs</b>					<b>300.0</b>		-
<b>Other Programme Costs</b>							
1.					-	0.0%	-
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					-		-
<b>Overall Programme Costs</b>							
					<b>300.0</b>		-

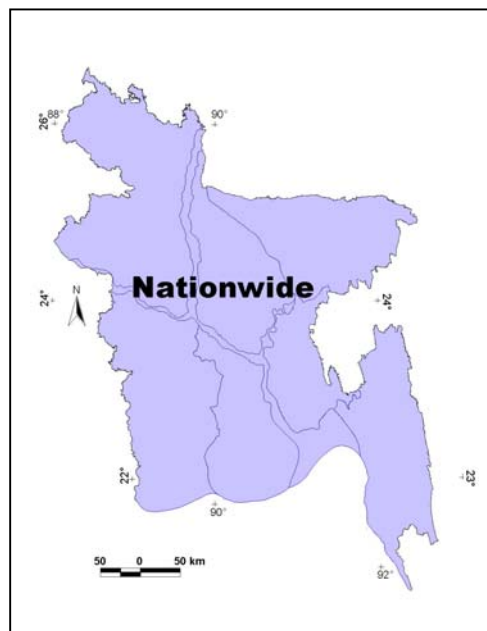
**National Fish Pass Programme**Ref: **EA 005****Basic Data**

NWMP Sub-sector      **Environment and Aquatic Resources**

Region(s)              **Nationwide**

**Relevance to NWPo and other Policies**

§4.9.a&b of the NWPo require that due emphasis is placed on the sustainability of fisheries when planning water resources activities in areas where their social impact is high; that adequate provision is made for fisheries; that disruption to the natural aquatic environment is minimised. Section 4.9.d requires perennial links of floodplain waterbodies with rivers while 4.9.e demands water development plans that will not interrupt fish movement and that hence will make adequate provisions in control structures for allowing fish migration and breeding.

**Purpose of Programme**

In support of the National Fisheries Master Plan (EA 004) this major nationwide programme aims to re-establish and, where possible, improve connectivity between the main rivers and floodplain waterbodies through implementation of appropriate fish pass measures in FCD/I projects. Fish pass in this programme refers to both structural measures (eg fish ladders) and non-structural measures (eg regulator gate operating rules) to make physical interventions more fish-friendly. It also aims to identify fish pass requirements for use in future planning in the water and other sectors, notably transport (roads and railways).

**Programme Outline**

This 20-year programme will build on the experience of existing initiatives (see Linkages). Following the recommendations of the Fisheries Master Plan (FMP) it will screen all existing FCD/I projects with areas greater than 5000ha to identify and prioritise locations for fish passes on existing and future projects, including road and railway embankments. The specification of the programme components will also take into account a review of other schemes, especially the 4<sup>th</sup> Fisheries project (FFP) - which effectively form short-term pilot projects for this programme. The distribution of the programme costs is as follows, although it is stressed that refinement will be necessary after completion of the FMP and the performance review:

Time scale	Indicative Cost by Region (MTk)							Total (MTk)
	NW	NC	NE	SW	SC	SE	EH	
Short Term	590	74	82	346	166	171	70	1,500
Medium Term	393	50	55	231	111	114	47	1,000
Long Term	197	25	27	115	55	57	23	500
Total	1,179	149	165	693	333	342	140	3,000

Note: Indicative costs at June 2001, subject to detailed specification of fish pass needs following the conclusions of the Fisheries Master Plan and the existing scheme review.

Fish pass requirements for future planning will be drawn up and circulated to relevant organisations in the water sector and others (notably transport) as a precursor to developing formal design and operation regulations. Finally, the programme will be regularly updated according to the results of performance monitoring and ongoing technical reviews of fish pass designs and operations.

### Financing Arrangements

The programme cost has been estimated to total some Tk3000M of which Tk1500M, Tk1000M and Tk500M are scheduled for disbursement in the short, medium and long terms respectively. It is suitable for GoB funding with donor assistance.

### Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
<ul style="list-style-type: none"> <li>Appropriate fish-friendly measures routinely adopted in the design and operation of all relevant structures</li> </ul>	I1	<ul style="list-style-type: none"> <li>Number of conforming designs</li> <li>Design regulation</li> </ul>	2004
<ul style="list-style-type: none"> <li>90% of all feasible fish passes in place</li> </ul>	I2	<ul style="list-style-type: none"> <li>Number of operational fish passes</li> </ul>	2019
<ul style="list-style-type: none"> <li>Sustainable increase in floodplain fish catches, in terms of both numbers and diversity</li> </ul>	K	<ul style="list-style-type: none"> <li>Fish catch statistics<sup>1</sup></li> </ul>	2019
<ul style="list-style-type: none"> <li>Quality, size and connectivity of water bodies adequate for the restoration and preservation of aquatic biomes</li> </ul>	D	<ul style="list-style-type: none"> <li>Status of indicator species<sup>1</sup></li> </ul>	2024

Note 1 provided that impact of water sector measures can be distinguished from other impacts

### Institutional Arrangements

DoF will prepare the Fisheries Master Plan. BWDB will implement the programme collaborating with the DoF on site-specific requirements and operational considerations. DoF will undertake impact monitoring, and joint performance reviews with DoF and BWDB. WARPO, BWDB, DoF and various NGOs will have key roles in raising awareness of fish/fisheries issues at the institutional and grass-root levels, where empowerment measures will have to be introduced.

### Existing Documentation

Fish pass designs are available for several existing / planned schemes, including the FFP and WSIP, but as the requirements will be site-specific, mere repetition of previous designs will not be enough.

## **Linkages**

Before Programme approval, the FMP must be completed and contain clear and enforceable measures to conserve wild fish stocks and protect floodplain fisheries (eg from agricultural encroachment). Without such measures, investment in this Programme cannot be justified. There are strong links with the FFP, which includes a U\$4.6M budget provision for fish passes and structural remodelling, and the proposed Water Sector Improvement Project, which has already identified fish pass structures costing Tk27M. The programme also links to all DoF programmes, as well as the following NWMP programmes: AW 007 (Rationalisation of Existing FCD infrastructures); EA 009 (Environmental Awareness / Empowerment); EE 010 (Awareness of NWPo), and EE 005 (Guidelines and Manuals for Regulation and Economic Instruments), which should contain fish pass provisions. Links will also be needed with NGOs active in the fisheries and interacting sectors.

## **Risks and Assumptions**

There are serious doubts over the survival of adequate wild fish stocks (see EA 004). This comparatively costly programme should therefore not proceed unless the FMP has demonstrated unequivocally that stocks can be conserved. It is uncertain whether improved fisheries management and conservation by the DoF and others can be implemented successfully, not least because of conflicting land-use interests on the floodplain. The planned stakeholder participation will address these conflicts, but may not successfully resolve them everywhere. This remains a residual risk, which must be assessed before fish pass measures are implemented at any site.

**National Fish Pass Programme**Ref : **EA 005**

Cluster :	<b>Environment and Aquatic Resources</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Water Management for Fisheries</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>15 year(s)</b>
		Agency(s) Responsible :	<b>BWDB</b> (Lead) <b>DoFish</b> (Supporting)
Short Description :	The NWPo requires that "Fisheries and wildlife will receive due emphasis in water resource planning in areas where their social impact is high" (§4.9.a); "Measures will be taken to minimise disruption to the natural aquatic environment in streams and water channels." (§4.9.b), and; "Water development plans will not interrupt fish movement and will make adequate provisions in control structures for allowing fish migration and breeding." (§4.9.e). Yet there has been a reduction in fish production in recent years due, at least in part, to structures that inhibit fish migration routes. As a response, this programme will screen all major existing FCD/I projects (>5000ha) and will prepare and implement a plan for mitigation works. Emphasis will be given to 'fish-friendly' structures rather than separate dedicated fish-pass structures.		

<b>MIS Links</b>	Cost Calculation : EA Programme costing.xls	Map : EA 005 Map.jpg
	Disb't Schedule : EA Programme costing.xls	Description : EA 005 PgP.doc

<b>Finance</b>	Costs	Private	Funding (%)	Expected by
			GoB	Beneficiaries
Total Capital <sup>3</sup>	<b>3,000.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>
Ultimate Recurring	<b>75.00</b> MTk/yr	<b>n/a</b>	<b>50%</b>	<b>50%</b>
				<b>Programme Year</b>
				<b>15</b>
				<b>16</b>
Date of Data :	<b>31 07 01</b>	<b>Stacked Cumulative Cash Flow Chart</b>		
	(dd) (mm) (yy)			
Status :	<b>Identified</b>			
Financial Base Year:	<b>mid-2000</b>			
Planned Expenditure (to date) :	<b>0</b> MTk			
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk			

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Appropriate fish-friendly measures routinely adopted in the design and operation of all relevant structures	• Number of conforming designs	NYD
• 90% of all feasible fish passes in place	• Design regulation	NYD
• Sustainable increase in floodplain fish catches, in terms of both numbers and diversity	• Number of operational fish passes	NYD
	• Fish catch statistics (provided that impact of water sector measures can be distinguished from other impacts)	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	<b>EA 005</b>
Title	<b>National Fish Pass Programme</b>

*Assumptions:*

Taka/US\$	51.000	TA duration	<b>0.0</b>	years	All prices in mid-2000 values
		Investment duration	15.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Expatriate consultants (all-in rate)	p-m	-	20,000		-		
Senior National consultants (all-in rate)	p-m	-		150	-	0.0%	-
Mid-level National consultants (all-in rate)	p-m	-		90	-	0.0%	-
Sub-totals					-		-
Other general TA programme costs		25%			-		-
Specific other TA programme costs					-	0.0%	-
<b>Total TA Costs</b>					-		-
<b>Other Programme Costs</b>							
1. Study, design and construction of fishpasses including O&M training					3,000.0	2.5%	75.0
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					3,000.0		75.0
<b>Overall Programme Costs</b>					3,000.0		75.0

Note

The details of this programme will be worked out in the the National Fisheries Master Plan (EE 004)  
The amounts above are provisional only

**Unspecified Regional Programmes**

Ref: EA 006

**Basic Data**

NWMP Sub-sector      **Environment and Aquatic Resources**

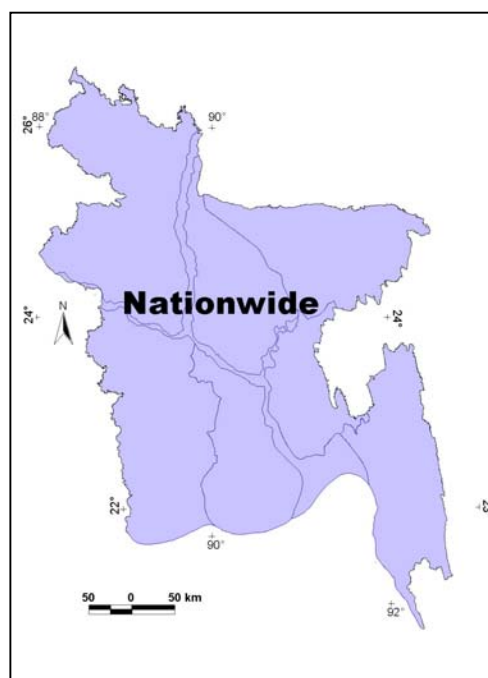
Region(s)              **Nationwide**

**Relevance to NWPo and other Policies:**

The NWPo is characterised by a wide range of environmental references and requirements from which no region is immune.

**Purpose of Programme**

The purpose of this programme is to ensure that provision is made for unanticipated or particular regional environmental concerns that are not well reflected in the other EA Programmes. This allows for comparatively small, but locally important issues to be dealt with according to regional priorities. This also implies regional (and down to village level) participation in identifying the concerns, which are therefore left non-specific at this stage.

**Programme Outline**

This programme is intended to span the short, medium and long terms of the NWMP. In the short term possible regional interventions will be prepared based on suggestions from participatory consultation programmes in each region, from the NWMP Regional Overviews and from expert opinion of environmental specialists. Promising programmes will be selected at regional workshops as the basis of regional environmental action plans which will be coordinated with other development plans. Draft, time-bound and budgeted, regional plans, including monitoring and evaluation components with verifiable progress and environmental indicators will be prepared and subjected to participatory reviews prior to finalisation, funding allocation, implementation and commissioning. These should normally begin with pilot programmes / projects to test the institutional capacities. In the medium to long term, plans will be reformulated as necessary in the light of information arising from reviews and other monitoring activities or as a result of new environmental issues or priorities and NWMP reformulations.

**Financing Arrangements**

With comparatively modest costs, and the emphasis on local initiatives, the Programme is suitable for GoB funding. Provisions for the short term are Tk300M; the medium term Tk250M and the long term Tk250M.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• 8 pilot projects (one per region) completed and evaluated	I1	• Project evaluation reports	2011
• Improvement in region-specific environmental characteristics	K	• Specific indicators and thresholds as appropriate	2019
• Quality, size and connectivity of water bodies adequate for the restoration and preservation of aquatic biomes	D	• Status of indicator species <sup>1</sup>	2029

*Note 1 provided that impact of water sector measures can be distinguished from other impacts*

## Institutional Arrangements

WARPO will be responsible for identification of these Regional Programmes, in co-operation with agencies which either have environmental interests (eg DoE, DoF and FD) or which promote activities likely to affect the aquatic environment (eg DoI, BWDB, LGED and RHD). Participation by regional and local government agencies will be required, as will that of lower-level organisations, facilitated by NGO assistance wherever necessary. Individuals and organisations, especially NGOs, with expert environmental knowledge will also participate as will site-specific interest groups.

## Existing Documentation

Existing documentation comprises descriptions of the ecological characteristics and environmental issues of the area in the FAP environmental reports and the brief summaries in the regional environmental Working Papers (NWMPP 2001), particularly the Water Resource Environment of Bangladesh, Volumes 1-8, (WARPO).

## Linkages

Particular linkages are foreseen with regional surface water development projects such as those resulting from NWMP programmes, AW 001 to 008. Other regional development plans affecting, or potentially affecting, the water environment (eg industrial plans) will have to be addressed and modified as required under the EIA certification process.

## Risks and Assumptions

There is some risk that local vested interests could appropriate the process for their own ends, but a suitably comprehensive and participatory consultation process with adequate representation of the poor and underprivileged should redress the balance. Theoretically, there might be a risk of regional desires running counter to the national water management framework as defined by the NWMP, but it is assumed that the presence of WARPO in the identification process will prevent major problems. Similarly, WARPO and DoE - with their supra-regional viewpoints - should be able to prevent any major inter-regional conflicts.



**Unspecified Regional Programmes**Ref : **EA 006**

Cluster :	<b>Environment and Aquatic Resources</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>General Environmental Responsibilities</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2005</b>	Duration <sup>2</sup> :	<b>15 year(s)</b>
		Agency(s) Responsible :	<b>WARPO</b> (Lead) <b>DoE, DoFish, DoForest, BWDB, LGED, RHD</b> (Supporting)
Short Description :	The purpose of this programme is to ensure that provision is made for particular regional environmental concerns that are not well reflected in the other EA Programmes. This allows for comparatively small, but locally important issues to be dealt with according to regional priorities. This also implies regional (and down to village level) participation in identifying the concerns, which are therefore left non-specific at this stage.		

**MIS Links**

Cost Calculation :	EA Programme costing.xls	Map :	EA 006 Map.jpg
Disb't Schedule :	EA Programme costing.xls	Description :	EA 006 PgP.doc

**Finance**

	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by ProgrammeYear
Total Capital <sup>3</sup>	<b>600.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>15</b>
Ultimate Recurring	<b>19.30</b> MTk/yr	<b>n/a</b>	<b>25%</b>	<b>75%</b>	<b>16</b>

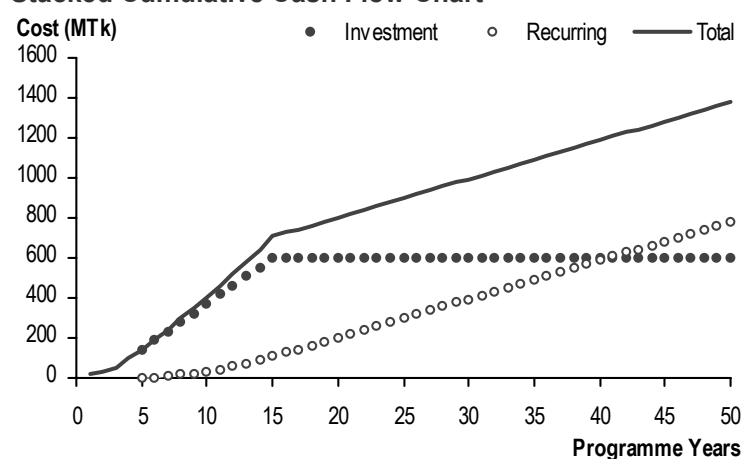
Date of Data : **31 07 01**  
(dd) (mm) (yy)

Status : **Identified**

Financial Base Year: **mid-2000**

Planned Expenditure (to date) : **0** MTk

Actual Expenditure<sup>4</sup> (to date) : **0** MTk

**Stacked Cumulative Cash Flow Chart****Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• 8 pilot projects (one per region) completed and evaluated	• Project evaluation reports	NYD
• Improvement in region-specific environmental characteristics	• Specific indicators and thresholds as appropriate	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

**National Water Management Plan**  
**Programme Costing Sheet**

Programme Ref	EA 006
Title	Unspecified Regional Programmes

*Assumptions:*

Taka/US\$	51.000	TA duration	3.0	years	All prices in mid-2000 values
		Investment duration	12.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>	Identification and preparation of programmes						
Expatriate consultants (all-in rate)	p-m	16.0	20,000		16.3		
Senior National consultants (all-in rate)	p-m	48.0		150	7.2	0.0%	-
Mid-level National consultants (all-in rate)	p-m	94.0		90	8.5	0.0%	-
Sub-totals					32.0		-
Other general TA programme costs		25%			8.0		-
Specific other TA programme costs	Surveys and subcontracts				10.0	0.0%	-
<b>Total TA Costs</b>					<b>50.0</b>		-
<b>Other Programme Costs</b>							
1. Provision for programmes					550.0	3.5%	19.3
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>550.0</b>		<b>19.3</b>
<b>Overall Programme Costs</b>					<b>600.0</b>		<b>19.3</b>

## Improved Water Management in the Haor Basins of the NE Region

Ref: EA 007

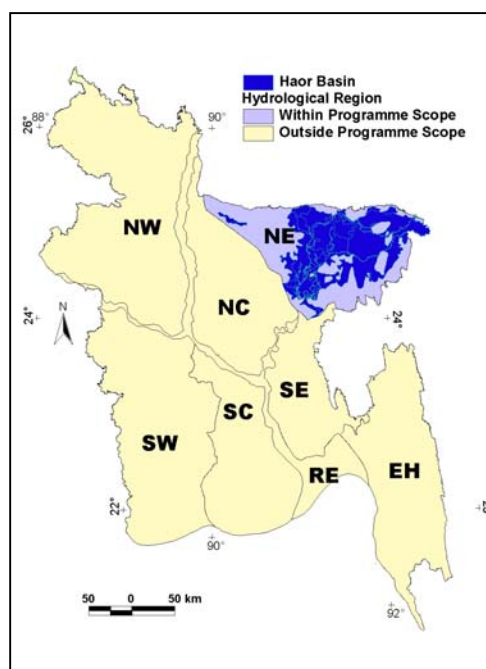
### Basic Data

NWMP Sub-sector      **Environment and Aquatic Resources**

Region(s)              **North East**

### Relevance to NWPo and other Policies:

Section 4.3.b of the NWPo gives high priority to water allocation for fisheries and wildlife; equally 4.9.b requires that measures are taken to minimize disruption to the natural aquatic environment in streams and water channels; 4.9.c: requires drainage schemes to avoid swamps and marshes used by wildlife and 4.9.d requires that water bodies such as haors, baors, beels and roadside borrow pits are reserved for fisheries.



### Purpose of Programme

The Haor Basin contains the last major remaining semi-natural and large-scale freshwater wetlands of the country and includes important mother-fish sites. Tanguar Haor is a Ramsar Site and three other haors are ecologically-critical Areas. The Basin is under threat from encroachment of agriculture and capture fisheries. The purpose of the programme is to safeguard the water resources and to preserve the semi-natural characteristics of the whole Basin with special attention being paid to the ecologically important sites.

### Programme Outline

The programme is intended to run throughout the 25 years of the NWMP. In the short term water requirements for the most important water bodies will be defined in terms of key indicators and corresponding threshold values for preservation of key aquatic habitats - such as water depths, areas, extent and timing of flooding and others. Special areas (such as mother-fish areas) will be demarcated as fish sanctuaries. Similarly production indicators and thresholds, such as fish catches, will be defined as the basis of sustainable development limits. Then, within the context of the NE Region overall water sector plan, a staged management plan will be prepared on the basis of wide consultations with all stakeholders (not just those in the water sector) and definition of the complementary interventions required in the water and other sectors. The plan would recommend any changes necessary to the environmental protection regulations and their enforcement while including (i) baseline studies and research to refine the indicators and thresholds; (ii) needs assessment of the Haor Development Board (HDB) and capacity strengthening as necessary and (iii) an environmental monitoring schedule. Implementation of the staged management plan will also begin in the short term. In the medium and long terms the plan will be revised as will the indicators, thresholds and plan components to whatever extent is necessary so long as stakeholders are consulted and otherwise involved once

more. Also in the medium and long terms it will be necessary define water requirements for the less important sites; continue implementation and monitor the indicators.

## Financing Arrangements

The estimated cost of the programme will be Tk1000M, of which Tk120M would be spent on preparatory studies. The programme, which is planned to take 15 years to complete, is suitable for GoB financing, but with other claims on government revenue, some external financing will almost certainly be needed.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Management Plan for the Haor basins of the NE agreed by a majority of stakeholders	I1	• The Plan	2005
• Regular water monitoring	I2	• Stakeholder endorsement	
• Water-related regulations established	K	• Monitoring schedules and reports	2006
• Quality, size and connectivity of water bodies adequate for the restoration and preservation of aquatic biomes	D	• The Regulations	2007
		• Status of indicator species <sup>1</sup>	2027

*Note 1 provided that impact of water sector measures can be distinguished from other impacts*

## Institutional Arrangements

HDB will prepare the water management plan with the assistance of consultants, and with the full participation of local communities (assisted by NGOs as necessary), local government, and government agencies involved with resource protection and development (notably DoF, FD and DoE) and with infrastructure development - notably BWDB, LGED and R&H. The HDB will coordinate implement action of the plan.

## Existing Documentation

The only relevant existing documentation comprises the Water Resource Environment of Bangladesh, Volume 3 the North East Regions (WARPO NWMPP 2001).

## Linkages

The programme has clear linkages with DM 003 and with EA 003, 4, 8 and 9. Given the problems of agricultural encroachment and increasing fish catches, the programme must also link with farmer and fisherman development programmes in attempts to obtain an agreed, sustainable management plan.

## Risks and Assumptions

With so many segments of society dependent on the wetlands, the management approach will only be effective if all stakeholders participate effectively. There is a danger that the rural poor and disadvantaged (among them the small fishermen) will not have an effective voice against large-scale and richer vested interests - although the NGO assistance is intended to provide a counterbalance. Ultimately, the main threats to the fish, waterfowl and other aquatic species are largely due to socio-economic forces, including population pressures and commercial fisheries and agricultural exploitation. It is not certain that these disparate interests can be reconciled in an agreed plan, nor that they can be brought under effective control as part of a plan for better overall (ie not just aquatic) resource management. If they are not, the water sector interventions alone will do little to alleviate the problems.

**Improved Water Management in the Haor Basins of the North East Region**Ref : **EA 007**

Cluster :	<b>Environment and Aquatic Resources</b>	Region(s) :	<b>NE</b>
Focus/Foci :	<b>Water Management for Eco-Sensitive Areas</b>	Location :	<b>Haor Basin, NE region</b>
Start Year <sup>1</sup> :	<b>2003</b>	Duration <sup>2</sup> :	<b>15 year(s)</b>
		Agency(s) Responsible :	<b>BHWDB</b> (Lead) <b>None</b> (Supporting)
Short Description :	The Haor Basin contains the last major remaining semi-natural and large-scale freshwater wetlands of the country and includes important mother-fish sites. The Basin is under threat from encroachment of agriculture and capture fisheries. The purpose of the programme is to safeguard the water resources and to preserve the semi-natural characteristics of the whole Basin with special attention being paid to the ecologically important sites. This will be achieved by the development and implementation of a staged, environmentally responsible water management plan for the area.		

<b>MIS Links</b>	Cost Calculation :	EA Programme costing.xls	Map :	EA 007 Map.jpg
	Disb't Schedule :	EA Programme costing.xls	Description :	EA 007 PgP.doc

<b>Finance</b>	<b>Costs</b>		<b>Funding (%)</b>		<b>Expected by Programme Year</b>
		<b>Private</b>	<b>GoB</b>	<b>Beneficiaries</b>	
Total Capital <sup>3</sup>	<b>1,000.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>15</b>
Ultimate Recurring	<b>26.40</b> MTk/yr	<b>n/a</b>	<b>25%</b>	<b>75%</b>	<b>16</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• Management Plan for the Haor basins of the NE agreed by a majority of stakeholders	• The Plan	NYD
• Regular water monitoring	• Stakeholder endorsement	NYD
• Water-related regulations established	• Monitoring schedules and reports	NYD
	• The Regulations	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design, supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref	EA 007
Title	Improved Water Management in the Haor Basins of the North East Region

### Assumptions:

Taka/US\$	51.000	TA duration	3.0	years	All prices in mid-2000 values
		Investment duration	12.0	years	

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>	Identification and preparation of programmes						
Expatriate consultants (all-in rate)	p-m	42.0	20,000		42.8		
Senior National consultants (all-in rate)	p-m	120.0		150	18.0	0.0%	-
Mid-level National consultants (all-in rate)	p-m	124.0		90	11.2	0.0%	-
Sub-totals					72.0		-
Other general TA programme costs		25%			18.0		-
Specific other TA programme costs	Surveys and subcontracts				30.0	0.0%	-
<b>Total TA Costs</b>					<b>120.0</b>		-
<b>Other Programme Costs</b>							
1. Investment programmes					880.0	3.0%	26.4
2.					-	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>880.0</b>		<b>26.4</b>
<b>Overall Programme Costs</b>					<b>1,000.0</b>		<b>26.4</b>

## Environmentally Critical Areas and Integrated Wetland Management

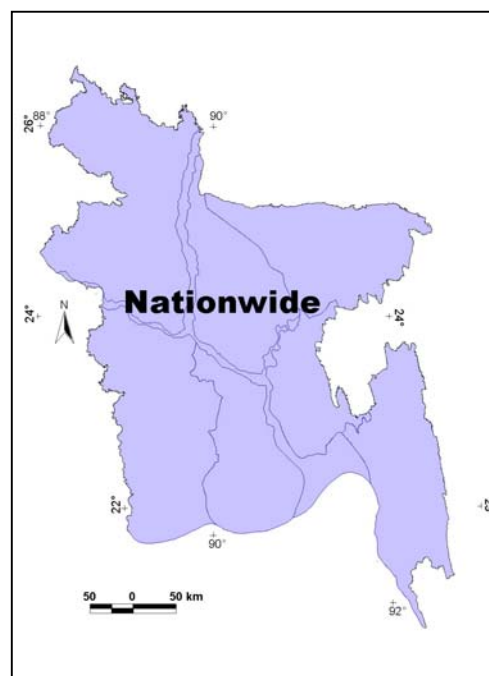
Ref: EA 008

### Basic Data

NWMP Sub-sector      **Environment and Aquatic Resources**  
 Region(s)              **Nationwide**

### Relevance to NWPO

Section 4.9.b of the NWPO calls for measures to minimise disruption to the natural aquatic environment in streams and water channels; 4.9.d requires that water bodies such as haors and baors etc are reserved for fisheries; 4.12.e prohibits the filling of publicly owned water bodies and depressions in urban areas for preservation of the natural aquifers and environment and 4.13.a stresses that natural water bodies such as beels, haors, and baors are to be preserved in the interests of maintaining the aquatic environment while facilitating drainage.



### Purpose of Programme

The country's aquatic habitat is rapidly shrinking as a result of interventions such as abstractions (especially for irrigation) flood control and agricultural encroachment. Deteriorating water quality compounds the problems. Supported by other measures, safeguarding the water resources of the nation's waterbodies is necessary to arrest the trends and provide for both the human and the natural environments (eg health, nutrition, livelihoods, and fish and biodiversity conservation). This programme is intended to provide the necessary protection and sustainable use measures in the water sector as part of a wider integrated wetlands management (IWM) programme. Its specific aims are to define and refine the necessary water requirements.

### Programme Outline

In the short term the programme will review all major waterbodies or types of water body discussed in the NWMP (eg river reaches and dry-season floodplain waterbodies) and recommend appropriate gazetting of the most vulnerable areas as new ECAs. Where necessary, recommendations will be included on changes to the laws and regulations for such waterbodies, especially provisions for protection of rural waterbodies. Application of the EA Guidelines for FCD/I projects and for the water sector when available (EE 008, when available) will be an important part of the protection measures. ECA water requirements will be progressively refined in the short to medium term and measures to ensure minimum (dry season) water requirements for ecological purposes are maintained - including, for example, critical areas, levels, depths and durations/seasonality. In the medium to long term, the programme will be subsumed into an integrated wetlands management programme, addressing the ecological needs as a whole, and not merely water needs.

## Financing Arrangements

This programme is expected to cost about Tk800M and highly suitable for GoB financing.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Water requirements defined and/or refined	I1	• Thresholds	2005
• Regulatory framework for environmentally critical areas	I2	• The regulations	2007
		• Number of voluntary agreements concluded	
		• Number of prosecutions	
• Integrated wetland management	I3	• Status of indicator species	2026
		• Extent and duration of wetlands	
• Improved levels of protection extended to existing and new environmentally critical areas	K	• New regulations gazetted	2026
		• Number of new environmentally critical areas gazetted	
• Quality, size and connectivity of water bodies adequate for the restoration and preservation of aquatic biomes	D	• Status of indicator species <sup>1</sup>	2026

*Note 1 provided that impact of water sector measures can be distinguished from other impacts*

## Institutional Arrangements

DoE, in consultation with Local Government and other concerned agencies and with support from WARPO, will define the waterbody locations and their minimum water needs, and the resulting information updates for successive NWMPs. MoEF will gazette the ECAs, whilst WARPO and DoE will update the EA guidelines for the water sector, with publication by DoE. DoE, and with encouragement and support of BELA, other lawyers' organisations and NGOs, will be responsible for ensuring compliance by prosecutions if voluntary agreements fail. Fisheries Department with Ministry of Youth and Sports and Local Government, will retain formal management responsibility, but GoB resources will not be sufficient to monitor and police all the waterbodies, so the active participation of stakeholders - especially local people, notably fishermen - will be essential. To give the latter an effective voice, there will need to be a special component of the awareness-raising and empowerment programme. WARPO, universities, NGOs and other interest groups and stakeholders will carry out programme monitoring.

## Existing Documentation

The only relevant existing documentation is limited to the Law for Protection of Playing Fields, Open Space, Gardens and Natural Water Bodies of all Municipal Areas including cities, divisional and district towns: Act No 36 of 2000, National Parliament, along with the various Parishad Acts.

## Linkages

Water monitoring programmes (EA 003 and EE 007) and other EA study programmes, as well as NGO and stakeholder actions, should assist identification of sites at risk. WARPO and DoE will develop together the regulatory and compliance measures, and ensure inclusion of ecological water requirements in the Guidelines (and later Manual) for EA in the water sector (NWMP EE 004). NWMP programmes EA 006 and 7, and further research over time, will provide better basic knowledge for refinement of the programme components. Careful dovetailing of the



programmes for awareness / empowerment and institutional reform will also be necessary. NGOs will provide special interest pressures and assist local people to have an effective voice in planning and implementation.

### **Risks and Assumptions**

It is assumed that Department of Fisheries will assume responsibility for all *jalmobals* from the Ministry of Land in the short term. The research and updating components will address: (i) the poor state of knowledge on ecological needs, the main risk being poorly-defined estimates of the aquatic environment needs and (ii) the consequent uncertainty that the initial indicators and threshold values will satisfactorily safeguard the aquatic environment until the formulation of better ones. Inter-agency co-operation is a fundamental part of the programme, but cannot be guaranteed, since the key agencies will have their own priorities and agendas. Success will depend critically on compliance with the regulations, a notorious failure in the past in the country; success will require acceptance by all water users of the regulations as the basis for preserving water resources for environmental needs. Despite the planned NGO assistance, the risk remains that the social and political climate will not allow local people to develop the power to take effective action over issues that affect their welfare.

**Environmentally Critical Areas and Integrated Wetland Management**Ref : **EA 008**

Cluster :	<b>Environment and Aquatic Resources</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>Water Management for Eco-Sensitive Areas</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>23 year(s)</b>
		Agency(s) Responsible :	<b>DoE</b> (Lead) <b>WARPO, LGIs</b> (Supporting)
Short Description :	The country's aquatic habitat is rapidly shrinking as a result of abstractions (especially for irrigation); flood control and agricultural encroachment. And deteriorating water quality exacerbates the problems. Supported by other measures, safeguarding the water resources of the nation's water bodies is necessary to arrest the trend and provide for both the human and the natural environments (eg health, nutrition, livelihoods, fish and broader biodiversity). This programme is intended to provide the necessary protection and sustainable use measures in the water sector as part of a wider integrated wetlands management (IWM) programme.		

<b>MIS Links</b>	Cost Calculation :	EA Programme costing.xls	Map :	EA 008 Map.jpg
	Disb't Schedule :	EA Programme costing.xls	Description :	EA 008 PgP.doc

<b>Finance</b>					Expected by Programme Year
	Costs	Private	Funding (%) GoB	Beneficiaries	
Total Capital <sup>3</sup>	<b>800.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>23</b>
Ultimate Recurring	<b>15.00</b> MTk/yr	<b>n/a</b>	<b>50%</b>	<b>50%</b>	<b>24</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Water requirements defined and/or refined	• Thresholds • Status of indicator species	NYD
• Regulatory framework for environmentally critical areas	• The regulations • Number of voluntary agreements concluded • Number of prosecutions	NYD
• Integrated wetland management	• Status of indicator species • Extent and duration of wetlands	NYD
• Improved levels of protection extended to existing and new environmentally critical areas	• New regulations gazetted • Number of new environmentally critical areas gazetted	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref

EA 008

Title

Environmentally Critical Areas and Integrated Wetland Management

### Assumptions:

Taka/US\$ 51.000

TA duration 2.0 years

All prices in mid-2000 values

Investment duration 21.0 years

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
Technical Assistance	Preparatory studies, and identification of priority ECAs						
Expatriate consultants (all-in rate)	p-m	16.0	20,000		16.3		
Senior National consultants (all-in rate)	p-m	48.0		150	7.2	0.0%	-
Mid-level National consultants (all-in rate)	p-m	94.0		90	8.5	0.0%	-
Sub-totals					32.0		-
Other general TA programme costs		25%			8.0		-
Specific other TA programme costs	Surveys and subcontracts				10.0	0.0%	-
Total TA Costs					50.0		-
Other Programme Costs							
1. Provision for programme implementation and monitoring costs					250.0	0.0%	-
2. Provision for capital investment components					500.0	3.0%	15.0
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
Total Other Programme Costs					750.0		15.0
Overall Programme Costs					800.0		15.0

## Improved Water Management and Salinity Control in the Sundarbans

Ref: EA 009

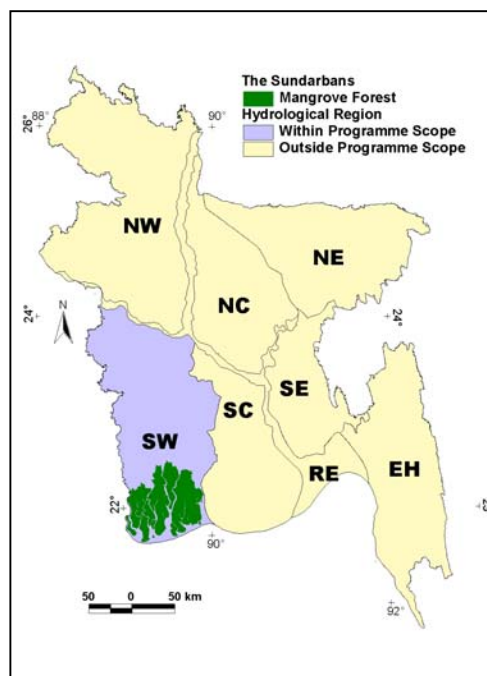
**Basic Data**

NWMP Sub-sector      **Environment and Aquatic Resources**

Region(s)              **South West**

**Relevance to NWPo and other Policies:**

Section 4.12 of the NWPo states that protection of the natural environment is essential for sustainable development and calls for the protection, restoration and preservation of the environment and its biodiversity including wetlands, mangrove...endangered species and of water quality. More precisely section 4.12.c requires that adequate upland flow is maintained in water channels in order to preserve the coastal estuary eco-system threatened by intrusion of salinity from the sea.

**Purpose of Programme**

Whilst action will be taken under Programme MR 003 to remedy the shortages of upland flows, and under MR 007 to ensure effective rejuvenation of the river systems within the Ganges Dependent Area, insufficient is known about the Sundarbans inter-acts with the water regime in this complex tidal area. Evidence points to a correlation between the economically important *Sundari* tree productivity and average salinity levels, but this is largely based on empirical evidence, which may mask out other key parameters. This is especially important in the context of the expected trend of sea-level rise and the known trend of increasing tidal range.

The purpose of this programme is develop a much improved state of knowledge of the inter-actions between the ecological health of the Sundarbans forest reserve and the aquatic environment within which it is situated. It is intended to complement the efforts under Programmes MR 003 and 007, and to provide clear guidance on long-term water management needs for the Sundarbans forest.

**Programme Outline**

The Government has already taken up an important initiative to improve management of the Sundarbans. The Sundarbans Biodiversity Project aims initially to identify a management system for the biodiversity conservation of the forest and fishery resources with a view to expanding economic opportunities for different occupational groups, better social and environmental facility generation and the development of eco-tourism. This will help to bring about more sustainable development of the area.

However if, as was postulated many years ago, the long-term ecological health of the Sundarbans is intimately linked with the state of the water resource system, the project alone will not be able to bring about a complete solution to restoration of the Sundarbans. Further research is urgently

needed to understand the linkages between the water system and the ecology of the area. A start has been made recently with collecting salinity data from within the forest area, and this will help calibrate the hydrodynamic models established by SWMC, but much more needs to be done to fully appreciate how the linkages work.

Increases in salinity brought about by the changes in upland channel flows has been widely attributed as being the main reason for top-dying of the *sundari* trees that are found throughout most of the forest, given the good correlation between salinity levels and potential wood production. However, a full understanding of the relationship between the ecological health of this internationally important area and the water resource system appears still illusive. It is very reasonable to expect that, in addition to salinity, factors such as water levels, tidal cycles, flow velocities, sediment loads, turbidity, micro-nutrient concentrations and other elements of the water system would also impact on the growth and sustainability of different species. Nevertheless, to date little research has gone into these aspects, notwithstanding the substantial investments under consideration to augment the upland flows.

In order to gain a full understanding of these potential relationships, the programme will provide for an extensive scoping exercise, drawing upon experience gained in management of similar environments throughout the world. This will be followed by a period of data collection and analysis and a review and update of climate change factors, concluding with a set of recommendations for water conditions favourable to the ecology of the area, and the potential impacts that can be expected. The programme will also include establishment of a long-term monitoring facility of selected parameters to ensure a close check is maintained on future developments in the area.

## Financing Arrangements

The initial research programme is estimated to cost TkM, with a further TkM spent on establishing a long-term monitoring facility. It is suitable for Government funding, with potential for donor support.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• Relevant data available	I1	• Reports	2004
		• Use of data	
• Appropriate parameters established and accepted by DoE	I2	• Documented parameters	2004
		• Formal agreement	
• Water quality targets achieved in the Sundarbans	K	• Water quality tests	2021
• Quality, size and connectivity of water bodies adequate for the restoration and preservation of aquatic biomes	D	• Status of indicator species <sup>1</sup>	2026

*Note 1 provided that impact of water sector measures can be distinguished from other impacts*

## Institutional Arrangements

The Sundarbans Forest Reserve is the responsibility of the Department of Forests (DoForest), who will be the implementation authority for this programme. DoForest will supported by a core TA team to manage the programme, supplemented by a wide range of international organisations expert in the management of coastal mangrove forests, biochemical investigations, and climate change. DoForests will need to establish close coordination with WARPO, DoE, BWDB, ICZMP and other relevant agencies and projects concerned with these issues.

## **Existing Documentation**

Existing documentation includes the ongoing work of the Sundarbans of the Sundarbans Biodiversity Project, FAP4 Regional Study (FPCO 1993), Feasibility Study of the Gorai River Restoration Project (BWDB, 2001), and Options for the Ganges Development Area Studies (WARPO, 2001), along with numerous scientific papers available on the web.

## **Linkages**

This programme primarily links with MR 003, MR 007, AW 007 and AW 008, all of which form part of an integrated strategy for development of the GDA. It also links with EA 008.

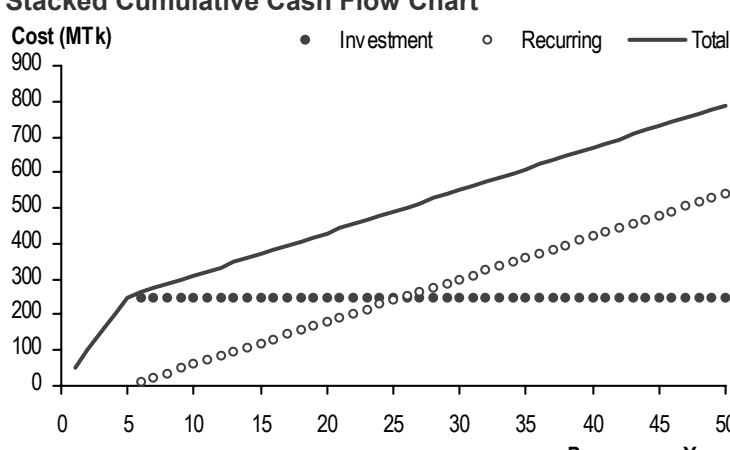
## **Risks and Assumptions**

The primary risk is that the scientists are unable to unravel this complex problem. The programme envisages accessing expertise on a world-wide basis, and this should mitigate against solutions not being found. A secondary risk is that monitoring of future impacts will not be sustained. This will be for WARPO to address in to ensure that sufficient efforts is continued to be given to this major environmental issue. The Government has commitments under the Ramsar convention, which will continue to give impetus to the long-term programme. A third risk, is that notwithstanding consequent efforts to modify the water regime, man's interventions in forest management offset the long-term environmental gains. The monitoring programmes are intended to minimise this risk, by the early identification of this potential hazard to environmental restoration.

**Improved Water Management and Salinity Control in the Sundarbans**Ref : **EA 009**

Cluster :	<b>Environment and Aquatic Resources</b>	Region(s) :	<b>SW</b>
Focus/Foci :	<b>Water Management for Eco-Sensitive Areas</b>	Location :	<b>Sundarbans Area of SW region</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>10 year(s)</b>
		Agency(s) Responsible :	<b>DoForest</b> (Lead) <b>DoE, BWDB, WARPO</b> (Supporting)
Short Description :	Whilst action will be taken under Programme MR 003 to remedy the shortages of upland flows, and under MR 007 to ensure effective rejuvenation of the river systems within the Ganges Dependent Area, insufficient is known about the Sundarbans inter-acts with the water regime in this complex tidal area. The purpose of this programme is to improve knowledge of the inter-actions between the ecological health of the forest reserve and the aquatic environment within which it is situated. An extensive scoping exercise will precede data collection and assessment. Provision is also made for long-term monitoring of selected parameters.		

<b>MIS Links</b>	Cost Calculation : EA Programme costing.xls	Map : EA 009 Map.jpg
	Disb't Schedule : EA Programme costing.xls	Description : EA 009 PgP.doc

Finance						Funding (%)		Expected by	
	Costs		Private	GoB	Beneficiaries	Programme		Year	
Total Capital <sup>3</sup>	250.00 MTk		0%	100%		0%	10		
Ultimate Recurring	12.00 MTk/yr		n/a	100%		0%	11		
Date of Data :	31	07	01	Stacked Cumulative Cash Flow Chart					
	(dd)	(mm)	(yy)	Cost (MTk)		● Investment	○ Recurring	— Total	
Status :	Identified								
Financial Base Year:	mid-2000								
Planned Expenditure (to date) :	0 MTk								
Actual Expenditure <sup>4</sup> (to date) :	0 MTk								

**Monitoring**

Objective	Indicator	Present Status <sup>5</sup>
• Relevant data available	• Reports • Use of data	NYD
• Appropriate parameters established and accepted by DoE	• Documented parameters • Formal agreement	NYD
• Water quality targets achieved in the Sundarbans	• Water quality tests	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref

EA 009

Title

Improved Water Management and Salinity Control in the Sundarbans

### Assumptions:

Taka/US\$ 51.000

TA duration 5.0 years

Investment duration 5.0 years

All prices in mid-2000 values

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
Technical Assistance	Core Consultancy group						
Expatriate consultants (all-in rate)	p-m	60.0	20,000		61.2		
Senior National consultants (all-in rate)	p-m	120.0		150	18.0	0.0%	-
Mid-level National consultants (all-in rate)	p-m	142.0		90	12.8	0.0%	-
Sub-totals					92.0		-
Other general TA programme costs		25%			23.0		-
Specific other TA programme costs	Surveys, testing etc				35.0	0.0%	-
Total TA Costs					150.0		-
Other Programme Costs							
1. Study tours					15.0	0.0%	-
2. Sub-contracts for specialist services					55.0	0.0%	-
3. Establishment of long-term monitoring facilities					30.0	40.0%	12.0
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
Total Other Programme Costs					100.0		12.0
Overall Programme Costs					250.0		12.0



## Public Awareness Raising and Empowerment in Respect of Environmental Issues

Ref: EA 010

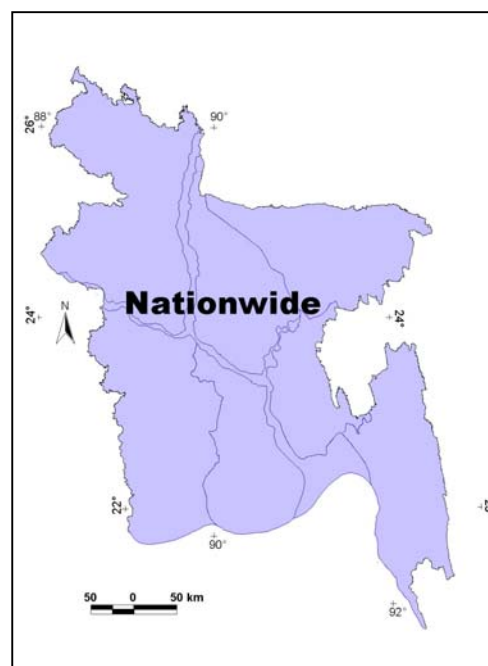
### Basic Data

NWMP Sub-sector      **Environment and Aquatic Resources**

Region(s)              **Nationwide**

### Relevance to NWPo and other Policies:

§4.2.c of the NWPo requires planning methodologies that promote people's participation; §4.6.e requires local governments to promote awareness among the people as regards the avoidance of pollution and wastage of water and §4.12.j requires all water management agencies and related natural resources departments to provide education and information to industrial and farming communities regarding self-help pollution control.



### Purpose of Programme

Because of the extent, variety and local variation of the many environmental problems, GoB is unlikely ever to have the full resources to 'safeguard the water resource environment' solely through government agencies, given the many other claims on political and financial resources. Even with the support of the many environmentally-concerned organisations, NGOs and individuals, action is unlikely to be successful without three major changes: (i) considerably increased public awareness of environmental issues and how they affect people's lives and livelihoods; (ii) the development of means for organisations and individuals to take effective action over environmental issues (ie to 'empower' affected parties) and (iii) the development of genuine political commitment in response to environmental concerns. This programme aims to develop, over time, an informed and active environmental lobby at all levels.

### Programme Outline

The programme will span the short, medium and long terms. It will involve the establishment of a Central Support Unit within Department of Environment that will identify key areas where publicity and education on environmental issues amongst civil society is required, and facilitate dissemination of information on these through various media. The Unit will work with all agencies in Government directly and indirectly involved in water resources development and management, and assist each agency as appropriate to prepare and disseminate information on environmental matters. Funds will be provided to the Unit to prepare core material and to help other agencies in preparing their own specific material. The cost of disseminating the information will normally be borne by the agency in question, with the preparation costs subsidised as above.

The Unit's responsibilities will include monitoring the impact of information campaigns, and identifying gaps and potential new issues to address. This will be on a rolling basis. The Unit will work also with NGOs and be responsive to issues raised by all sectors of the community, subject to these being within the Government's policy and strategic frameworks. It is anticipated that the Unit will have only a small core staff, and will employ suitably qualified subject matter specialists and private sector advertising companies on a contract basis to prepare material. An editorial board could be established with programme funds, made up of eminent specialists from a broad spread of backgrounds, both from within and from outside Government, particularly drawing upon research institutions and universities. The job of editorial board would be to ensure the relevance and quality of the Unit's outputs.

## Financing Arrangements

The programme is expected to cost Tk920M with an initial set-up cost of Tk40M. It is suitable for GoB expenditure, especially if it can be partially or wholly financed by revenues accruing from pollution levies, fees and/or fines. Committed long-term funding will be essential.

## Objectives and Indicators

Objective	Suffix	Indicators/Mean of Verification	Due
• National Plan for informing and mobilising public opinion	I1	• The Plan document	2003
• 8 pilot projects (one per region) completed and evaluated	I2	• Project evaluation reports	2011
• Effective public demand for sustainable environmental stewardship	K	• Number of local water resource protection agreements • Number of polluters and agreement transgressors dealt with at the request of the of general public	2016
• Public sensitised and empowered to demand environmental restoration and stewardship	D	• Knowledge, Attitude and Practices (KAP) surveys	2026

## Institutional Arrangements

The Unit will be established within DoE. It will retain close links with all relevant agencies, NGOs and stakeholders. It will have a special relationship with WARPO to ensure that information relevant to NWMP implementation is prioritised.

## Existing Documentation

Existing documentation comprises reports emanating from NGO environmental initiatives and government agency publicity programmes.

## Linkages

Linkages will be established with all the NWMP environmental programmes and with all programmes with (potentially) significant impacts on the natural and human environments. Links will be needed with other awareness-raising programmes covering water developments, environment, people's participation, institutional reform and empowerment of local people through measures for government reform such as good governance initiatives.

## **Risks and Assumptions**

The principal risks are two-fold. Firstly that the quality of the material produced by the Unit is inadequate, and causes dissemination of mis-information on crucial issues. To mitigate against this, an editorial board has been included within the Unit's set-up. The second risk is that the necessary long-term funding will not be assured to maintain the programme, and that the experience and capability built in the initial years will be dissipated. If the Unit demonstrably provides a valuable service, this risk will be greatly reduced.

**Public Awareness Raising and Empowerment in respect of Environmental Issues**Ref : **EA 010**

Cluster :	<b>Environment and Aquatic Resources</b>	Region(s) :	<b>All</b>
Focus/Foci :	<b>General Environmental Responsibilities</b>	Location :	<b>Nationwide</b>
Start Year <sup>1</sup> :	<b>2002</b>	Duration <sup>2</sup> :	<b>23 year(s)</b>
		Agency(s) Responsible :	<b>DoE</b> (Lead) <b>NGOs, WARPO</b> (Supporting)
Short Description :	The NWPo states that "Protection and preservation of the natural environment is essential for sustainable development." (§4.12). However, despite the existing support of environmentally concerned organisations, NGO's and individuals within Bangladesh, any actions are unlikely to be successful without considerably increased public awareness of the environmental issues and how the affect on their own lives. This programme will therefore involve both government and NGO's and will include wide-ranging dissemination of information and strengthening of environmental NGOs. Means to ensure access of people to effective remedies (eg. Environmental law and effective courts) will also be established.		

<b>MIS Links</b>	Cost Calculation : EA Programme costing.xls	Map : EA 010 Map.jpg
	Disb't Schedule : EA Programme costing.xls	Description : EA 010 PgP.doc

<b>Finance</b>	<b>Costs</b>		<b>Funding (%)</b>		<b>Expected by ProgrammeYear</b>
		<b>Private</b>	<b>GoB</b>	<b>Beneficiaries</b>	
Total Capital <sup>3</sup>	<b>930.00</b> MTk	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>23</b>
Ultimate Recurring	<b>2.00</b> MTk/yr	<b>n/a</b>	<b>100%</b>	<b>0%</b>	<b>24</b>
Date of Data :	<b>31 07 01</b> (dd) (mm) (yy)	<b>Stacked Cumulative Cash Flow Chart</b>			
Status :	<b>Identified</b>				
Financial Base Year:	<b>mid-2000</b>				
Planned Expenditure (to date) :	<b>0</b> MTk				
Actual Expenditure <sup>4</sup> (to date) :	<b>0</b> MTk				

**Monitoring**

<b>Objective</b>	<b>Indicator</b>	<b>Present Status<sup>5</sup></b>
• National Plan for informing and mobilising public opinion	• The Plan document	NYD
• 8 pilot projects (one per region) completed and evaluated	• Project evaluation reports	NYD
• Effective public demand for sustainable environmental stewardship	• Number of local water resource protection agreements • Number of polluters and agreement transgressors dealt with at the request of the of general public	NYD

Notes : 1. Indicative 2. Until commissioning 3. Inclusive of planning, design supervision 4. For future monitoring purposes and NWMP updates  
5. Present Status keys: NYD- Not yet due, IP- In progress, D- Done

# National Water Management Plan

## Programme Costing Sheet

Programme Ref

EA 010

Title

Public Awareness Raising and Empowerment in respect of Environmental Issues

Assumptions:

Taka/US\$ 51.000

TA duration 1.0 years

Investment duration 22.0 years

All prices in mid-2000 values

Item	Unit	Quantity	Rate		Amount TkM	O&M %	O&M/yr TkM
			US\$	Tk'000			
<b>Technical Assistance</b>							
Establishment of DoE central support unit							
Expatriate consultants (all-in rate)	p-m	12.0	20,000		12.2		
Senior National consultants (all-in rate)	p-m	24.0		150	3.6	0.0%	-
Mid-level National consultants (all-in rate)	p-m	24.0		90	2.2	0.0%	-
Sub-totals					18.0		-
Other general TA programme costs		25%			4.5		-
Specific other TA programme costs	Sub-contracts				7.5	0.0%	-
<b>Total TA Costs</b>					<b>30.0</b>		<b>-</b>
<b>Other Programme Costs</b>							
1. Central unit establishment costs					10.0	20.0%	2.0
2. Publicity and promotional leaflets and programmes					890.0	0.0%	-
3.					-	0.0%	-
4.					-	0.0%	-
5.					-	0.0%	-
6.					-	0.0%	-
7.					-	0.0%	-
8.					-	0.0%	-
9.					-	0.0%	-
10.					-	0.0%	-
<b>Total Other Programme Costs</b>					<b>900.0</b>		<b>2.0</b>
<b>Overall Programme Costs</b>					<b>930.0</b>		<b>2.0</b>

Notes

Programme costs based on 5.0% of the costs of all other EA programme costs