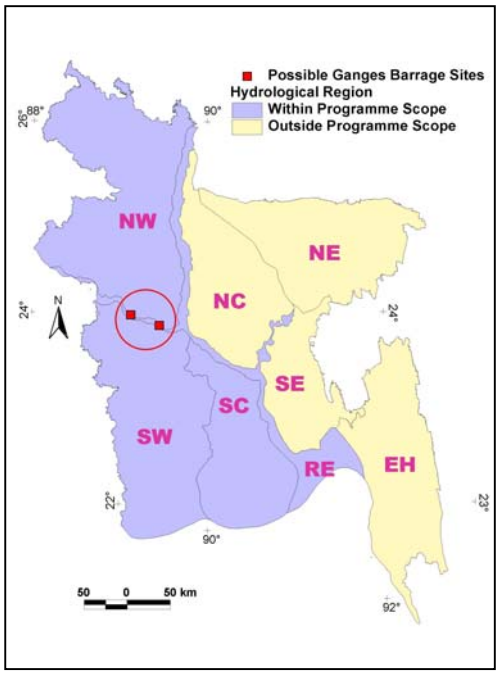
Ganges Barrage and Ancillary Works Ref: **MR 003**

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 OGDA 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/Means 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 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 :	**Main Rivers**	Region(s) :	**SW, NW, SC and RE**
Focus/Foci :	**Major River Barrages**	Location :	**On the Ganges River, Western B'desh**
Start Year[1] :	**2002** Duration[2] : **15 year(s)**	Agency(s) Responsible :	**BWDB** **(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.		

MIS Links

Cost Calculation :	MR Programme costing.xls	Map :	MR 003 Map.jpg
Disb't Schedule :	MR Programme costing.xls	Description :	MR 003 PgP.doc

Finance

	Costs	Private	Funding (%) GoB	Beneficiaries	Expected by Programme Year
Total Capital[3]	**50,858.00** MTk	**0%**	**100%**	**0%**	**15**
Ultimate Recurring	**1,394.00** MTk/yr	**n/a**	**100%**	**0%**	**16**

Date of Data : **31** (dd) **07** (mm) **01** (yy)

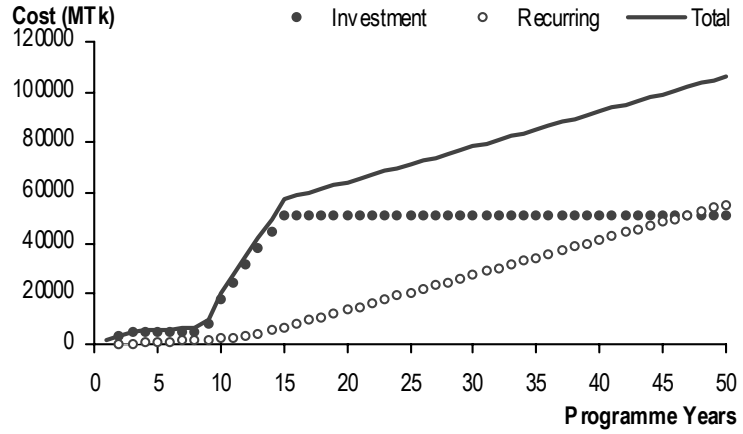
Status : **Identified**

Financial Base Year: **mid-2000**

Planned Expenditure (to date) : **0** MTk

Actual Expenditure[4] (to date) : **0** MTk

Stacked Cumulative Cash Flow Chart



Monitoring

Objective	Indicator	Present Status[5]
• 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 US$	Rate Tk'000	Amount TkM	O&M %	O&M/yr TkM
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%*	-
Total TA Costs					**-**		**-**
Other Programme Costs							
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%*	-
Total Other Programme Costs					50,858.0		1,394.0
Overall Programme Costs					**50,858.0**		**1,394.0**

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, OGDA Studies, WARPO,July 2001

**The cost of the Gorai Offtake Structure is estimated at Tk7,018M with GRRP and at Tk7,926M without GRRP.*