

DRAFT TERMS OF REFERENCE FOR MUHURI IRRIGATION MANAGEMENT OPERATOR

A. Program Background

1 In Bangladesh, agricultural development and sustainable natural resource management are critical for poverty reduction, as the majority of the poor (85%) live in rural areas and depend on agriculture for their livelihood. Agriculture generates 50% of employment, contributes 20% of gross domestic product, and provides a secure food supply for the whole population. Major causes of poverty are recurrent floods and riverbank erosion, as well as drainage congestion, salinity, cyclones and tidal surges, arsenic contamination, over-exploitation of groundwater, chemical and biological contamination of surface water, and drought. Climate change is expected to affect the future incidence and severity of disasters, necessitating more attention to managing disaster risk and adapting to change.

2 Extensive irrigation facilities have been constructed that include privately owned and operated groundwater abstraction technologies, and publicly owned and financed large surface water irrigation schemes.¹ The large irrigation schemes suffer from inefficient water utilization, inadequate maintenance, and a large backlog of needed repairs. More effort is required to foster community participation in sustainable management, and to include women and the private sector. The productivity of these schemes continues to be weakened by inadequate management, operation and maintenance (MOM), and now the infrastructure of most large schemes requires rehabilitation. This weakness is due to inadequate financing,² lack of beneficiary participation in management, and poor service delivery. The present low performance may be aggravated in future by changes in temperature and rainfall patterns owing to climate change. Such risks need to be considered when rehabilitating the infrastructure and modernizing system operations.

3 Government provides distribution systems down to secondary or tertiary levels for 15 existing large irrigation schemes, with a total command area of around 550,000 hectares (ha).³ For the period 1996-98, only about 46% of their net command area was irrigated from BWDB sources in the main irrigation season, and there is little evidence of improvement since then. Increasing the areas irrigated and recovering fees would assist economic growth through increased production and reduced subsidies. Also, developing sustainable approaches for MOM of the existing schemes would provide a sound basis for developing new schemes: the National Water Management Plan (2001) identified an additional 1 million ha that could be irrigated with new surface water schemes in areas where groundwater resources are limited.

4 Enhancing land, water and labour productivity is a high priority under the Government of Bangladesh's (the Government) Sixth Five-Year Plan, FY2011–FY2015.⁴ Robust and well managed irrigation systems are central to boosting productivity and contributing to food security. Agriculture growth is driven by a shift from subsistence rice-based cultivation to commercial high-value agriculture commodities, which is instrumental in advancing rural economic growth and contributing to long-term food security. The Government promotes diversification in agriculture by encouraging private agribusiness as well as providing access and improvements

¹ In Bangladesh, large irrigation schemes are classified as be larger than 2,000 hectares.

² Funds provided by Government for maintenance of these schemes is less than 50% of requirement and irrigation service charges collected from end-users amounts to only about 10% of the assessed amount.

³ 2000. National Water Management Plan. Volume No 3: Investment Portfolio. Ref AW001

⁴ Government of Bangladesh, Planning Commission, Ministry of Planning. 2011. Sixth Five-Year Plan: FY2011–FY2015. Dhaka.

to rural infrastructure. The Government's objectives for surface irrigation are, among others: (i) promote peoples participation in conformity with Integrated Water Resources Management principles; (ii) achieving food security of food grains through ensuring year-round sustainable irrigation; (iii) ensuring climate change resilience; (iv) strengthening and capacity building of water resource institutions; (v) command area development and irrigation expansion; (vi) increase beneficiary participation and, where possible, transfer management to beneficiary organizations, local government and the private sector; (vii) introduction of public-private partnerships (PPPs) to provide support to agriculture and for selected-services; and (viii) provide agricultural extension services including irrigation technology and on-farm water management.

5 Following the completion of the First Command Area Development (CAD-I) Project in 2003, the Government requested the Asian Development Bank (ADB) to provide assistance with preparing a Second Command Area Development Project (CAD-II) aimed at improving the performance of large flood control drainage and irrigation schemes (FCDI) schemes.⁵ During preparation of CAD-II two principal constraints to sustainable performance of major water schemes emerged: (i) limited capacity and resources of public agencies in effective maintenance of public agencies in effective MOM of large irrigation schemes; and (ii) chronic system deterioration as a result of inadequate operation and maintenance planning and financing mechanisms. The CAD-II investment project did not proceed and instead, the ADB supported the Government with capacity development TA 7260-BAN: Developing Innovative Approaches to Management of Major Irrigation Schemes (DIAMMIS).⁶ DIAMMIS investigated the potential for alternative service delivery agreement and management arrangements including using independent entities that would better manage and operate the systems. DIAMMIS developed innovative MOM approaches for the Muhuri Irrigation Project (MIP) based on establishing an independent Irrigation Management Operator (IMO).

6 Subsequently, the Government and ADB agreed to a \$150 million multi-tranche financing facility (MFF) to support the \$245.2 million Irrigation Management Improvement Investment Program (IMIIP, the "Program"). IMIIP will improve the management, infrastructure and productivity of the following three large surface irrigation projects ("projects"): (i) MIP in the first tranche; and (ii) the Teesta Irrigation Project (TIP), and Ganges-Kobadak Irrigation Project (GKIP) in the second tranche.⁷ These terms of reference are for engaging an international or national private entity to undertake the role and responsibilities of the IMO for the first five years of the Program, to prepare detailed designs of the MIP modernization investments, and to supervise construction works.

B. The Overall Program

7 The impact of the Program will be sustained high growth in irrigated agriculture. The Program's outcome will be efficient and sustainable management for large scale irrigation schemes producing higher yields, with expanded irrigated areas, and with a higher cropping intensification including diversification into higher value crops. The Program will be implemented over 10 years from 2014 to 2023, with Tranche 1 implemented over five years 2014 to 2018. The Program will have the following three key outputs:

⁵ ADB. 2005. *Technical Assistance to Bangladesh for Preparing the Second Command Area Development Project*. Manila (ADB TA No. 4740-BAN)

⁶ ADB. 2009. *Technical Assistance to Bangladesh for Developing Innovative Approaches for Management of Major Irrigation Systems*. Manila (ADB TA No. 7260-BAN)

⁷ The Program will directly improve the productivity of about 172,000ha of dry season irrigation (comprising: MIP 17,000ha, TIK 60,000ha and GKIP 95,000ha) and supplementing wet season irrigation to about 451,000ha (comprising: MIP 23,000ha, TIK 286,000ha and GKIP 142,000ha).

8 **Output 1: Performance Based Irrigation Management established for Selected Large Scale Irrigation Schemes** including: (i) establishing third-party Irrigation Management Operators (IMOs) at each project that will supervise rehabilitation and modernization works and provide long-term sustainable MOM; (ii) establishing efficient management and cost-recovery systems to maximise water use efficiencies and develop sustainable and reliable cost-effective service delivery of irrigation water supply that meets farmer's needs and improves their productivity; (iii) providing agricultural support services through the IMOs that promote efficient water use, crop diversification through sustainable practices, and developing opportunities for more commercial farming or agribusiness; and (iv) assisting with government reforms and institutional strengthening for long-term support of IMOs including: (a) the establishment of a PPP cell within the Bangladesh Water Development Board (BWDB); (b) the establishment of Implementation Coordination Committees (ICCs) for each project that will guide and support the establishment of sustainable and effective management; and (c) assisting with drafting of policy documents to support third-party management of medium and large irrigation schemes including provisions for improving cost recovery.

9 **Output 2: Selected Large Irrigation Schemes Rehabilitated and Modernized:** The Program will rehabilitate and modernize irrigation infrastructure including repair of head and cross regulators, canals, ancillary facilities, flood embankments and associated drainage structures. The prime focus will to provide more efficient and equitable irrigation distribution systems through appropriate technologies including provision of systems for cost recovery such as pre-paid metering systems, where appropriate.

10 **Output 3: Strengthened Program Management and Institutional Development** including: (i) program management at all levels to ensure the effective and timely delivery of the project outputs, including the highest possible standards of quality control; (ii) planning, feasibility assessment and detailed engineering design for Output 2; and (iii) Undertaking institutional strengthening, enhancing awareness, and providing training of key stakeholders including: (a) working with BWDB, water users associations (WUAs) and local government to redefine their role in the context of a new and changed approach to MOM of the upgraded projects; (b) working with farmers to ensure clear understanding of the new irrigation management strategies including requirements for cost recovery; and (c) training for farmers in irrigation water management for more efficient water use.

C. Implementation Arrangements

11 The Executing Agency for the Program is the Bangladesh Water Development Board (BWDB) in which a Program Management Unit (PMU) will be established and led by the MFF Director (MD). The PMDC will support the PMU and MD. The PMU will manage the implementation of both tranches of the MFF. For each project, the PMU will assign a Project Director (PD) to manage design and implementation works, and manage the Irrigation Management Operator (IMO). Each PD will be supported by a team of planning, design and construction, procurement, accounts and administration staff. A Program Steering Committee (PSC) will be established within the Ministry of Water Resources (MOWR) to provide overall coordination of the Program and facilitate inter-ministerial coordination. The PSC will be chaired by the Secretary, MOWR. The MD will be the PSC's secretary and all concerned ministries and agencies will be represented.

12 Also supporting the PMU will be a new PPP Cell that will provide guidance on tendering, private public partnerships, contract management, negotiating, legal, and communication. BWDB's Monitoring Division will be supported with a new Monitoring Cell that will provide

independent verification of the performance of various stakeholders as well as assessing impacts associated with Program's objectives. A Safeguards Desk will also be established to support the Monitoring Division with safeguard compliance management.

An Implementation Coordination Committee (ICC) will be established for each project to manage field implementation issues that arise related to conflicts, safeguards, security, and more generally concerns about the performance of the implementing parties. The ICC will be chaired by the project's BWDB Zonal Chief Engineer and committee members will comprise representatives from the offices of the Deputy Commissioner, the Water Users Associations and the IMO.

13 The EA will provide appropriate, furnished and air conditioned offices in Feni and field offices in each Upazila to accommodate IMO staff. The EA will also provide counterpart staff, equipment, maps and other necessary information, if available.

MUHURI IRRIGATION PROJECT

A. Introduction

14 The Muhuri Irrigation Project (MIP) is located in the middle of the Southeastern Region of Bangladesh adjacent to the coastal belt of the Bay of Bengal.⁸ It has an approximate a total area of about 43,900ha and covers the five Upazilas of Feni Sadar, Sonagazi, Chagalnaiya, Fulgazi and Parsuram Upazilas under Feni District, and the Mirsarai Upazila of Chittagong District. Immediately north of MIP is the Muhuri-Kahua Irrigation Project (MKIP) which has a total area of about 21,700 ha, and is contiguous with MIP. Both schemes rely on the same water supply and hence will be considered combined under IMIIP and referred to as MIP (Figure 1). A summary of their total, settled, cultivated and commanded areas is shown in Table 1.

Table 1: Muhuri and Muhuri-Kahua Areas

Irrigation Project	Land Use (ha)				Rabi Season Cropping (ha)		
	Total	Settlements	Cultivated	Other	Boro Rice	Fallow	Other
Muhuri	43,892	15,265	24,776	3,851	11,843	9,773	3,160
Muhuri Kahua	21,731	7,168	13,783	780	6,108	7,136	539
Total	65,623	22,433	38,559	4,631	17,951	16,909	3,700

Source: Analysis of 2011 satellite imagery prepared for the project by CEGIS, 2013

15 Topographic relief of the project area is generally low lying with ground elevations varying from 8m PWD in the north to 4m PWD in the south; and 5.3m in the west to 6m PWD in the east. The area comprises smooth, broad ridges and basins which are underlain by silty-soil deposits. Land types classified according to seasonal depth of flooding are shown in Table 2 which shows about 70% of the area floods to a depth of 0.9 m or more during the Kharif season.

Table 2: Geographic and Crop Data

Land	Description	Flood depth	Percentage	Remarks
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⁸ Between latitudes 22°45'N to 23°09'N and longitudes 91°21'E to 91°35'E

Type		(cm)	(%)	
F0	High land	0 - 30	20	Triple cropping possible with irrigation during Rabi
F1	Medium high land	30 – 90	51	
F2	Medium low land	90 – 180	21	Double cropping possible with deep water Aman and irrigation during Rabi
F3	Lowland	>180	8	
Total			100	

Source: CAD-II Agriculture Report 2008

16 Geologically, MIP comprises parts of the physiographic unit of Meghna Estuarine Flood Plain, Chittagong Coasted Plain, and the Northern and Eastern Hills. The area has the following soil characteristics:

- (i) Old Meghna Estuarine Flood plain: Silt-loam soils predominate on highlands and silty-clay to clay in lowlands. Non-calcareous Dark Grey Flood plain soils are the only general type of the area. Organic matter content of the soils is moderate, moisture holding capacity is medium. Top soils are moderately acidic but sub soils neutral in reaction. General fertility level is medium.
- (ii) Chittagong Coastal Plain: Non-calcareous Grey Floodplain Soils, Non-calcareous Alluvium and acid sulphate soils are the major components of general soil types of the area. Generally the fertility level of soils is medium. Organic matter content is low to moderate.

17 Based on sample surveys, landholdings comprise: (i) 37% are landless or functionally landless with less than 0.2 ha of landholdings; (ii) 47% have small or marginal landholdings ranging from 0.2 ha to 1.0 ha; (iii) 13% have medium landholdings ranging from 1 ha to 3 ha; and (iv) 3% have large landholdings greater than 3 ha.⁹

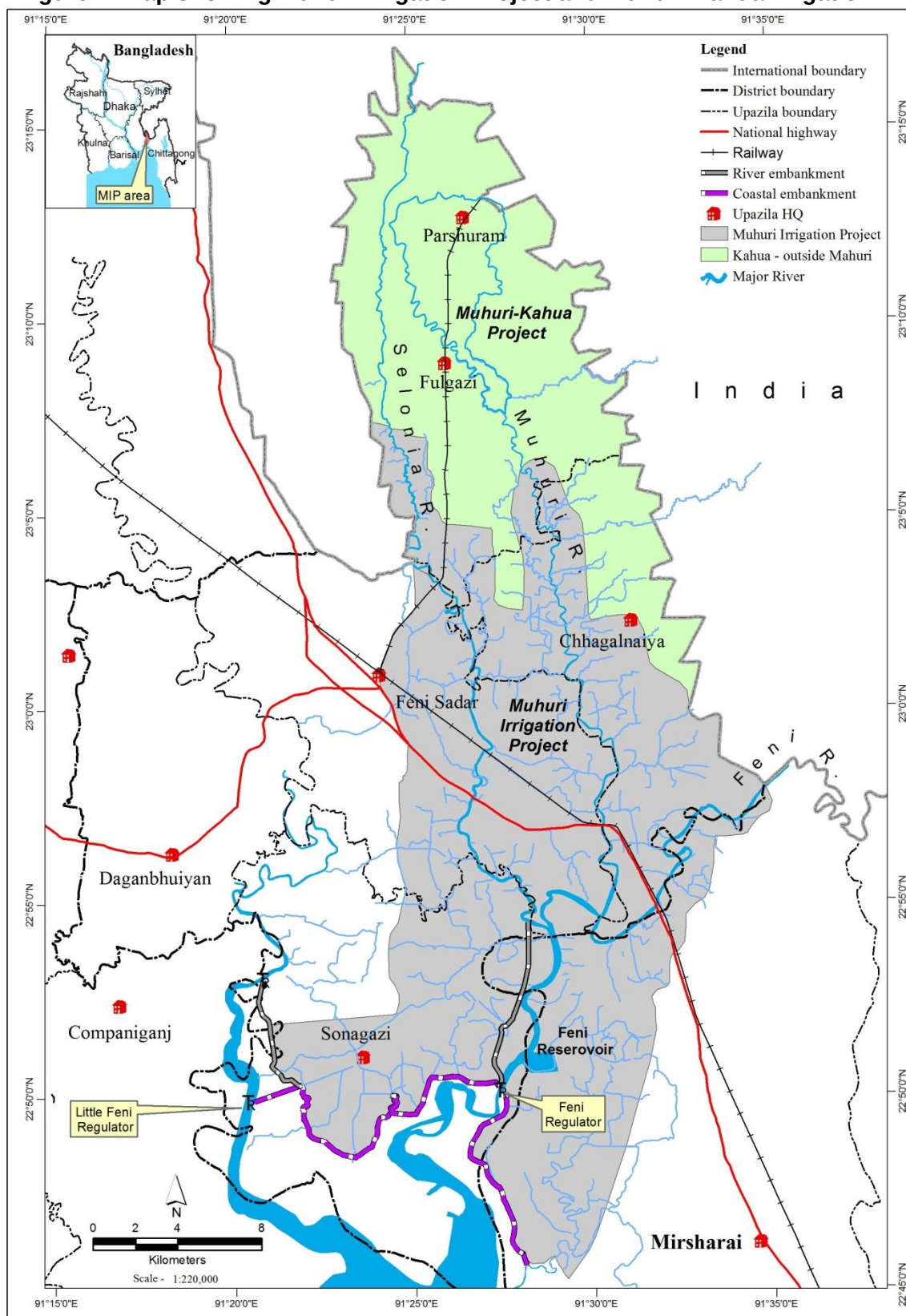
18 The MIP area experiences three seasons:

- (i) Southwest Monsoon, usually starting in May and lasting until October. Almost 90% of the total annual rainfall occurs during this period, when temperatures and relative humidity are high.
- (ii) Northeast Monsoon, usually lasting from November to March. This is the dry, cold season but occasionally rainfall occurs.
- (iii) Hot Season, usually a short period that extends from about late March to May. The highest daily temperatures generally occur at this time and, owing to cloud burst events, flash floods often occur from the rivers flowing from the Tripura Hills located in the eastern region.

19 MIP has a three tiered system: (i) the Level 1 primary system comprises the coastal embankment, main regulator structures, the Feni Reservoir and the Feni, Muhuri and Kalidash-Pahalia main river channels; (ii) the Level 2 secondary system comprises the khals; and (iii) the Level 3 tertiary system comprises the low lift pumps (LLPs) and farm distribution systems. The embankment and regulator raises water levels in the upstream rivers which in-turn flood the khals. LLPs are positioned along the khals and raise the water from the khal into the farm distribution systems, each servicing command areas ranging from 5ha to 40ha. In addition to irrigation, the Level 1 system also manages the risk of both river and tidal flooding.

⁹ CAD-II Agriculture Report 2008

Figure 1: Map showing Muhuri Irrigation Project and Muhuri-Kahua Irrigation Project



Source: PPTA, 2013

Main Issues Affecting MIP Productivity

20 MIP has lost productivity, in terms of irrigated area and cropping intensities, owing to limited access to water and poor drainage. The main causes are complex and include:

- (i) Major siltation in the khals and rivers which: (a) limits sufficient irrigation water in the khals from reaching the LLPs; and (b) restricts drainage from flowing back to the rivers.
- (ii) Significant reduction in Feni Reservoir storage due to this siltation. The original reservoir storage was about 32Mm³ but this has reduced to about 7Mm³. The current overall storage in reservoir, rivers and khals is 54Mm³ of which 18Mm³ is live storage.
- (iii) There appears to have been reduction in the river flows as a result of increased abstractions in India. Heavy abstraction of ground water is also likely to be reducing the natural recharge to the rivers.
- (iv) There are large annual climatic variations which are affecting water availability, recent cold winters and changes in agricultural practice are delaying the planting dates of Boro rice to late January and February which puts additional pressure on the scarce water resources during the critical February and March periods.
- (v) The low prices of rice and high prices of inputs including pumping has resulted in many farmers not planting rice.
- (vi) Pump operators find it too expensive to provide water to plots located far from the pumps and most of the irrigated land is a nucleus around each pump.
- (vii) There is a significant drop in the number of operational pumps and the irrigated areas. Pump inventories in 2013 show there are only about 440 operational pumps from an original 800 pumps. The irrigated area from surface water based on 2013 satellite imagery is estimated to be 8,400ha in MIP reduced by 60% from the original target of 23,000ha.

21 Other issues include deterioration of the coastal embankment and associated structures which are causing salinity intrusion and impediments to drainage as well as risk from sea water inundation during high sea level periods.

Planned MIP Infrastructure Investments

22 In the framework of the IMIIP an investment plan is designed to increase the productivity and long term sustainability of the MIP. The investments have been targeted to improve the irrigation performance and cost recovery and include:

- (i) Repair of the coastal embankment and associated structures to prevent saline intrusion and ingress of sea water during storms.
- (ii) Repair of 10 existing flow control structures including the main Regulator and provision of 8 new small water/ flood control structures.
- (iii) River bank protection in localised areas to protect adjacent communities.
- (iv) Excavation of 4.5 million m³ from the 460km of khals to provide full access to irrigation water for all irrigation water users and to improve drainage.
- (v) Upgrading and modernization of the Level 3 system including: (a) the replacement of existing (mostly diesel) pumps with electric pumps; (b) replacement of the existing open canals with buried uPVC pipe distribution system; and (c) installation of a prepaid meter system to allow water allocations to be based on a volumetric basis and ensure full and transparent payment and accounting.

- (vi) Upgrading and expansion of the local electrical distribution system to energize all new pumps, with some supplementary solar power, to reduce operation costs and allow for the introduction of prepaid card meters and control systems.
- (vii) Provision of the prepaid card meters and control systems.
- (viii) Repair and provision of new office space for the BWDB and proposed irrigation management operator.

23. The investment to modernize the tertiary (farmer) distribution system forms about 40% of the investment and is designed to increase the water efficiencies to maximize the irrigable area, as well as reduce operation and maintenance (OM) costs. The prepaid metering and piped distribution will provide on-demand water to farmers throughout the year. It will open opportunities for farmers to increase cropping intensities, support crop diversification and facilitate collection of water charges. The use of low pressure pipes offers the best solution to meeting the needs of water and power efficiencies.

24. All the existing diesel pumps will be replaced with electric pumps to reduce the operating costs and improve efficiencies. At some pumps, provision of solar panels is also being explored to supplement electric power.

25. To advance project preparedness and allow construction activities to begin during the IMO's first year of operation, detailed designs of new Level 3 systems have been prepared and approved by the government. These cover about 2,000 ha of MIP, including a 30ha pilot unit with solar pumping.

Planned Pre-paid Smartcard Pump Operation and Revenue Collection System

26. Prepaid smartcard meter and control systems offer a highly efficient and transparent collection of service fees from farmers. The system also allows the farmers to pay based on the volume of water received which has shown to result in significant water use reduction over current systems that charge on seasonal payments per area basis. Prepaid meter have been tested and are proving very effective under the Barind Multipurpose Development Authority Project.¹⁰ In conjunction with a buried pipe tertiary distribution system, this modernized system is expected to result in the following: (i) water use efficiency gains; (ii) flexible on-demand irrigation supply to farmers; (iii) 100% financial cost recovery from users (farmers) according to amount of water each uses; and (iv) elimination of possible "rent seeking" from pump owners and operators, corruption, or loss of project funds. These in turn will enable: (i) considerable expansion in cropped area; (ii) reduced pumping volumes and costs; (iii) a variety of crops to be cultivated with different planting dates, crop durations and irrigation water requirements, to suit individual farmers; (iv) improved crop yields arising the individual farmers being able to control timing and amounts of irrigations; and (v) sustainable funding for operation and maintenance.

Planned MIP Management Arrangements

27. MOM of Levels 2 and 3 will be the responsibility of the IMO. The IMO will be contracted by BWDB in two stages: (i) Stage 1 IMO will be a performance-based management contract for Years 1 to 5 (inclusive) during which the IMO will design and supervise construction of the investment works while also managing, operating and maintaining Levels 2 and 3 of the project; and (ii) Stage 2 IMO will be a lease contract for Years 6 to 25 (inclusive) to undertake MOM of Level 2 and 3 of the project. The Stage 1 IMO will be financed by IMIIP according to the terms of the contract, whereas the Stage 2 IMO will be financed solely from water tariff revenues.

¹⁰ <http://www.bmda.gov.bd/>

During Stage 1 there will be an independent review of the IMO arrangements and terms of reference (TOR) for Stage 2 will be prepared. The present TOR applies to the Stage 1 IMO only.

28. The IMO will be a private company or consortium contracted by BWDB through international competitive bidding based on a two-envelope technical and financial offer. The contract will be for a five year period. During this period, the IMO will be responsible for MIP's MOM (Levels 2 and 3) and will include the establishment and management of efficient revenue collecting through the prepaid meter systems. The IMO would also be responsible for: (i) the design for tertiary level infrastructure (LLPs and water distribution system), (ii) supervision of construction of all the investment contracts (including those for the Level 1 system that will be designed by the PMDC); and (iii) the development of pilot agricultural demonstrations and pilot cost recovery activities. All MIP assets will remain in the ownership of the Government.

29. Using the prepaid smartcard system, the IMO will be responsible for the collection of water tariff fees which include the Irrigation Service Charge (ISC). During Stage 1, the collected tariff will accumulate within an Escrow bank account. A portion of the ISC will be paid to BWDB and the ICC to support the WUAs.¹¹ The accumulated tariff fees within the escrow account will be used to finance the start-up requirements of the Stage 2 IMO.

B. Scope of Services

Introduction

30. The IMO will be engaged under a Management Services Contract for the provision of services for design, construction supervision, MOM, and agricultural support services for MIP. A general schedule of the following activities is shown in Figure 2:

- (i) Activity 1: Establishment of efficient and sustainable MOM of Level 2 and 3 infrastructure on rehabilitated areas.
- (ii) Activity 2: Construction supervision of Tranche 1 investment works.
- (iii) Activity 3: Participatory design of the Level 3 distribution systems.
- (iv) Activity 4: Agricultural support services, pilot cost recovery activities, and implementation of training and awareness programmes.

Figure 2: Activity planning during over the contract time

	Year 1	Year 2	Year 3	year 4	year 5
Activity 1 : Establishment of Efficient and Sustainable Management Operation and Maintenance of level 2 and 3 infrastructure					
Activity 2 : Supervision of the Construction of the Tranche 1 Investment Contracts					
Activity 3 : Participative Design of the Pipe Distribution Systems					
Activity 4 : Agricultural Support Services, Pilot Cost Recovery Activities and Training and Awareness					

31. Given the importance of all aspects of the contract in the long-term sustainability of the provision of irrigation services for MIP, bidders should submit as part of their technical proposal a detailed plan showing their proposed approach to the integration of the four activities, an appreciation of the key issues involved, and their approach to staffing and project management. The services and outputs of the IMO are described in detail below.

¹¹ The portion of ISC to be paid to BWDB and ICC will be determined on an annual basis when water tariff prices are agreed.

Activity 1: Efficient and Sustainable MOM of Level 2 and 3 Infrastructure

Scope of Services

32. Efficient and sustainable MOM for MIP is the core activity for the IMO and includes:

- (i) The establishment and implementation of effective OM systems of the Levels 2 and 3 as well as minor structures in the coastal and river embankments. Costs of maintenance would be paid for through water tariffs. Physical maintenance activities would be done by the most appropriate method as decided by the IMO.
- (ii) Effective OM on the rehabilitated structures, after completion of the works, accordingly to the provisional schedule.
- (iii) Annually agreeing with BWDB and ICC the water tariff rate.
- (iv) Once investment works are completed ensure full cost recovery for MOM activities are achievable through tariff collection using the prepaid meter systems.
- (v) Maintain close coordination and liaison with water users and other stakeholders, and implement programs of communication and awareness to ensure stakeholders are well informed and engaged with the project process.
- (vi) Establishing transparent and open systems of financial management through an Escrow¹² bank account for the project which would be used for collected revenue and payment of pump operations, ex-BWDB staff supporting the IMO on lien contracts, payment of electricity and telecom tariffs, and financing the IMO in Stage 2.
- (vii) Preparation of an annual report and work plan, preparation of quarterly progress reports showing revenues and disbursements.
- (viii) Maintaining a professional approach to undertaking all tasks and keeping the highest possible of cooperation and relationship with water users and other stakeholders.
- (ix) Selecting and contracting individual pump operators. The IMO will prepare a standard form of contract for engaging all pump operators which will be amended and updated as necessary on a collective basis. Selection will be based on their skills, attitude and experience. The experience of existing pump operators will be taken into account.
- (x) Engaging civil works contractors and IMO subcontractors will follow government and ADB Procurement Guidelines (2013, as amended from time to time) and ADB's Guidelines for the Use of Consultants (2013, as amended from time to time).
- (xi) Monitoring and developing an overall water resources management plan for the project area that includes surface and ground water. The plans will be developed and updated as required in liaison with stakeholders to ensure long-term sustainable management of MIP and equitable access to water for all.
- (xii) Liaise with the Rural Electrification Board (REB) to ensure the best quality of service is made available for irrigation including reducing wherever possible power cuts especially during the periods of peak irrigation requirements and the sensitive periods of crop growth.
- (xiii) Organising and managing back-up pumping systems during power cuts.
- (xiv) Ensuring environmental, social and gender safeguard compliances are maintained during implementation of investment works and regulation MOM activities. Working under the direction of the PMU and working closely with

¹² Escrow refers to money held by a third-party on behalf of transacting parties. The escrow manager has the duty to properly account for the escrow funds and ensure that usage of funds is explicitly for the purposes intended.

contractors to ensure the effective implementation of the environmental management plan and prepare the necessary monitoring reports as defined in the monitoring plan.

- (xv) Developing an management information system (MIS) including, among other things: (i) GIS spatial database of infrastructure, assets and landholdings including detailed mapping of land assets owned by BWDB including khals, embankments and structures; (ii) time-series database of operational data including rainfall, water levels and flows throughout the Level 1 to 3 system including pump flows; (iii) records of maintenance needs and actions detailed by their nature, type, and location; (iv) record of all tariff and ISC revenues collected; (v) records of all OM expenses; and (vi) records of crops, yields and marketed surpluses based on the monitoring of a representative sample of farmers and other sampling methods.
- (xvi) Preparing OM Manuals to meet all OM needs and procedures based on an assessment of requirements as well as lessons learnt during the initial four years. The manuals will be the key documents to support the bidding process for the Stage 2 IMO. Three manuals will be prepared: (i) scheme operational manual; (ii) scheme maintenance manual; and (iii) a scheme administration manual.

33. The IMO will be required manage, operate and maintain the Level 2 and 3 infrastructure including:

- (i) OM of the LLPs and smart card metering system.
- (ii) Management of revenue collection using the smartcard metering systems.
- (iii) Maintenance of the pipe distribution systems.
- (iv) Maintenance of the khals and other secondary infrastructure.

34. The estimated OM requirements for the Level 2 and 3 systems are summarized in Table 3.

Table 3: Estimated OM Costs for Years 1 to 5

Cost Categories		Year						
		1	2	3	4	5	6	7 onwards
		Stage 1 Management Contract					Stage 2 Lease	
Area of Irrigation under new management		500	2,000	6,000	12,000	17,000	17,000	17,000
Volume Pumped	Mm3	6	24	71	141	200	200	200
Income \$ million								
Tariff \$/000m3	10.6	0.062	0.248	0.745	1.489	2.110	2.110	2.110
Outgoings \$ million								
OM/depreciation Level 3 pumps/pipe distribution		0.027	0.107	0.322	0.644	0.912	0.912	0.912
OM Level 2 Khals and other costs		-	0.100	0.100	0.100	0.100	0.150	0.338
Irrigation Service Charge Tk260/ha (\$3.25/ha)		0.002	0.007	0.020	0.039	0.055	0.055	0.055
IMO Organisation Costs		-	-	-	-	-	0.399	0.399
IMO margin 10% on operational costs							0.112	0.131
VAT 15%		0.004	0.032	0.066	0.117	0.160	0.244	0.275
Total Outgoings		0.033	0.246	0.507	0.900	1.227	1.871	2.110
Net Balance \$ million								
Net Balance \$ million		0.029	0.002	0.237	0.589	0.883	0.238	-
Cum Balance \$ million per year		0.029	0.032	0.269	0.858	1.741	1.979	1.979

Tasks Required for Bid Submission

35. A methodology for MOM of MIP to ensure a consistently high standard of service for delivery of irrigation water services to the farmers that also takes into account the issues discussed in the following paragraphs.

36. With the proposed Level 3 system, the operation of the rehabilitated areas may become relatively simple; however the Bidder should describe in their technical proposal the main aspects of the work to be undertaken. The methodology should: (i) demonstrate that the Bidder understands the tasks needed to be carried out and their ability to plan, manage and guarantee dependable, efficient and cost-effective water delivery service; (ii) describe the organization of its team to guarantee the water services during irrigation season (Rabi season and Kharif 1 season: January to June) and the organization of the team and their activities during the non-irrigation season (Kharif 2 season: July to December). The Bidder will: (i) specify the level of labour intensity they intend to apply for scheme operation and how local staff (pumps operators) will be hired/contracted and supervised, to ensure quality of service; (ii) propose how the electrical pump backup system will be organised and managed; (iii) describe the procedures to cooperate with BWDB that will keep the responsibility of MOM of the Level 1 system; and (iv) describe the mechanisms for data collection from the prepaid meter system.

37. Draft maintenance Manual: The proposed mechanisms for routine, emergency and preventative maintenance should be developed by the IMO as part of its bid. It should demonstrate a planned approach to maintenance of the infrastructure with a planned program of activities, and measurable parameters to ensure potential for effective monitoring and control as well as record keeping system. The Draft Manual to be presented as part of bid submission will be used to evaluate the Bidders' approach and methodology. During the contract period the successful bidder has the task of updating and developing fully this draft.

38. Draft Maintenance Program: a fully resourced and time bound maintenance program for the completed Scheme including resources to be mobilized by the IMO, e.g. use of own labour, equipment, renting or outsourcing to local or regional contractors; the bidder will specify the level of labour intensity he intends to apply for maintenance works and how local labour would be hired and supervised to ensure adequate quality of works; detailed specifications, time-bound and priced proposals for items of major plant and equipment that the bidder intends to purchase or hire to carry out maintenance are to be provided by the bidder in the respective technical and financial forms of the bid. The proposal should include possible approaches to management of siltation in the khal including silt reduction strategies, development of cost effective desiltation works including necessary actions to minimise disruptions to irrigation supplies.

39. Information system proposals to develop the data bases and SIG linked to infrastructures, O&M, water users; agricultural situation; hydraulic and climatic data collection; etc. The bidder will describe its staff organization and effective means of implementation.

40. Management reporting approach: To show the items of financial, technical and operational data collection and reporting that will be provided on a regular basis. This to show the program and procedures for reporting both internally and to BWDB.

41. Customer Service Plan to include levels of service response, dispute resolution, interaction with farmers and IWUA, as well as to incorporate approaches to office staffing, equipment.

42. The bidder will describe the effective means of implementation to guarantee efficient and sustainable operation and maintenance of the rehabilitated infrastructures (transport means for operation staffs, organization chart; office requirement at Upazila level; workshop; etc...)

Activity 2: Construction Supervision of Tranche 1 Investment Works

Scope of services

43. The IMO would be responsible for the supervision of construction of the investment contracts (coastal embankment, river bank protection; khal excavation, rehabilitation and new structures, pipe distribution/pumps/prepaid meters, upgrading of the electricity network, rehabilitation of offices). Contracts will be let by BWDB through the nominated Project Director. Payments would be made by BWDB based on progress certificates by the IMO. The IMO staff supported surveyors will develop a very high level of supervision to international ISO or equivalent standards which can form a model for future supervision under the IMIP. The construction time schedule is as shown in the Figure 3.

Figure 3: Design and Construction Implementation Schedule

	Year 1				Year 2				Year 3				Year 4				Year 5			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Wet Season			x	x			x	x			x	x			x	x			x	x
Coastal embankment works ^{a/}	x	x			x	x			x	x			x	x						
Khal excavation ^{b/}	x	x			x	x			x	x			x	x						
Rehabilitation and new structures ^{c/}	x	x			x	x														
Level 3 system works ^{d/}	x	x	x	x	x	x	x	x	x	x	x	x	x	x						
Upgrading of the electricity network (km line /quarter) ^{e/}	x	x	x	x	x	x	x	x	x	x	x	x	x	x						
Rehabilitation of offices ^{f/}					x	x														

Notes: ^{a/} Number of km of coastal embankment works = 22.4 km; ^{b/} New Coastal Flood Protection Structures (3 structures)/New Water and Flood Control Structures (4 structures)/river bank protection (0.4 km); ^{c/} estimated volume for re-excavation is for 3.8 million m³; ^{d/} 15,000 ha need to be modernized; ^{e/} a total of 160km of new electrical distribution of which it is estimated 70% would high tension and 30% low tension. In addition provision of voltage regulators capacitors, transformers and line isolators; and ^{f/} Rehabilitation of the current offices of the BWDB

44. The scope of services of the IMO for construction supervision will include the following:

- Represent the interests of BWDB under the Works Contracts, in any manner related to the Works Contracts and the proper execution thereof.
- Review and comment or recommend acceptance of Contractor's performance security, insurances and other legal documents.
- Deliver instructions to commence or suspend works according to the provisions of the contract on behalf of BWDB.

- (iv) Review and comment or approve the Contractor's work program, method statements, proposals for materials sources, quality management plan, including testing laboratories and procedures for testing, Environmental Management Plan (EMP), Health and Safety Plan (HSP), Public Health and Public Safety Awareness (PHPSA) Plan, including HIV/AIDS Awareness Program, Traffic Management Plan, and other deliverables that the Contractor is obliged to furnish for the Engineer's approval.
- (v) Prepare and submit to BWDB for approval a disbursement schedule based on the Contractor's proposal in accordance with the requirements of the construction contract.
- (vi) Verify the Contractor's pre-construction survey and setting out.
- (vii) Prepare a quality assurance plan, in consultation with the Contractor, including arrangements to check the quality of materials brought to the site, to ensure that the quality of construction is consistent with the technical specifications, and to maintain test records.
- (viii) Prepare a program for inspections and load testing of existing structures (as applicable), review test results and make recommendations for any further actions.
- (ix) Review and approve the Contractor's construction drawings, and drawings for temporary site works.
- (x) Review and approve the as-built construction drawings prepared by the contractor. The as-built drawings will be based on detailed design drawings with amendments for changes during construction.
- (xi) Visit the site on a routine basis to observe the progress and quality of the Contractor's work, and maintain representatives at the site in such a manner that adequate supervision of construction works is provided at all times the Contractor is working.
- (xii) Organize the supervision of the works with proper allocation of responsibilities to individual inspectors and supervise their work to ensure effective execution, including proper conduct, attendance and performance of their duties.
- (xiii) Ensure the Contractor supplies to the site all material, equipment and machinery that have been committed in its bid, and ensure that all items remain on site until their release has been authorized. Ensure that the Contractor properly records all equipment, materials and labour which have been supplied under the Works Contract.
- (xiv) Assess the adequacy of all inputs, such as equipment, labour and materials provided by the Contractor and its methods of work in relation to the required rate of progress and, when required, take appropriate action in order to maintain agreed schedule.
- (xv) Inspect and evaluate all Contractor's installations, shops and warehouses and other accommodation to ensure compliance with the terms and conditions of the Contract.
- (xvi) Provide timely assistance and direction to the Contractor in all matters related to the interpretation or clarification of the Works Contract, ground survey controls, quality control testing and other matters related to Works Contract compliance and progress of the Works; and ensure prompt responses when the Contractor calls for inspections and approvals.
- (xvii) Issue instructions, in accordance with the authority specified in the Conditions of Contract, to Contractors to ensure Works will proceed according to agreed schedule.

- (xviii) Collect, track and furnish BWDB with indicators of Construction Performance, against contractual requirements as enumerated in the Construction Contract.
- (xix) Ensure that the Works are executed in accordance with the detailed design drawings and that the quality of workmanship and materials is in compliance with the technical specifications. Evaluate and determine acceptability of substitute or "equal" materials and equipment proposed by the Contractor.
- (xx) Perform or oversee all laboratory and field testing of Contractor's work, materials and products required to ensure that the quality as specified in the Contract is attained. The Construction Contractor will provide testing facilities and will establish routine testing related to construction works. Review all certificates of inspections, tests and approvals.
- (xxi) Assure the receipt of, and maintain as permanent records, all warrants required under the terms of the Construction Contract for materials and equipment accepted and incorporated in the Scheme. All local materials incorporated in their source are also to be approved.
- (xxii) Monitor implementation of Environmental and Social Management Plan of the Scheme during construction phase.
- (xxiii) Monitor implementation of the Health Safety Plan. Check and ensure that the Contractor has taken suitable measures with regard to the safety and health of its workers (e.g. provision of potable water, lodging, mosquito nets, and first aid kits), site safety, and accident prevention measures. Inspect the security and safety aspects of construction and temporary works to ensure that every reasonable measure has been taken to protect life and property.
- (xxiv) Monitor implementation any public health requirements including HIV/AIDS awareness and prevention.
- (xxv) Liaise with communities and businesses affected by any of the works undertaken under the Project.
- (xxvi) Ensure that Contractor complies with its contractual obligations in respect of labour standards (including the monitoring of trafficking in persons), mitigation of impacts on the environment, health and safety, by withholding payment against appropriate items in applications for interim payment, as applicable in accordance with the provisions of the Works Contract.
- (xxvii) Prepare and maintain inspection and engineering reports and records to adequately document the progress and performance of the works.
- (xxviii) Prepare incident reports, covering accidents, environmental and other incidents, and take appropriate follow on action.
- (xxix) Perform all survey measurements of completed or partial works where required for the determination of quantities. Compute quantities of approved and accepted work and materials and check, certify and make recommendations to BWDB on the Contractor's interim and final payment certificates. All payment certificates shall be checked and countersigned by the IMO.
- (xxx) Review and comment on, or recommend approval of, Contractor's proposals for variations.
- (xxxi) Propose and present for the approval of PMU any variations in the Works Contract that may be deemed necessary for the completion of Works, including information on any effect that the variations may have on the Works Contract amount and the time for completion of the Scheme, and prepare all necessary variation orders, including alterations of plans, technical specifications, and other details for the approval of BWDB.
- (xxxii) For the earthwork contracts (coastal embankment and khal excavation) to work closely with the BWDB, communities and contractors to prepare appropriate

adjustments to the design as required including adjustments to the design cross sections to avoid impacts on properties located along the banks of the khal or on the crest or slopes of the coastal embankment. For adjustments to the khal and embankment cross sections the impacts on the hydraulic capacity of the khal and resilience to coastal sea levels need to be considered.

- (xxxiii) To work with the BWDB, communities and contractors to ensure safe, environmentally appropriate and socially acceptable excavation of borrow material for fill of the coastal embankment and disposal of spoil from the khal excavation.
- (xxxiv)
- (xxxv) Inform BWDB about problems or potential problems, which may arise in connection with the Works Contract and make recommendations for possible solutions.
- (xxxvi) Examine and make recommendations to BWDB on all claims from the Contractor for extension of time, additional compensation, extra work or expenses or other similar matters. Attend claims meetings between BWDB and Contractor.
- (xxxvii) Arrange and preside at periodic coordination and progress meetings on site, and prepare the minutes of meetings.
- (xxxviii) Review reports and documents submitted by Contractor.
- (xxxix) Prepare and submit reports on the progress of the Works, the Contractor's performance, quality of works and the Project's financial status and forecasts.
- (xl) Keep on site full and complete records of all matters pertaining to the Works including, but not limited to, programs, correspondence, instructions, variations, revised drawings, site sketches, minutes of meetings, testing, inspections, approvals, measurements, interim payments, progress reports, insurances, visitors to site, completion certificates, day works, Contractor's labour and equipment, site diaries and inspector's daily reports.
- (xli) Arrange and make public presentations of the work done to date at the request of BWDB.
- (xlii) Upon completion of the Works, carry out the necessary inspection, specify and supervise any remedial works to be carried out and, upon completion, propose to BWDB a date for a joint inspection, prior to the issuance of the Certificate of Substantial Completion.
- (xlili) Review and comment on or approve as-built drawings prepared by the Contractor.
- (xliv) Submit supervision Plan for Investment Works and supervision progress report.
- (xlv) Perform all other tasks, not specifically mentioned above, but which are necessary and essential to ensure the successful supervision and control of all the construction activities, in accordance with the terms of the Works Contract.

45. The IMO will also be responsible for post construction services that take place during the Contractor's defect liability period. Also, during the defect liability period the Contractor should provide an active maintenance program to maintain the elements of the scheme in good order until Final Acceptance. During this period, the IMO will act on behalf of the Employer in all matters related to the full performance by the construction contractor of its obligations under its defect liability warranty. The IMO's tasks shall include the following:

- (i) Inspect the Works at appropriate intervals during the Contractor's Defects Liability Period and ensure that the Contractor is maintaining all scheme elements in good condition.

- (ii) Inspect the Works at appropriate intervals during the Contractor's Defects Liability Period; and, prior to expiration of the Defects Liability Period, prepare a final deficiency list, supervise remedial works and recommend to BWDB the date of the Final Inspection of the Works.
- (iii) Carry out the Final Inspection of Works together with representatives of BWDB, and the Contractor.
- (iv) Prepare and issue the Final Acceptance Certificate in consultation with BWDB and the collaborating agencies.
- (v) Prepare the Final Payment Certificate.

Tasks Required for Bid Submission

46. A methodology and program of work will be submitted as part of the bid submission including:

- (i) Detailed methodology for supervision of rehabilitation work (preparation of construction; technical management; administrative management ; communication with stakeholders; financial management; agreement with quality, health, environmental plans); Post construction services (periodical inspection of infrastructure and reparation of defects; issuing of final certificates).
- (ii) Scoping: A statement confirming limits of work, including: (a) a clear definition of the work to be carried out for the various components of the activity (coastal embankment; khal excavation; rehabilitation of new structures; distribution system; electricity network; rehabilitation of offices), noting any difficulties that may be expected and how they may be overcome; (b) proposed timetable of each components; and (c) IMO team and specialist needs.
- (iii) Outline program of work, showing expected time, duration and personnel as well as the interrelationship between components.
- (iv) Regarding excavation of the khal, the bidder shall describe in their proposal the best method to accurately estimate the volumes of excavation and approaches to effectively manage the disposal of amount of sediment excavated from the khal.

47. The bidder will describe the effective means of implementation to guarantee efficient and supervision of work (transport means for field staffs; organization chart; etc...)

Activity 3: Participatory Design of the Level 3 Distribution Systems

Scope of services

48. The IMO is responsible for preparing the detailed engineering design, bill of quantities (BOQ), engineering cost estimates, specifications and contract bidding documents for the Level 3 distribution systems for the remaining 15,000ha which includes: (i) the LLPs and associated civil structures; (ii) the pipe distribution network including storage tanks, pressure risers, and outlet valves and associated civil structures; (iii) expansion of the electricity distribution network; and (iv) installation of the smartcard prepaid meters and control systems. The designs should generally follow the design criteria for the advance designs already prepared for the initial 2,000 ha. The IMO will prepare the layout designs of the distribution systems with participation of the farmers, landowners, local water user associations, ICC and local communities. The participatory approach to be followed by the IMO during the design consultation process will be firstly agreed with ICC and BWDB. A tentative schedule for the design and implementation of Level 3 works is shown in Figure 2 which shows the design and implementation of investment works taking a phased approach with the initial 2,000ha systems being implemented in the first

year followed by three phases of participatory design and implementation of 5,000ha units of investment works.

Figure 4: Level 3 Tentative Design and Implementation Schedule

	Year 1				Year 2				Year 3				Year 4				Year 5			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Wet Season			x	x			x	x			x	x			x	x			x	x
Phase 1 (2,000 ha)																				
Construction	x	x																		
Defeats Period			x	x	x	x														
Phase 2 (5,000 ha)																				
Consultations	x	x																		
Design		x	x																	
Bidding				x																
Construction					x	x														
Defeats Period						x	x	x	x											
Phase 3 (5,000 ha)																				
Consultations					x	x														
Design						x	x													
Bidding								x												
Construction									x	x										
Defeats Period											x	x	x	x						
Phase 4 (5,000 ha)																				
Consultations									x	x										
Design										x	x									
Bidding												x								
Construction													x	x						
Defeats Period															x	x	x	x		

49. The design process will generally follow:

- (i) Review of existing data and reports made available to the consultant including:
 - (a) available topographical information and digital elevation models; (b) layout map of MIP showing the reservoir, rivers, khal, roads, etc., and boundaries of project area; (c) design criteria for the buried pipe system including cropping patterns, and crop water requirements and design duties; and (d) specifications and a blank (sample) Bill of Quantities.
- (ii) Identification of pumped systems for about 15,000 ha (net) irrigation based on the current layout of pumps and farm distribution systems in consultation with the farmers and needs for improvements. The number of systems will depend on their size but is likely to be about 600 assuming an average of 25ha/system.
- (iii) Organise and undertake consultations with farmers, landowners, land holders, ICC and WUAs, including detailed stakeholders identification for consultations, providing awareness campaigns, organising meetings, and signing of

Memorandum of Understanding (MOU) for every system for which detailed designs are prepared. On signing of the MOU's, each farmer must commit to making an upfront payment of BTK1,500 prior to construction of the buried pipe systems. Payment would be made at the time of mobilisation of the contractor to the IMO whom will deposit the payments into the escrow account.

- (iv) Preparing detailed engineering designs of each distribution system including preparation of drawings, bill of quantities, and cost estimates that are disaggregated for each scheme. Drawings shall be done showing for: (a) layouts of the khal, pumps and pipe systems; (b) long sections for systems; (c) all for associated civil structures; and (d) all associated electro and mechanical equipment. However, except for the header tank and any other one-off structures, all drawings should be standardised as much as possible.
- (v) Assessment of required electric power supply and LLP requirements including pump and motor capacity, control systems, and power and energy requirements for the systems for which detailed designs are prepared. Design and specifications of electricity distribution extensions to energize the LLPs shall be prepared. Extensions to the electric distribution system will include extension to existing substations, if necessary, distribution lines, poles and transformers, if required.

Tasks Required for Bid Submission:

50. A methodology and program of work and staffing schedule will be submitted as part of the bid. This will include the participative approach proposed to plan and design the distribution system, along with undertaking the detail designs. The Bidder will also provide a detailed time schedule for this activity to guarantee that the participative design will be in accordance with the proposed deadline for the rehabilitation of the distribution system.

Activity 4: Agricultural Support Services, Pilot Cost Recovery Activities, and Implementation of Training and Awareness Programmes

Scope of services

51. Provisional sums have been allocated to support this work and the IMO is required to arrange the engagement of appropriate organizations to implement Activity 4 as sub-contractors.

52. **Agricultural Support Services** are a responsibility of the IMO with the objective of enabling small farmers to take up more efficient water use, crop diversification through sustainable practices, and developing opportunities for commercial farming and agribusiness. The intention is for IMO to offer a nucleus of localised self-financing support services either directly or by interacting and engaging with existing government and non-government organizations. Pilot programs will be established under Tranche 1 to assess viabilities and response agriculture support programs before up-scaling under Tranche 2.

53. The objective of the agricultural services is to directly involve the IMO in agriculture extension services and providing technical support to farmers. The IMO will be required to prepare an annual training plan which, on approval by PMU, will be implemented by the IMO. The training will focus on, among other things: optimizing water use, expanding the service area, promoting and facilitating crop diversification, and increasing cropping intensity. The result of the training should raise farmer incomes and therefore their ability to pay the ISC

and for irrigation services. The training program will be implemented using both in-house training capacities and subcontracting to local, regional and national qualified training institutes.

54. **Development of Pilot Cost Recovery Activities:** Opportunities for increasing the cost recovery of providing irrigation services, over and above revenue from water charges, will be explored to minimize the burden on farmers as well as minimize or avoid the need for Government subsidies. There are various opportunities that can be researched including, but not limited to: leasing of BWDB land assets; leasing of areas within the khal, rivers and reservoir for fisheries including stocking; royalties from sand abstraction; and agriculture support enterprises. Their concepts and viabilities will be studied by the IMO and presented to BWDB and ICC for endorsement. The most promising, viable and sustainable opportunities would be taken up as pilots by the IMO. A provisional sum within the IMO contract has been allocated to support this work.

55. **Awareness and Training:** The need for a strong program of awareness and engagement with stakeholders has been identified as a key role for the IMO. This is to provide continued support for the stakeholders including BWDB, Department of Agriculture, Local Government, Water Management Organizations, ICC, and most important the farmers. The roles of these supporting organizations are critical and how the stakeholders can work most effectively with the IMO is an essential requirement. Selected and focused training will be provided by the IMP and will include a mix of informal on-the-job training and formal institutional training to key stakeholders. The IMO will prepare and submit an awareness and training plan to the BWDB, which on their approval, will be implemented under the IMO. Training and awareness would be subcontracted to third party organizations or payments made for training costs which would be reimbursed at cost.

Tasks Required for Bid Submission

56. A methodology and program of work for undertaking these activities will be submitted as part of the bid submission. The Bidder will provide the method it will adopt to identify and carry out or sub contract: (i) agricultural support services; (ii) training programs; (iii) pilot cost recovery activities; (iv) capacity building and capacity strengthening programs of the main stakeholders; and (v) how selected BWDB staff on lien would be incorporated into the IMO. The Bidder will provide an outline work program and staffing schedule.

DELIVERABLES

57. The deliverables of the IMO contract will be in two parts: (i) reporting deliverables; and (ii) project deliverables.

Reporting Deliverables

58. The reporting deliverables are summarized in Table 4. All reports will be submitted in English, in both editable and fixed electronic form, and hard copies. All deliverables shall be uploaded to an electronic sharing network such as an FTP site or Sharepoint site that BWDB and their representatives can access. In addition, the IMO shall submit all backup Excel spread sheets and computer based analytical models, including models that are developed using specialized software applications. The format for AutoCAD and GIS data to be submitted by the IMO shall be agreed with BWDB.

59. The IMO shall establish and maintain a comprehensive inventory, both hard copy and electronic, of all relevant documents made available and collected. All such documents, which

are considered confidential, will be compiled in usable form and delivered in an organized fashion to BWDB at the end of the contract.

Table 4: IMO Reporting and Documentation Deliverables

Ref.	Report	Description	Submission (month)
A	Establishment of Efficient and Sustainable MOM		
1	Project Management and Administration Manual	The Project Management and Administration Manual (PMAM) will be prepared at the beginning of the IMO contract and will be routinely updated as required. It will present the MIP development and MOM arrangements including documenting arrangements for, but not limited to: asset management; staffing logistics; financial management; stakeholder liaison and engagement; operational methodologies; maintenance and administrative procedures; extension services; cost recovery activities, and social and environmental requirements. It will also detail how assets will be catalogued, assessed and maintained. The initial and amended contents of the PMAM will be agreed by BWDB and ICC.	1 and as needed
2	Annual Work Plans	Annual work plans (AWPs) will be prepared in liaison with WUAs through the ICC and agreed with BWDB. The AWP will present the IMO's plans for the year ahead, including: MOM activities; design and construction supervision activities; and, agricultural support services and pilot cost recovery activities. The AWP will also present estimated revenues and costs, and will present the agreed tariff for that year.	1, 12, 24, 36, 48
3	Quarterly and Annual Reports	Progress reports to be submitted to BWDB on a quarterly and annual basis. The reports would show actual expenditures, revenues and MOM outputs. The quarterly reports will be concise and will report only on the previous three months. The annual report will be comprehensive and present cumulative results throughout the preceding year. The annual report will be supported by an external independent audit. The annual report will include progress of the Key Performance Indicators (KPI).	Annual report: 12, 24, 36, 48, 60; Quarterly reports: every 3 months
4	Asset Management Plans	Asset Management Plans (AMPs) will be an inventory of all scheme assets and will present their current conditions and indicate if maintenance or replacements are required. The AMPs will be prepared annually, three months	9, 21, 33, 45, 57

		prior to submitting the AWP. The AMPs will be used to support planned OM activities presented within the AWP. The IMO will routinely inspect the condition of all Level 2 and 3 scheme assets which will be documented within the AMPs. The initial AMP will outline the inventory reference and GIS database system.	
5	Information System Report	Annual report on main data collected and up dated in the data base: rainfall, level and flow in the Khal, volumes pumped; land register; agriculture; etc.	Annual report
6.	Implementation and monitoring of the environmental management and gender action plans.	Working with PMU, Stakeholders, the ICC and contractors to ensure the environmental management (EMP) and gender action plans (GAP) are effectively implemented and monitored.	Annual and periodic reports as described in the EMP and GAP
B	Construction Supervision of Tranche 1 Investment Works		
1	Supervision Plan for Investment Works	Detailed plan for the supervision activities including requirements for surveys, quality control to ISO standards or equivalent	3
2	Supervision Progress Report	Monthly construction progress reports	monthly
3	Progress Certificates	Payment certificates as required.	monthly
C	Participatory Design of the Level 3 Distribution Systems		
1	Detailed Design Reports and Drawings	Detailed engineering design reports are prepared for the Level 3 Distribution system detailing the design process, assumptions, parameters, formulae, results, specifications and costs of the designs. The report will be accompanied by detailed designs drawings for all components. A single document will be prepared that will be updated and expanded following design of each implementation phase.	12, 24, 36
2	Design Progress Reports	Periodic reports on the progress of design and accounts of farmer participation in the design process.	Quarterly
D	Agricultural Support Services and Pilot Cost Recovery Activities		
1	Awareness and Training Plan	The Awareness and Training Plan (ATP) will present the results of IMO's needs assessment of awareness and training of farmers, pump operators, WUAs, BWDB and other relevant stakeholders. It will outline an awareness and training programme that the IMO will implement	4

		during its term, using either internal or external resources.	
2	Agricultural Support Services Plan	The Agricultural Support Services Plan (ASSP) will review of the scope and potential for agricultural support and present strategies and recommended plan for engaging external support for implementing the services. The plans should be prepared in detail with agricultural support pilots and demonstrations, and include budget estimates. These will be prepared in consultation with the WUA and ICC, and approved by BWDB.	6
3	Cost Recovery Opportunities Plan	The Cost Recovery Opportunities Plan (CROP) will identify and assess alternative cost recovery opportunities. It will present approaches and strategies for development of the pilot projects, for approval of BWDB.	6
4	Recruitment Documents	Prepare, in consultation with WUAs and ICC, contract documents and scope of works for agricultural support services and pilot cost recovery activities. These will be approved by BWDB.	9
5	Monitoring Reports	Quarterly monitoring reports of the agriculture support services, cost recovery pilot activities, and training and awareness activities.	quarterly
6	Agricultural Support Evaluation Report and Strategic Plan	The Agricultural Support Evaluation and Strategic Plan (ASERSP) will present the evaluation of the agricultural support pilots and preparation of strategies and recommend proposals for the long-term development of agriculture and water saving systems and the provision of agricultural support services.	36
7	Cost Recovery Opportunities Assessment Report	The Cost Recovery Opportunities Assessment Report (CROAR) will present the evaluation of the pilot cost recovery activities and recommend proposals for long-term cost recovery activities.	36

Project Deliverables

60. In addition to the reporting deliverables, the IMO is required to prepare and support a number of project deliverables which are described in Table 5.

Table 5: IMO Project Outputs

Ref	Output	Description	Submission (months)
A Establishment of Efficient and Sustainable MOM			
1	Pumps and pipe	17,000ha of piped irrigation including pumps, pipe	12, 24, 36,

	irrigation commissioned	distribution and prepaid meters are installed commissioned and operating. These will be constructed in a phased approach with 2,000ha completed in Year 1, and 5,000ha completed each year in Years 2 to 4.	48
2	OM of pumps, pipes and prepaid meters	Efficient OM of the pumps, pipe distribution and prepaid meters. Breakdowns are repaired within 24 hours.	Continuous
3	Cost Recovery	OM cost recovery systems are established and 100% of costs are recovered for 17,000ha	48
4	Maintenance works	Maintenance work is properly planned and implemented.	Continuous
5	Irrigation Areas	Target cropping patterns and yields as estimated in the economic analysis are achieved.	60
B Construction Supervision of Tranche 1 Investment Works			
1	Investment Works	All investment works for MIP are constructed according to the target schedules and international standards and norms have been followed. Progress and final payments have been agreed and paid by BWDB.	48
C Participatory Design of the Level 3 Distribution Systems			
1	Designs of Level 3 Distribution System	Participatory designs of the Level 3 distribution systems	30
D Agricultural Support Services and Pilot Cost Recovery Activities			
1	Agricultural Support Services	Agricultural support services and demonstrations are implemented. Long-term sustainable and viable cropping systems are identified to increase farmer incomes and reduce water use. Up-scaling of improved systems models over 1,000ha are achieved.	36
2	Cost recovery pilots	Pilot cost recovery pilots are identified and implemented. Supplementary cost recovery is achieved to fund 10% of the overall OM costs.	36
3	Awareness and training	Implementation of awareness and training based on the awareness and training plan	36
4	Farmer and Stakeholder Engagement	Farmers are fully aware of the project and support the objectives. ICC is established and meets four times per year. Farmer and stakeholder complaints are compiled, assessed, and adequately addressed	36

TERMS OF REFERENCE FOR PROFESSIONAL STAFF

61. The Irrigation Management Operator (IMO) consultant will be for a period of five years to be provided during Tranche-1 implementation. Recruitment will be undertaken in accordance

with ADB's *Procurement Guidelines* (2013, as amended from time to time)¹³ and ADB's *Guidelines on the Use of Consultants* (2013, as amended from time to time).¹⁴ Firms will be recruited using quality and cost-based selection with a 90:10 quality to cost ratio. This ratio is justified as the priorities for the IMO are high quality outputs including designing and preparing innovative and modern infrastructure and management improvements for MIP. A full technical proposal will also be required. The total international input will be for 47 person-months (pm) and 1,467 pm for national consultants. The overall requirement is 1,814 pm. Outline terms of reference for individual IMO specialists are given below and a summary of specialist inputs is shown in Table 6.

Table 6: Estimated Requirements for Professional Staff

Position	Person-Months	
	International	National
MIP Management		
General Manager / Chief Irrigation Engineer	36	
Deputy General Manager / Executive Engineer		55
Office Manager ^{/a}		55
Assistant Office Manager/Secretary ^{/a}		55
Accountant / Procurement		50
Safeguards / Public Relations		50
Computer / MIS Database Specialist		50
Upazila Field Offices (6 nos.)		
Field Officer Managers		300
Field Office Staff (Assistant OM Engineers and Agriculture Support) ^{b/}		300
Agriculture Extension Office		
Agricultural Management Specialist	10	
Extension and Training Specialist		50
Design Office		
Senior Irrigation Planning and Design Engineer		28
Irrigation Design Engineers		56
Assistant Design Engineers / AutoCAD Operators ^{/a}		112
Construction Supervision Office		
Chief Resident Engineer		36
Assistant Site Engineers ^{a/}		240
Senior Topographic Surveyor		50
Assistant Surveyors / Chain-persons ^{a/}		99
Mechanical / Electrical Engineer (Supervision and OM) ^{/c}		50
OM Office		
Senior OM Engineer		39
OM Engineer		47
Overall Total	47	1,422

¹³ Available at: <http://www.adb.org/Documents/Guidelines/Procurement/Guidelines-Procurement.pdf>

¹⁴ Available at: <http://www.adb.org/Documents/Guidelines/Consulting/Guidelines-Consultants.pdf>

Notes: ^{a/} these are supporting roles; ^{b/} these positions will be undertaken by lien-contracted BWDB staff and funded by the irrigation tariff; ^{c/} the national Mechanical / Electrical Engineer can fulfil the responsibilities for both roles with a total input of 50 pm.

International Specialists (47 p-m)

a. General Manager / Chief Irrigation Engineer (36 p-m)

62. The General Manager / Chief Irrigation Engineer will be required to work closely with PMU and will be responsible overall management of the IMO to achieve the four main activities describe in the scope of works above. The specialist will also lead the design team. The specialist will have a Master's degree in Civil Engineering, or a related field, and will have at least 20 years of technical project experience with at least 5 of those years leading the implementation of the projects. Experience of working in irrigation and water resources development in South Asia on major irrigation systems is highly desirable. The specialist will be responsible for:

- (i) Represent the IMO in all its contractual obligations and be in charge of the relationship with the PMU/BWDB and the regional authorities.
- (ii) Overseeing the implementation of the various activities and be responsible for the preparing and maintaining a quality insurance plan
- (iii) Manage the teams of the four activities and specifically supervise the recruitment and evaluation of the operation and management local staff
- (iv) Overall direction of the team, coordination of inputs, and management of individual specialists.
- (v) Ensuring the timely progress of the project implementation including planning, design, construction and institutional development.
- (vi) Ensuring timely delivery of all outputs as listed under Table 4 including the various progress reports.
- (vii) To support the necessary approval processes of deliverables including BWDB, ADB and stakeholders.
- (viii) Guide the management and coordination with the government, and other stakeholders including the facilitation of regular management dialogue between the EA, other associated agencies and stakeholders at central and project levels.
- (ix) Support the establishment and guide the activities of the Project Management Unit (PMU), the Implementation Coordination Committees (ICC), the PPP Cell, the Safeguards Cell and other proposed institutional arrangements.
- (x) Support the development of the PPP models for irrigation management including maintaining close liaison with the Muhuri IMO, and defining the roles for the proposed management operators for the Tranche 2 projects.
- (xi) Lead policy dialogue with the Government and support the development of the sector roadmap including refining the policy frameworks and overall MFF investment strategies and plans.
- (xii) Support the PMU in the liaison and coordination and supervision of the Muhuri IMO including the implementation of the Muhuri Management Review.
- (xiii) Support the Irrigation Planning and Design Engineer to assess the feasibility and prepare the detailed engineering designs for Tranche 2 irrigation scheme modernization.
- (xiv) Undertake a review of other large irrigation schemes and outline tailored infrastructure modernization and management models incorporating early lessons learnt from Project 1.

- (xv) Supervise and organize the irrigation services with the national experts during the irrigation season. During the first years he/she will have to strength capacity of the local irrigation engineers. He/she will also provide technical inputs to the O&M manuals with regard to irrigation management. With the deputy team leader and the national irrigation O&M engineer, he/she will organize the operation services, maintenance services, customer relationship services.
- (xvi) Be responsible for the review of distribution system prepared by the construction Contractor, and for the overall supervision of the structural components of the Works.
- (xvii) Coordinate the design review of distribution system gathering inputs from other subject specialists.
- (xviii) Contribute to propose relevant training related to best irrigation practices on plot.

b. Agricultural Management Specialist (10 p-m)

63. The Agricultural Management specialist must have a background in Agronomy or related field/discipline and a Master of Science in Agro-economics or related field/discipline. She/he must have a minimum of twelve (12) years of experience in agro-economics with a minimum of at least two (2) projects in the region, with Bangladesh preferred. The Agricultural Management Specialist should have experience in the development of irrigated agriculture projects, economic value chains and market based crop production analysis. The Agricultural Management Specialist should have experience working in multi-disciplinary teams. Fluency in written and spoken English is mandatory.

- (i) Organize with the Computer IT specialist/Data base, the data collection regarding agricultural aspects at the scheme level (record of crops, yields and marketed; other sampling methods for monitoring agriculture development within the scheme).
- (ii) Be one of the main contributors to this activity. He/she will have to liaise with other service providers with regard to agricultural development support. He/she will have to propose and assess relevancy of pilot cost recovery activities. He/she will advise the ICC and PMU on water tariff. He/she will contribute to the establishment of the training plan. He/she will have to build capacity of the local Extension officer/training specialist /agri extension, regarding the optimal use of the irrigation infrastructure (rise the cultural intensity) and diversification of crops (rise the ability of the farmers to pay for the water service).
- (iii) Engage with farmers and stakeholders to identify the main constraints to crop production in TIP and GKIP.
- (iv) Assess the scope and capacities of the existing agricultural extension services and other related organizations working in the project area. Identify gaps and possible areas of support from the project.
- (v) Review the requirements and propose strategies for increasing agricultural productivity, increasing POW, improving farm water application efficiencies and overall scheme efficiencies, reducing water use, and assessing potentials and strategies for crop diversification for TIP and GKIP. The review will assess the irrigation needs for the main boro crop as well as supplementary irrigation during other seasons.
- (vi) From lessons learnt from MIP and other international projects, assess how new initiatives for modern irrigated agriculture could be applied in TIP and GKIP. Liaise and support the planning and implementation of the agricultural support pilots for MIP.

- (vii) Identify the key requirements for efficient irrigation to meet the needs of crop productivity including: timely water availabilities, crop diversification, scheduling of planting, reduced water use. Discuss with stakeholders to identify irrigation management strategies to help meet requirements to meet targets for increased productivity.
- (viii) Work with the other specialists to develop strategies for investment and management of TIP and GKIP, and show how these strategies can incorporate the requirements and help meet the needs and full potentials of irrigated agriculture.
- (ix) Develop a plan and costs for agricultural support services to be implemented by the IMO's for TIP and GKIP. The plan should build on the existing agriculture extension and support programmes within those areas.

c. Mechanical / Electrical Engineer (1 p-m)

64. The international electro-mechanical engineer will be a highly qualified professional electrical and mechanical engineer, (at least BSc degree) with a minimum of 10 years of experience in all aspects of pumping station design and construction, in the design and rehabilitation of irrigation electromechanical equipment including but not limited to pumps, valves, modules, maintenance, operation. Fluency in written and spoken English is required

- (i) Contribute to drafting the OM manuals with regard to electro-mechanical maintenance activities and related training. With the support of other members of the team he/she will have to propose the best option for electrical pumps backup system. He/she will have to organize with the Computer IT specialist/Data base, the data collection regarding individual Low lift Pump at the scheme level.
- (ii) Be responsible for the review and production of all pump, electrical materials designs and drawings, and for the overall supervision of the electro-mechanical components of the Works. He/she will work with the Computer IT specialist/Data base to fulfil the pumps register and define the average efficiency of each pump that will be used for operation KPI.
- (iii) The Electro-mechanical engineer will undertake the design review for all electro-mechanical components of the Scheme.
- (iv) The Electro-mechanical engineer will contribute to propose relevant training related to pumps operation and maintenance.

National Specialists (877 p-m)

a. Deputy General Manager / Executive Engineer (55 p-m)

65. The Deputy General Manager (DGM) will have either a Degree in Civil Engineering, or equivalent; or at least a Diploma of Business Management, or equivalent. The DGM will have at least 10 years of business management experience and will be fluent in both English and Bengali. The DGM will work in closely with the General Manager / Chief Engineer and is responsible for the day-to-day management of the team, and relationship with the local authorities and project beneficiaries. It is intended the DGM will take over the role of General Manager following completion of the IMO's design activities. The main tasks of the specialist will include:

- (i) Ensuring the IMO undertakes the four main activities according to schedule, meeting key performance indicators and with inputs targeted on the design of the OM system and capacity building of stakeholders in the first years.
- (ii) Monitoring and developing overall water resources management plan for the project area including surface and ground water.
- (iii) Liaising with the Rural Electrification Board (REB) and negotiate the best quality of service is made available for irrigation.

b. Accountant / Procurement Specialist (50 p-m)

66. The Accountant / Procurement Specialist will have at least a Degree in Accounting or equivalent, and have at least 10 years of experience in project accounting and at least 5 years of experience of supporting procurement of works, goods, services, preferably on international donor projects. The main tasks of the specialist will include:

- (i) Preparing, developing, maintaining and using an accounting database system to maintain all transaction and procurement records of the IMO.
- (ii) Setting up an Escrow Account in the name of the IMO
- (iii) Making payments to suppliers, pump operators and smartcard vendors.
- (iv) Preparing and submitting payment invoices to BWDB and ADB.
- (v) Support the design team with packaging and procurement of civil works and the supply and installation of mechanical and electrical equipment.
- (vi) Support the team with procuring additional surveys and studies.

c. Safeguards and Public Relations Specialist (50 p-m)

67. The Safeguards and Public Relations Specialist will have at least an advanced social sciences degree or equivalent, with at least 10 years of experience working international development projects. The main tasks of the specialist will include:

- (i) Be guided by ADB's Safeguard Policy Statement (2009) guidelines, procedures and best practices.¹⁵
- (ii) Supporting BWDB and IMO staff with: (a) training and capacity building on environmental management, supervision, reporting and monitoring of implementation of environmental management plans (EMP); and (b) orienting contractors on implementation of EMP.
- (iii) Guiding IMO staff on reporting requirements on environmental monitoring to ADB and BWDB.
- (iv) Recommending any corrective actions on any unforeseen environmental impacts.
- (v) Plan and implement consultations with the affected people in accordance with the participation plan.
- (vi) To coordinate the necessary actions with stakeholders and the PMU to implement adjustments to the earthworks designs (khals and coastal embankment) to avoid impacts on existing structures along the khal banks or coastal embankment.

¹⁵ Refer to <http://www.adb.org/documents/safeguard-policy-statement> for a copy of the SPS; and <http://www.adb.org/site/safeguards/main> for a copy of Involuntary Resettlement Safeguards: A Planning and Implementation Good Practice Sourcebook, and Environment Safeguards: A Good Practice Sourcebook.

- (vii) To help coordinate the spoil management arrangements from the khal excavation.
- (viii) As part of the annual work plans, prepare communications plan for disseminating information on consultation, design, construction and MOM activities throughout the project area.
- (ix) Support IMO staff to implement the communications plan and facilitate consultation meetings.
- (x) Train and support the field office managers with customer relation skills and handling of complaints.

d. Computer / MIS Database Specialist (50 p-m)

68. The Computer / MIS Database Specialist must have an MSc degree in computer sciences or one of the relevant disciplines. He/she must have at least 10 years of experience developing information systems, particularly applied to the management of operational structures like an irrigation Scheme. He/she must also be able to communicate in English. The Information System and Technology specialist will

- (i) Be responsible for the development of the Scheme Information System, using a GIS tool as well as informatics prepaid meter system data and financial management software.
- (ii) Will work in close consultation with other team members to establish the system requirements, and then oversee both the hardware and the software part of the system design until all functionalities of the system are fully operational.
- (iii) Provide users assistance as necessary. Based on the information system/data base he/she will provide most of the output required to check if the various KPI have been reached.
- (iv) Developing and maintaining a computerized customer feedback database and complaints management system.

e. Field Office Managers (6 positions, total: 300 p-m)

69. The Field Office Managers will have graduate qualifications in engineering or agriculture with at least 10 years of irrigation management experience. They will be the managers of the Upazila Field Offices and are responsible for day-to-day customer relations and provision of irrigation services. They will also be responsible for:

- (i) Acting as the IMO representative at the Upazila level and being the focal point for all customer services issues, complaints, information dissemination, training activities, payment of services, etc.
- (ii) Coordinating between the customers and technical and OM staff in main IMO office.
- (iii) Liaising between the farmers and the irrigation design and OM engineers.
- (iv) Catalogue and respond to customers' complaints and ensure prompt service and technical support is provided by the IMO.
- (v) Provide support to the main IMO office on design, construction supervision, MOM activities, and agriculture support.
- (vi) Assist IMO with preparing and implementing training activities for the farmers.
- (vii) Plan and manage the work plan of ex-BWDB staff placed in the field offices.

f. Extension and Training Specialist (50 p-m)

70. The Extension and Training Specialist will have an extended experience with regard to capacity building of farmers (at least 5 years of experience dedicated to this type of training). Experience with specific training requirements for irrigation scheme management and WUAs is a plus. Fluency in English and in Bengali is required. The national extension officer/training specialist will

- (i) Design the training program and supervise its implementation, including recruitment of trainers, training logistics, training materials.
- (ii) Will support of the other members of the team he/she will specifically assess the training requirements for farmers as well as other stakeholders, with regard to OM of large scale irrigation scheme. He/she will then establish a detailed training program, and organize its implementation based on locally available training capacities or establishing them when required.

g. Senior Irrigation Planning and Design Engineer (28 p-m)

71. The Irrigation Planning and Design Engineer will support the Chief Engineer with the overall preparation of detailed engineering designs and contract documents for the modernised Level 3 system. The Engineer will have at least a Master's degree in Civil Engineering, be a chartered, professional engineer, and have at least 15 years of experience in planning and designing irrigation schemes, preferably on international donor assisted projects. The Engineer's tasks will include:

- (i) Reviewing previous studies and understand the current norms for irrigation planning and design.
- (ii) Review of the current design criteria and design of the advance 2,000ha and propose adjustments as considered necessary
- (iii) Support the Chief Engineer with leading and supporting the design team with: (a) consulting the farmers; (b) assessing cropping and water use patterns; (c) reviewing current water use, water allocations and water use efficiencies; (d) preparing water balances for the current water and cropping systems; and (e) assessing future water balances based on the new system layouts and cropping patterns on which to base the system designs.
- (iv) Develop standard designs, drawings and specifications for the modernised Level 3 systems based on the designs for the initial 2,000ha and incorporating international best practices for using pipes, LLPs and smartcard control systems. Present the criteria to the BWDB and obtain theirs and other necessary government approvals.
- (v) Planning, preparing and managing all necessary surveys and investigations for the design for rehabilitation and modernization of infrastructure including surveys, geotechnical investigations, and structural analysis.
- (vi) Leading the preparation of detailed designs, including working with the team to prepare the engineering cost estimates, specifications, BOQs and contract documents.
- (vii) Assisting BWDB with packaging, tendering and awarding civil works and equipment supply and installation.

h. Irrigation Design Engineers (2 positions, total: 56 p-m)

72. The Irrigation Design Engineers shall be a qualified and competent Irrigation Design Engineer (MSc degree) with a minimum of 10 years of experience and at least 4 years of experience in charge of the design of secondary or tertiary level irrigation schemes including some experience of pipe distribution. The Engineers will support the Senior Irrigation Planning and Design Engineer and will be responsible for the preparation of the pipeline design and pipe designs for 15,000ha, as well as coordination of design aspects of the main rehabilitation works including:

- (i) Engage with farmers and surveyors to ensure a high level of participation to define the pipe layouts and locations of the pumps
- (ii) Prepare the detailed design for the 15,000ha including the drawings, bills of quantities, specifications and cost estimates.
- (iii) Liaise with the PMDC relating to the other design activities including upgrading of electrification, new and rehabilitation of structures, river bank protection and repairs to buildings.
- (iv) Supporting training programmes related to best irrigation practices on plot.

i. Mechanical / Electrical Engineer (62 p-m)

73. The Mechanical/Electrical Engineer shall be a qualified Mechanical Engineer (at least BSC degree) with a minimum of 5 years of experience in maintenance and operation of water pump or in the design and rehabilitation of irrigation electromechanical equipment. The Engineer must also be able to communicate in English. The Engineer will support the design, implementation and OM of the electro-mechanic systems. Main tasks of the Engineer include:

- (i) Providing support to the pump operators for maintaining the pumps, the prepaid meter system and electrical pump backup system.
- (ii) Will periodically collect the pump data on behalf of the Computer IT specialist/Data base. He/she will also provide technical inputs to the OM manuals with regard to Pumps maintenance.
- (iii) Will support the international electromechanical engineer to undertake the design for all electro-mechanical components of the new modernized scheme.

j. Chief Resident Engineer (36 p-m)

74. The Chief Resident Engineer (CRE) will have at least a Master's degree in Civil Engineer, be a chartered professional civil engineer, and have at least 10 years of experience supervising the construction of civil works, preferably as the CRE. The main tasks of the CRE will include:

- (i) Leading the overall supervision of the structural components of the implementation works (coastal embankment, khal excavation, rehabilitation and new structures, pipe distribution/pumps/ prepaid meters, upgrading of the electricity network, rehabilitation of offices)
- (ii) Contributing to the preparation of the OM manuals with regard to regular structural checks to be included in the preventive maintenance program.
- (iii) Support the design engineers with improving designs based on lessons learned during earlier construction.
- (iv) Manage the site supervision engineers.

k. Senior Topographic Surveyor (54 p-m)

75. The Senior Topographic Surveyor will have at least a Degree in Land Surveying and at least 10 years of surveying experience. The specialist will be responsible for leading the surveying team, preparing work plans, and undertaking topographical surveys to support the design team and monitoring dredging works within the khals.

l. Senior OM Engineer (39 p-m)

76. The Senior OM Engineer shall be a qualified and competent Irrigation Engineer (MSc degree) with a minimum of 10 years of experience. At least 4 years of experience in a service in charge of the Operation and Maintenance of Water scheme will be a plus. He shall be fluent in English and Bengali. With the deputy team leader and the international irrigation engineer the O&M Engineer will:

- (i) Design the OM system. He/she will be in charge of writing the OM manual. He/she will be one of the main interlocutors with the final users. He/she will be in charge of the water services field team management. With the electromechanical engineers he/she will be in charge of organizing a reliable electrical pumps backup system. He/she will be in charge of organizing the team of water dealers.
- (ii) Because of his close contact with Upazila irrigation engineers and with customers it will be particularly involved in the participative design review.

m. OM Engineer (47 p-m)

77. The Senior OM Engineer shall be a qualified and competent Irrigation Engineer (MSc degree) with a minimum of 10 years of experience. At least 4 years of experience in a service in charge of the Operation and Maintenance of Water scheme will be a plus. He shall be fluent in English and Bengali. With the deputy team leader and the international irrigation engineer the OM Engineer will:

Supporting Staff

78. Table 7 presents the supporting staff requirements for the IMO.

Table 7: Supporting Staff

Ref.	Role	Qualification / Experience	Tasks	Inputs (pm)
1	Office Manager	At least 10 years of good office management experience preferably with an international company. Good English and computing skills	Office management, logistics, support for field trips, workshops etc.	55
2	Assistant Office Manager / Secretary	Good English and computing skills.	Office support, data entry, preparing letters, organising printing.	55
3	Field Office Staff	Good experience in MOM of MIP irrigation infrastructure and	Report to the Field Office Managers and support MOM operations,	-

		experience with support agriculture services	respond to farmer issues and complaints, etc.	
4	Assistant Design Engineers / AutoCAD	Degree in Civil Engineer, or equivalent, with practical experience in using AutoCAD	Report to the senior irrigation design engineers, prepare design drawings, bill of quantities, cost estimates.	112
5	Assistant Site Engineers	Degree in Civil Engineer, or equivalent, with construction site experience	Report to the CRE and monitor construction activities.	260
6	Assistant Surveyors / Chain-persons	Diploma in Surveying, or equivalent with some experience in field surveying	Report to the Senior Topographic Surveyor, carry out topographic surveys.	108
7	Office boys / guards		Support office operations and guard IMO properties.	-

Procurement of Additional Studies, Equipment and Training

79. Provisional sums have been included in the IMO contract for the procurement of various additional studies, equipment and training to support the project. The exact implementation arrangements, specifications and detailed costs estimates of the procurement will be approved by the PMU Programme Director and procurement procedures will follow ADB Procurement Guidelines. The tentative scopes of works for the additional studies are summarized in Table 8.

Table 8: Additional Procurement

Name	Tasks
Surveys and studies	Supporting surveys and specific studies including topographic surveys, geotechnical investigations, flow monitoring, agriculture support, pilot cost recovery activities.
Flow Monitoring Stations	Equipment and associated structures for installing flow monitoring stations on the main rivers.
Procurement of office equipment	Procurement of office equipment including computers, printers, photocopiers, GPS, power invertor, etc. for central and field offices.
Vehicle Rental	Cars and motorbikes to support design, construction supervision and MOM activities.
Survey Equipment Rental	For undertaking topographical surveys for design and construction supervision activities.
Training and awareness	Costs for the implementation of the training and awareness program including workshops.
Secondment of BWDB or other Government Staff	To support the establishment and the good transition towards long sustainable management it is proposed to build on the existing skills of the BWDB staff at MIP. The recommendation is that BWDB should allow

to the Irrigation Management Operator	appropriate skilled personnel to provide services to the IMO on 'lien' ¹⁶ with remuneration of the staff to be paid by the IMO as per the organizations own salary structure. The period of lien would be guided by the government's existing rules. The IMO would review the qualifications and experience of potential staff and prepare proposals for BWDB or staff from other Government organizations who might be assigned on lien. The recruitment of the staff on lien would be initiated at the time of mobilisation of the IMO and would be outside the bidding process. Bidders would however present proposals in their bid how the staff on lien could be effectively incorporated into the IMO.
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ADDITIONAL REMUNERATION

Management Fee

80. The IMO may charge a management fee of up to 5% of the total value of additional procurement activities as listed in Table 8. The management fees will be presented as a part of the Bidder's financial proposal. The estimated value of additional procurement is \$1,800,000.

Performance Based Remuneration

81. To encourage the IMO to achieve the outputs and outcome of the project it will receive additional payments should key performance indicators (KPI) be met. Payments will be triggered based on the measurement of KPI as described below. The performance based remuneration would be a percentage of the total remuneration of profession and non-professional staff excluding ex-BWDB staff supporting the IMO on lien contracts.

82. The KPI should focus on the four main activities outlined above. However, examples of KPI's for consideration are: (i) maintaining design, contract award and disbursement, reporting schedules and targets; (ii) meeting the targets for water pumped and revenue collected; (iii) completing repairs within agreed time-frames; (iv) having an agreed number of participatory consultation meetings with farmers and landowners as part of the management and design processes; (v) managing the complaint mechanisms to minimise complaints and ensure complaints are quickly and effectively addressed ; (v) facilitating an agreed number of on-farm training sessions for water management and agriculture support; (vi) facilitating alternative cost-recovery activities that generate an agreed amount of additional revenue; etc.

FINANCING OF OM REIMBURSABLES

83. The IMO will finance the following routine payments solely from revenue collected from the irrigation service tariffs: (i) electricity tariffs; (ii) mobile telecommunication tariffs for operating the smartcard vending machines and the hydro-meteorology monitoring system; (iii) pump operator fees; (iv) smartcard vendor fees; (v) maintenance of the Level 3 distribution system; and (vi) some additional funding for BWDB staff supporting the IMO on lien contracts.

¹⁶ Lien is leave of absence from Government with the job and salary level kept open for a pre-agreed period. The remuneration package would be provided by the new/host organization.