

Figure 5.4.1 Location of Verified Subprojects with Prioritization

# CHAPTER 6

## MASTER PLAN ON

### SMALL SCALE WATER RESOURCES DEVELOPMENT

#### 6.1 Basic Concept of Small Scale Water Resources Development Plan

##### 6.1.1 Objectives

###### (1) Government Policy for Water Resources Development

The National Water Policy (NWPo) is formulated aiming to provide direction to all agencies working with the water sector, and institutions that relate to the water sector in one form or another, for achievement of specified objectives. These objectives are broadly:

- a. To address issues related to the harnessing and development of all forms of surface water and groundwater and management of these resources in an efficient and equitable manner
- b. To ensure the availability of water to all elements of the society including the poor and the underprivileged, and to take into account the particular needs of women and children
- c. To accelerate the development of sustainable public and private water delivery systems with appropriate legal and financial measures and incentives, including delineation of water rights and water pricing
- d. To bring institutional changes that will help decentralize the management of water resources and enhance the role of women in water management
- e. To develop a legal and regulatory environment that will help the process of decentralization, sound environmental management, and improve the investment climate for the private sector in water development and management
- f. To develop a state of knowledge and capability that will enable the country to design future water resources management plans by itself with economic efficiency, gender equity social justice and environmental awareness to facilitate achievement of the water management objectives through broad public participation

Also, NWPo instructs WARPO “to prepare, and periodically update, a National Water Management Plan (NWMP) addressing the overall resources management issues in each region and the whole of Bangladesh and providing directions for the short, intermediate and long runs”. Based on the NWMP, “sector agencies of Government and local bodies will prepare sub-regional and local water-management plans and approved Government project appraisal guidelines. The Executive Committee of the National Water Resources council (ECNWRC) will solve any interagency conflict in this regard”.

###### (2) Objectives of Small Scale Water Resources Development Plan

Considering such background, including the completion report of SSWRDSP-1 which has pointed out the necessity of district water resources management/ development for the smooth selection and implementation of subproject, the preparation of Master Plan for District Water Resources Development has been initiated by LGED including this Study, covering 6 districts in Greater Mymensingh as one of the pioneers.

As stated in the Scope of Work of the Study,” the overall goal of the Study is to secure safe

and sustainable water resources management and to increase farmers' income". And Master Plan is prepared comprising of strategies, prioritized subproject list, priority programs, and the scope for follow-on investment projects which include effective use of surface water.

## 6.1.2 Basic Concepts of Small Scale Water Resources Development

### (1) Integrated Rural Development

The small scale water resources development will be implemented in the rural area where most people live by agriculture/fishery activities. Therefore, water resources development in the rural area is understood to be a part of the integrated rural development as shown in Fig. 6.1.1. Achievement of the water resources infrastructural development and sustainable water management can not reach to the overall goal of the Study, and infrastructures only provide the potential for the sustainable incomes/benefits generation, such as agricultural and fishery production. Therefore, the improvement plan of development agriculture, livestock, and fisheries including extension, credit system, post harvesting, marketing, etc., shall be conducted in subproject area under the collaboration with DAE, DoL, DoF, and other government agencies/NGOs. Also due consideration shall be made to avoid / minimize the negative impact on environment and society.

### (2) Water Resources Development complying with NWPo and NWMP

The Master Plan prepared through this Study should be positioned under the NWPo and NWMP, and must be in line with the contents of the policy.

According to the NWMP, the Study Area belongs to the hydrological zone of Northeast (NE) region and North Central (NC) region. NE region covers Sherpur, northern part of Mymensingh, Netrakona and eastern part of Kishoreganj districts. Generic programs of each region are described as follows:

#### 1) Northeastern Region

Most of the NE region is taken up by the environmentally important *haor basins*, and efforts are needed to sensitively manage these in the context of the wider development requirements. Major issues specific to the region are:

- Environmental management of the Haor Basin
- Flash flooding and remedial actions for existing FMD schemes
- Flood management of villages in the Haor Basin
- Erosion of old Brahmaputra left bank
- Drainage congestion in the Kalni–Kushiyara and other rivers
- Local development of hill irrigation

Studies will be conducted to investigate whether a barrage on the Meghna River would bring multi-purpose benefits to this and the SE region. Otherwise the main region-specific programs will focus on improved water management of the *Haor* Basins, relieving drainage congestion and promoting flood management within the area.

#### 2) North Central Region

As home to the nation's capital, development of the NC region is particularly dependent upon plans to manage urban expansion. Major issues specific to the region are:

- Major programs will be taken up to address the water supply,
- Bulk water supplies and pollution clean-up for Dhaka City

- Encroachment on Buriganga and other rivers and channels in Dhaka
- Flooding and drainage problems in parts of the region
- Flood management needs in the char lands and low lying areas

Major programs will be taken up to address water supply, sanitation, storm drainage and flood protection of Dhaka, along with a concerted effort to clean-up industrial pollution. Studies will be taken up to investigate the feasibility of augmenting the regional rivers from main rivers to improve navigability and the availability of clean water. Flood management will be promoted along with drainage improvements under the regional river improvement programs.

### (3) Flood management in Small Scale Water Resources Development

Human life shall be protected from all conceivable floods, and under such condition, the people will be able to develop their livelihood activities into viable economic activities. However in reality, complete flood-proof conditions cannot be realized, and management of flood would be improved only in steps both in areal extent and increase level of protection. People themselves consider the upgrading flood management based on the increased level of income and economic wealth in their community, step by step.

LGED considers floods of 20 years frequency in design of embankments for flood management in the SSWRD scheme. In a rough estimate, the floods of the years 1987 and 1998 can be referred to as floods with 20 years frequency (though flood levels differ between deferent areas). In regard that flood levels must be studied in detail during feasibility study and detailed design, the Master Plan has considered the flood during the time span of the past 20 years as rough reference of flood levels to be coped with.

### (4) Participatory Development Process

In order to achieve the sustainability of the water resources infrastructure, beneficiaries' participation is indispensable. From the initial stage of project, possibly from subproject formulation, up to O&M stage, beneficiaries as a group (favorably WMA of the subproject) shall be involved or participate in order to formulate ownership on the subproject.

Also continuous dissemination and explanation will take place to build consensus among the local beneficiaries on financial burden within their capability.

### (5) Income Generation for Weak through the Project Implementation

Specific measures shall be taken to ensure that the poor, marginal/small farmers and destitute women will get benefit from the subprojects through labour contract Society (LCS). This should be reflected at the identification and preparation stages of the project, during implementation and O&M and while considering composition and management of WMA and micro-credit programs. Specific community development training should include this group of beneficiaries.

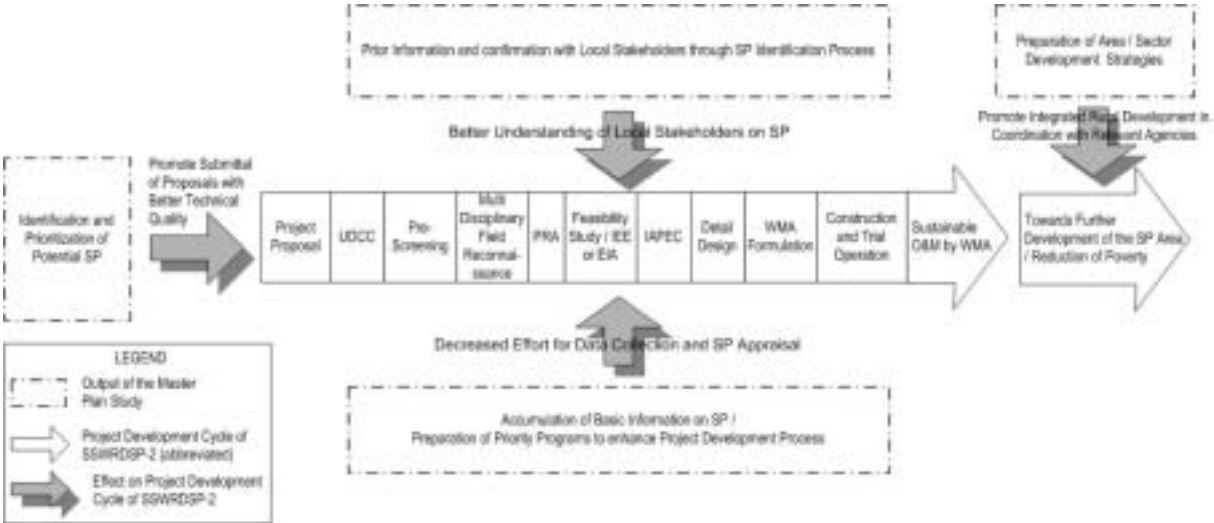
### (6) Institutional Strengthening

Small scale water resources development is implemented in the rural area, and Union and Upazila level officials shall act as an enabler. But considering the present conditions, they need capacity building for the implementation of the subproject.

Beneficiaries are also expected to be an implementer of the subproject to achieve sustainability. Simple O&M works, which can be done without advanced technical knowledge, are expected to be conducted by themselves. As a beneficiaries group, WMA shall be formulated from the project formulation stage. They will be empowered by government officials, etc. for economical activation

**6.1.3 Linkage of the Master Plan with the SSWRDSP**

The SSWRDSP-2, carried out by LGED with the financial assistance of ADB and the GoN is currently the driving force of SSWRD subproject implementation. The project, succeeding the experiences of the previous SSWRDSP-1 has been working on SSWRD for some 10 years and has developed a system for subproject development and O&M, taking into regards local issues and situations specific to rural Bangladesh. In regard that a considerable sum of technical and institutional know-how are accumulated in this project, the Master Plan shall basically adopt the current procedures practiced in SSWRDSP-2. Furthermore, the Master Plan aims to enhance such procedures by covering the outer-rims of the process through: 1) identification and prioritization of potential subprojects, 2) preparation of further development strategies after realization of SSWRD subprojects, and 3) preparation of priority programs to enhance the current system for subproject development. However, it should be noted that the Master Plan does not limit the implementation to only SSWRDSP-2, taking into regard the possibility of the planned SSWRDSP-3 or any other similar schemes for implementation of SSWRD subprojects.



Linkage with SSWRDSP-2

**6.2 Strategy for Small Scale Water Resources Development Plan**

**6.2.1 Target Year and Phasing of the Implementation**

(1) Background

There are following development plans/projects related to the Study:

- After the NWRC’s approval on March 31, 2004, the NWMP is under implementation based on the target year of 2025 with three phases; 1) the short term (2000-05) it is considered a firm plan of on-going and new activities; 2) the medium-term (2006-10) it is an indicative plan, and 3) the long-term (2011-25) a perspective plan.
- On-going SSWRDSP-2, which is considered to be initial engine of the implementation of the Water Resources Development Master Plan, will terminate the loan period in December 2009. Also SSWRDSP-3 is expected to be continued to SSWRDSP-2 with five (5) year implementation period, then the phase 3 can be expected to complete in

the year of 2014

- Also, the Fifth national development plan terminated in the year 2002. There is no national five-year development plan existing at present. The national development plan effective at present is “A National Strategy for Economic Growth, Poverty Reduction and Social Development” (PRSP), which has been finalized in November 2005. It sets the long term social target by the year 2015 as the international commitment of Millennium Development Goals (MDGs).
- Minutes of Meeting for Scope of the Study states the LGED requested that the time frame for implementation of Master plan would be around ten (10) years, i.e., target year is 2014

## (2) Target Year

Considering the target year of these plans, the target year of the Master Plan shall be the year of 2015. And the target year of the Master Plan is set in the following three stages;

- Short Term: by 2007 to complete the feasibility study and start implementation of high priority subprojects
- Mid Term: by 2010 to implement high and medium priority subprojects
- Long Term: by 2015 to complete the permissive subprojects

## 6.2.2 Strategy for Small Scale Water Resources Development Plan

### (1) Strategy of Small Scale Water Resources Development Plan

Through development and management of surface water, the Master Plan aims to contribute to poverty alleviation through effective use of surface water. This will be realized by containing surface water in a usable form and by creating an enabling environment to effectively use surface water resources for production purposes by securing production sites from floods and inundation at a feasible level. The main pillar of this will be the implementation of Small Scale Water Resources Development subprojects. The Small Scale Water Resources Development Sector Project Phase 2 (SSWRDSP-2) is now under implementation in the Study Area. The basic strategies for the implementation of SSWRD subprojects in the Master Plan will follow the process of SSWRDSP-2.

### (2) Implementation of the Plan

Implementing the subprojects at the same time is impossible considering the limited financial and human resources. Implementation plan of the Master Plan shall be formulated stage by stage basis. Therefore, the Project is divided into three phases as mentioned above. But these terms shall be monitored and mandated based on the financial conditions.

#### 1) Short term period

According to the latest information, there are more than 400 candidates for SSWRDSP-2. Among them about 30 subprojects (in average 5 subprojects in each district) will be implemented in the Study Area by the year of 2007. These subprojects are considered to be the pilot projects in the Study Area, and they are expected to be the demonstration subprojects for other candidate subprojects. Therefore, for the short-term period of the Project, dissemination of the Project, including detailed subproject formulation, will be continued by effectively using these demonstration subprojects. Potential subprojects with the highest

priority should be matured among the beneficiaries, such as formulation of WMCA and some feasibility studies. Also, minor activities which can be conducted by beneficiaries will be implemented on non-project basis.

## 2) Medium term period

High priority subproject, to be classified among identified subprojects, will be implemented in similar process of SSWRDSP-2 under the expected SSWRDSP-3 or other financial assistance by the development partners.

## 3) Long term period

All subprojects to be identified and listed by the Study will be completed and sustainable management of Project shall be started by partnership among WMA, GOB, NGOs and other stakeholders.

### (2) Small Scale Water Resources Development Strategy for Categorized Zones

As discussed in Subchapter 3.8, Upazilas in the Study Area is categorized into five (5) zones; 1) highland, 2) medium highland, 3) Medium lowland, 4) lowland, and 5) very lowland. Strategies for the small scale water resources development of each zone shall be set as follows:

#### 1) Highland

The Madhupur Tract area is a typical area of the highland zone. As shown in Fig. 3.2.5, few permanent waterbodies exists in the area, and it is drought prone area. Since the silty loam and well drained soil cause the low moisture, there is always a fear of the drought. And there is less damage of the flood without flush flood.

Based on these characteristics, strategy of small scale water resources development in the zone shall be the water retentions of the monsoon flood water and rainfall to use the irrigation during the dry season. The development potential of the pond at the depression of the hill shall be examined in this zone area.

#### 2) Medium highland

The medium highland spreads outside of the highland zone in the old Brahmaputra flood plain of the Study Area. The inundation depth of normal flood is 30 to 90 cm. The silt, clay loam of the zone shows a relatively better drainage condition. Therefore the strategy of the small scale water resources of the zone shall be the flood management to reduce the damage of seeded aman paddy from inundation at the beginning of flood season and to drain the submerged water rapidly for the early re-transplanting aman paddy after flood season.

#### 3) Medium lowland

The medium lowland spread outside of the lowland and the Old Brahmaputra and Jamuna rivers in the Study Area. The inundation depth of the flood is 90 to 180 cm. Similar to the medium highland zone, the strategy of small water resources development shall be flood management to delay the submerge of grown aman paddy, and drainage to drain the inundation rapidly after flooding. Embankment height of polder will be reasonably set along the border of beneficiary area.

#### 4) Lowland

The lowland with inundation depth between 180 and 300 cm spread outside of the Haor area in the Study Area. Most of the area covered with clay with moderate to poor drainage. Because of the inundation depth, flood management in this zone is rather difficult without major river flood management, and therefore the strategy of the small scale water resources development shall be concentrated mainly on drainage after flood season to accelerate the boro paddy cultivation.

#### 5) Very lowland

The very lowland zone is the Haor area of the old Meghna estuarine flood plain of Sylhet basin in the Study Area. Inundation depth is more than 300 cm and long submerge condition continues. The strategy of the small scale water resources development shall be mainly concentrated to the drainage acceleration before the boro paddy cultivation and flood management of the early flood to protect the boro paddy.

#### 6) Char land

Char areas are classified by the location type as follows;

- Attached char: formed outside a river embankment and attached to the embankment. During the dry season, people in the attached char can move to and inside the embankment by land
- Setback char: a part of the mainland outside a river embankment
- Island char: formed within the river as a shoal, people in island char need to rely on water transport throughout a year

According to the Flood Proofing Project (FPP) by CARE-LGED classified char areas by their stability;

- Stable char: effects of the erosion have not been observed for 20 years or longer. This type only implemented the structural measures under the FPP
- Unstable char-1: effects of the erosion have not been observed for 7 years to 20 years
- Unstable char-2: effects of the erosion have not been observed for less than 7 years

According to the JICA Study for Rural Development Focusing on Flood Proofing, char areas in the District are classified as follows:

Upazila	Total Area	Stable			Unstable-1		Unstable-2		Total	
		Setback	Attached	Island	Attached	Island	Attached	Island	Char area	Share in Upazila
Dewanganj	26,659	15,813	94	62	236	155	613	404	17,377	65.18%
Islampur	34,302	3,302	0	142	0	355	0	923	4,722	13.77%
Madarganj	22,538	6,301	0	42	0	104	0	271	6,718	29.81%
Sarishabari	26,348	4,864	10	311	25	778	65	2,023	8,076	30.65%
Total	203,198	30,277	104	557	261	1,393	678	3,621	36,891	18.16%

Source: JICA Study for Rural Development Focusing on Flood Proofing

In this Study, field surveys for the potential subproject finding in the char area has been mostly concentrated or prioritized in the stable char area in Jamalpur district as same as adopted by the FPP.



## 7) Haor area

According to the JICA Study for Rural Development Focusing on Flood Proofing, the haor area classified by water depth in monsoon season defined by WARPO and dominant means of transportation during the dry season the following types;

District	Upazila	Total Area	F3(180 – 300 cm)			Share
			Land	water	total	
Kishoreganj	Austagram	35,553	0	35,555	35,555	100.01%
	Bajitpur	19,376	7,315	7,148	14,463	74.64%
	Itna	40,194	8,535	31,659	40,194	100.00%
	Karimganj	20,052	19,174	877	20,051	100.00%
	Kishoreganj Sadar	19,373	7,361	0	7,361	38.00%
	Mithamain	22,292	0	22,292	22,292	100.00%
	Nikli	21,440	12,848	8,320	21,168	98.73%
	Trail	14,146	8,291	0	8,291	58.61%
	Total	192,426	63,524	105,851	169,375	88.02%
Nerakona	Khaliajuri	29,764	2,769	26,996	29,765	100.00%
	Kalmakanda	37,741	12,870	0	12,870	34.10%
	Madan	22,585	9,761	3,369	13,130	58.14%
	Mohanganj	24,320	13,083	1,274	14,357	59.03%
	total	114,410	38,483	31,639	70,122	61.29%
	Total	306,836	102,007	137,490	239,497	78.05%

Source: JICA Study for Rural Development Focusing on Flood Proofing

In conformance with the NWMP, the development strategies of haor areas shall be set as follows.

- Emphasis on converting the use of ground water to surface water to mitigate arsenic problems
- Water resources management in regard of environmental management of wetlands for fisheries and biodiversity
- Partial FM with submergible embankments, mainly to protect *boro* crop from pre-monsoon floods
- Local development of hill irrigation, where proposed by local stakeholders

### (3) SSWRDP in Paurshavas

Local government bodies in urban areas are municipalities or paurashavas, while rural areas are called Union Parishad (union councils). There are 32 municipalities/paurashavas in the Study Area (Statistical Yearbook 2001). Upazila engineers have roles to give technical support for the paurashavas, but they have not so much information on paurashavas. In this Master Plan Study, paurashavas areas are excluded from the Study Area.

## 6.2.3 Strategies of Relevant Sectors Development for the SSWRDP

### (1) Multi Disciplinary Development

As stated in the basic concept of the SSWRDP, the Project is regarded to improve the surface water resources infrastructure for the improvement of the villagers' income and livelihood in the rural area. In order to achieve these targets, beneficiary sector development such as agriculture, fisheries and livestock and rural water supply including the arsenic mitigation shall be implemented together with small scale water resources development.

## (2) Parallel Implementation for Multiplier Effects

As the nature of the Small Scale water resources development project, other sector activities cannot be directly involved in the project, not as integrated rural development. Therefore, it is considered that beneficiary sector activities will be implemented by other financial resources and SSWRDP subproject area should be a pilot area for other sector development so that it can demonstrate effect of integrated rural development.

## 6.3 Basic Concepts of SSWRD Subproject Plan

### 6.3.1 Type of SSWRD Subprojects

#### (1) Type of Subproject in SSWRDSP-1

The ADB Project Final Report (January 2003) classifies the SSWRDSP-1 subprojects into 4 types:

- Command Area Development (CAD)
- Drainage Improvement and Water Retention (DI & WC)
- Flood Control & Drainage (FCD) and
- Flood Control & Drainage and Irrigation (FCDI)

In total, 613 hydraulic structure constructions consisting of regulators, sluices, water retention structures, culverts, siphons and aqueducts, 945.58 km of embankment constructions and 1,161.88 km of *khal* re-excavation works have been completed.

Number of sub-projects by type and number of sub-projects by district are summarized in Table 5.4.1. Even though the data were attained from the same ADB report, the arrangement of sub-project types (six in total) is a little bit different from the above four types. Among the sub-projects, only one is of CAD type (Nawabganj district), two are DR & IRR type (Bhola district) and three are FC type (Dinajpur, Madaripur and Meherpur districts). More than 50% sub-projects are FCD type, 17% are DR type, 16% are WC type and 7% are DR & WC type. The largest (19 nos. or 7%) and the smallest (1 no. or <1%) number of sub-projects are implemented in Barisal and Lalmonirhat districts respectively. Implemented sub-projects in rest of the districts vary from 3 to 12 nos.

#### (2) Type of Subproject in SSWRDSP-2

61 districts excluding three hilly districts (Khagrachari, Rangamati and Bandarban) of the Chittagong division will be covered in the SSWRDSP-2.

Four types of sub-projects are implemented during SSWRDSP-2 which are shown in Fig. 6.3.1. The 4 types are:

- **Flood Management (FM):** Reduce extent of flood including duration and depth within the sub-project areas through rehabilitation and construction of embankments and sluice gates to increase HYV cultivated area, timely crop production, protect crop from damage and eventually increase agricultural production.

#### Height of embankment

Full flood type: 1-20 year flood level + 0.60 m free board

Submersible type: 1-10 year flood level (pre-monsoon flood) + 0.30 m free board

- **Drainage Improvement (DI):** Remove water logging through khal re-excavation to increase agricultural production as well as to benefit fisheries and local navigation.
- **Water Conservation (WC):** Develop water retention capacity of existing beels, haors and khals through khal re-excavation and construction of water retention structures (WRS) to increase irrigation area.
- **Command Area Development (CAD):** Improve existing irrigation system through pipes and lining of irrigation canals to reduce water loss and construction of hydraulic structures like pump stations to lift water from nearby river/khal.

### (3) Type of Subprojects in the SSWRDP

The Identified potential subproject of the Study will be implemented under SSWRDSP-2, the expected SSWRDSP-3 of other financial sources. Therefore, the four types subprojects as those of SSWRDSP-2 will be applied in this SSWRDP subprojects.

## 6.3.2 Sustainable Water Resources Management

### (1) Water Management Association (WMA)

As Discussed in Sub-chapter 5.4, WMA shall be formulated by beneficiaries for sustainable subproject implementation and management under the legal framework of “Cooperative Association Act (2001)”, “Guidelines for People’s Participation” and “Guidelines for Participatory Water Management”. The main function of WMAs are to act as the representatives of local stakeholders in subproject design and decision making, conflict settlement among stakeholders, and to contribute to the sustainability of the subproject by bearing recurrent maintenance activities including re-excavation work for maintaining design performance of the subprojects. They also function as the recipient body for technical support from government agencies such as LGED and DAE. Moreover, some of the WMAs provide services to the members in form such as loans for new economic activities. Also, WMA must fulfill a number of preconditions including i) enrolment of at least 70 % of beneficiary households as WMA members; ii) collection of full beneficiary contributions for O&M, iii) project-affected persons are consulted, and iv) environmental mitigation and land acquisition plans are prepared.

### (2) WMA formulation Procedure and Issues for Sustainable Water Resources Management

The “Subproject Planning and Design Guideline (2004)”, states that the process starting from formulation of subproject plans shall be done with beneficiary mobilization. After confirming the technical viability, the process of institutionalizing people’s participation will be initiated under the formulation of Water Management Associations (WMAs). Under the assistance of LGED, mainly by the district staff and facilitators working under SSWRDSP-2, beneficiaries will formulate WMA as described in the Guideline.

Based on the finding on the SSWRDSP-1 subproject areas, followings are pointed out for a more sustainable form of water resources management.

- Upazila Engineers shall follow up the requests of sub projects for submission of proposals, through disseminating the concept of the request to various stakeholders and forming consensus. Necessary support and training shall be provided to realize an efficient and

transparent process before submittal of the proposal, and the process shall be confirmed by the UDCC to maintain transparency.

- For sustainable water resources management in each subproject, more accurate water balance studies will be essential at the stage of feasibility study.
- Additionally, basic O&M procedures for appropriate usage of water related facilities should be plainly explained to the local stakeholders at the stage of feasibility study for the future formulation of O&M plan by the WMA.
- In the O&M stage, the WMA should operate the water related facilities according to the O&M plan formulated in advance. If the situation differs from the assumptions in plan preparation, WMA should modify the O&M plan and submit it to the Assistant Engineer of LGED located at each district office.
- The Modified O&M plan is to be confirmed by the Assistant Engineer together with the Agriculture, Fishery officers and Socio-Economist as technically feasible and socially viable.
- When subprojects are adjacent to other subprojects or large-scale projects by BWDB, the Assistant Engineer and other LGED officers shall discuss the modified plan regarding the technical and social aspects with the concerned agencies / engineers.
- The O&M committee under WMA is to pay due attention on utilizing water from Beels in regard of maintaining fishery resources and ecosystem. Necessary training shall be provided to enable such conditions.
- Contribution of beneficiaries to the WMA shall be set carefully with due consideration for the vulnerable; landless, female-headed families, etc.
- The relation between WMA and UP should be improved for better support for the subproject. However, due attention should be paid to secure the independence of WMA, preventing the shift of rights to UP.

## **6.4 Agriculture, Fisheries and Livestock Development**

### **6.4.1 Agriculture Development**

#### **(1) Functions of Agriculture**

Present function of agriculture is summarized as follows:

- 1) In Bangladesh due to various projects in agriculture and farmers' efforts, the food balance has been improved, as observed in the achievement of self-sufficiency of rice. There are no acute tasks to tackle, but counter-measures to cope up with low-cash income and widely spread poverty are serious problems.
- 2) Considering the development of agriculture, the first task is to supply necessary food to farmers and citizens, and the second task is to increase cash income and the third task is to protect environment and improve human welfare. We are now entering the second stage of the development.

#### **(2) Basic Concepts of Agricultural Development**

- 1) Irrigation farming is at least medium input farming system. Therefore, the farming system (Farming profile) will be "Medium inputs, medium return" by that higher inputs will be compensated.

- 2) Communication between the water development side and water use side (Agriculture, livestock, etc.) should be well maintained as a two-way action.

### (3) Necessary Approaches

The following approach for development shall be considered:

- 1) Improve human nutrition by diversified agriculture: Increase protein intake. i.e. Ex “One egg (fish) for market, one egg (fish) for home”
- 2) Focus on profitable farming through higher productivity
- 3) Upgrade of general agricultural technology – Technical packages other than water management will not be obstacle to agricultural production
- 4) Collaborate with other agricultural projects
- 5) Develop Value Added Agriculture
  - i. Diversification of cropping and development of livestock and fisheries.
  - ii. Development of processing and rural industry:
  - iii. Development of marketing (Road net work, market facilities, etc)
  - iv. Linkage with rural development, sanitary electrification
  - v. Development of specialized farming areas
  - vi. Development of integrated farming: i.e. Agriculture-livestock-fisheries
- 6) Develop community-based activities to fulfill basic regional needs for the rural human security
- 7) Develop wide-area based water management: Ex. Multiple function of paddy fields
- 8) Human Resources Development

### (4) Proposed Agricultural Development in Study Area

Agricultural development potential for regions in the Study Area is proposed as shown in Table 6.4.1.

## **6.4.2 Fisheries Development**

### (1) Strategies of Fisheries Development in the Study Area

Based on the Government development strategies on fisheries development and the regional natural and social conditions of the Study Area, the following six fisheries development strategies are formulated:

#### 1) Encouragement of integrated fish culture

Fish culture as low cost and advantage land use; rice cum fish culture, fish culture with chicken/duck, vegetable cultivation on a dyke and migration of indigenous/natural fish with flood water. Every land size is available for the above method. A lot of people know these methods though farmers who have actually introduced it are still little.

#### 2) Introduction of tilapia culture

The tilapia culture is not widespread yet in Greater Mymensingh.

Some fish farmers believe that tilapia breed by themselves without farmer's control, because information of fish culture method is insufficient for farmers. However, it will be suitable fish for culture for subsistence household, as it can be managed with low cost, low manpower and continuously reproduces. Moreover, Tilapia also eats a wriggler and the alga etc, and prevents the mediation disease such as dengue fever and malaria.

### 3) Introduction of freshwater prawn culture

Estimated profit from freshwater prawn culture counts up to five times that of finfish culture if succeeding in that though feed cost is higher than fish (price of fish Tk. 60/kg, price of prawn Tk. 300/kg).

Freshwater prawn PL (*Postlarvae*) is produced by private hatchery at Gouripur in Mymensingh District. Production capacity of PL in the hatchery is 20 million PLs in a year. But now hatchery produces only PL 3 million a year.

Even if PL is produced up to capacity, it is not possible to sell them because there are few prawn culture farms in Greater Mymensingh area.

For example, it accommodates PL of 20,000 ha, the PL supply form of 1,000 ha farm is possible. There is only one hatchery that can sell PL in Greater Mymensingh area yet. When prawn culture will be expanding in the area, more hatcheries will be necessary.

Although expenditure for initial investment of hatchery construction and management of PL production is higher than that of a finfish hatchery, the profit is higher. After hatching, handling of PL is most important for growing. In this context, it is necessary to establish not only hatcheries but also nurseries. Consequently, cooperation with private sector is applicable to improve prawn culture.

### 4) Introduction of freshwater ornamental fish culture

Target species are fancy carp and golden fish in regard that fish culture and artificial spawning method is almost same with carp species culture. Also polyculture is possible. If fishponds can maintain water throughout the year, natural spawning is possible for both fancy carp and golden fish. At the present time, most of ornamental fish are imported from overseas. With regard to market, high-class hotels, restaurants and upper middle class people in Dhaka and large cities, can bare demand of ornamental fish may increase, it is expected that the supply of the ornamental fish in the country will be increased in the future. Market prices are different depending on fish species, but normally the price (estimated age is 0.5-1 year old) ranges at about 40-150 Tk/fish.

### 5) Conservation of indigenous/natural fish in Beel, Khal, River and Haor

Establishment of shelter, conservation area such as khua (like small hole or pool), and katas (making habitat and fish ground by some structure) for indigenous/natural fish and restriction of fishing (period, size fishing gear etc.) in open-water bodies (beel, khal, river and haor). A lot of people are known about effectiveness and some NGO conducted the activities on community base.

### 6) Propagation of indigenous/natural fish by fish culture

Cooperation with private sector is required (commercial based fish culture farm) for technical development of indigenous/natural fish (Koi, Chital, Boal etc.) propagation. If the technique

is developed, will be effective to improve income form fisheries, because the price of indigenous/natural fish is higher than that of the kind for cultured fish.

## (2) Fisheries Development Plan in the Study Area

Based on the strategies mentioned above, the possible fisheries development in each agroecological regions in the Study Area is studied as shown in the Table 6.4.2.

## (3) Maximization of Fisheries Development and Reduction of Negative Impact of SSWRDP

Possible impacts of fisheries by type of water management measures in SSWRDP are summarized as follows:

Types of Water Management measures and their impact on Fish Habitat by ADTA

Type of Water Management Measures	Water Management Action Undertaken	Impact on Fisheries Ecosystem	
		Negative Impact	Positive Impact
Flood Management	Protective embankments to contain flooding	Reduction of fish habitat	Creation of protected and controllable fish habitat
Drainage Improvement	Drainage canal excavated to ease water logging	Fish habitat reduced	Drainage canal becomes added fish habitat
Water Conservation	Water shed created by excavation or dam building to hold water for irrigation	–	Watershed becomes added fish habitat
Command Area Development	Irrigation facilities are created/extended by making /improving drainage channels.	–	Irrigation channels may be used for fish culture as done in the arid regions.

(Source: ADTA Approach to Fisheries Development)

## Habitat Rehabilitation

This measure is adopted to reduce the negative impact of flood control on fish production caused by loss of fish habitats. This measure will be applicable in high land areas of full flood control and controlled flooding where area and magnitude of flooding is affected by project infrastructure. The habitat loss could be compensated by re-excavation of affected fish habitat and maintaining optimal water level for rice and fish together.

A summary of the impact mitigation strategy is presented in Table below.

Impact Mitigation Strategy by ADTA

Aspect	Impact	Mitigation Measures
<b>A. Fisheries</b>		
Habitat	Area, size and depth decreased	<ul style="list-style-type: none"> <li>• Wherever possible, maintenance of water level congenial to rice-fish farming</li> <li>• Creation of additional fish habitat (as per project provision) by re-excavation wherever possible</li> <li>• Exploring alternative fish habitat (Rice field, derelict pond)</li> </ul>
Fish	Biodiversity lost due to the barrier to the fish movement (Natural fish decreased)	The biodiversity loss can be partly compensated by: <ul style="list-style-type: none"> <li>• Construction and fish-friendly operation of hydraulic infrastructure</li> <li>• Raising wild fish within the subproject area</li> </ul>
Fish production	Decreased usually	<ul style="list-style-type: none"> <li>• Improved methoDoF fish production</li> <li>• Extension of fisheries ecosystem</li> </ul>
<b>B. Fisheries Community</b>		
Fishermen and others	Decreased fishing opportunity, fish production and income	<ul style="list-style-type: none"> <li>• Employment in WMA sponsored fish farm</li> <li>• Training and support to adopt alternative livelihood</li> </ul>

(Source: ADTA Approach to Fisheries Development)

#### (4) Implementation of Fisheries Development in SSWRDP

Basically the SSWRDP will be implemented as similar approach of the on-going SSWRDSP-2. In SSWRDSP-2, "Approach to Fisheries Development" was prepared by ADTA in February 2004. The major items are as follows:

##### 1) Collaboration with Department of Fisheries and LGED

The LGED and DoF signed a Memorandum of Understanding (MoU) to obtain technical assistance for implementation of the fishery related activities of the SSWRDSP-2. In the MoU, the following collaboration between LGED and DoF are defined:

- DoF will provide technical assistance to the WMA to carry out all fisheries related activities of the subproject starting from the implementation phase through the post project stage of the subproject fisheries activities. Beside the technical assistance to carry the project-supported activities, DoF will cover the subproject are in its own fisheries extension program.
- DoF officials at the middle management level will be made aware of the Project and DoF 's role in supporting the Project. This is of particular importance for those officers located in the eastern half of Bangladesh, which is a new area for this project; and parts of this region have enormous capture fisheries resources in regard to which special care will need to be exercised. One way to inform officials would be to organize regional meetings for discussion of all fisheries related Project matters and issues with regional fisheries officials and LGED field officials together.
- Regular interaction with DoF is required, to identify ongoing programs that would be of interest to fishers and to encourage DoF to include these fishers in its fisheries support and extension programs. In this regard, due attention will be given to ensuring that women are included in these programs.
- DoF and relevant Project field officials will be provided assistance to develop appropriate materials and programs for training, demonstration, and other extension activities. DoF extension activities within the subprojects of fisheries importance will have to be monitored, and the ADTA/PMO Team will be working with DoF to strengthen and focus those activities.
- The Project will consider providing some support to Upazila DoF officials (such as fuel or other transport assistance), so that they can provide needed field assistance services.

##### 2) Leasing Water Bodies to WMA for Fisheries Development

A state of water bodies relevant to fisheries activities is under the jurisdiction of the Government. New orders on leasing right of water bodies were adopted for SSWRDSP-2.

Before starting the SSWRDSP-2, a Memorandum of Understanding (MoU) between Ministry of Land and the Local Government Division of MLGRD&C was signed on 7 October 2002.

In pursuance of the MoU, the Government forms a Committee for leasing out the water bodies to the Water Management Cooperative Associations (MWCAs) of Small Scale Water Resources Development Subproject of SSWRDSP-2. Leasing right of water bodies in subproject areas are obtained with the highest priority by WMA. Regarding the lease fee, the committee makes the decision based on the area of the water body and it's production quantity.



### 3) Dispatch WMA Facilitators

Fisheries facilitators to be provided by the NGOs will assist the WMA during all the implementation stages of the fisheries program in SSWRDSP-2. They will actively support all the WMA fisheries program related activities.

When a subproject is found to be feasible and the implementation agreement is signed, Fisheries Facilitators will be assigned to assist the local stakeholders with their fisheries production efforts. An initial step will be for these facilitators to undertake a resource survey (Fisheries Sector Survey). The resource survey will document the existing water bodies, input supply, production, fisheries community, and any training that has been provided to the community either by the Department of Fisheries or NGOs. The work of the Fisheries Facilitators will be overseen by the district Executive Engineer.

### 4) Capacity Building and Training requirement for WMA and Relating Agency

Capacity building related to fisheries is to a large extent for mitigation measures where investment in water management infrastructure has adversely affected the fisheries of a subproject and thus affected the livelihood of those individuals that relied on this resource.

- mitigation measures to train the affected fisheries community to help adopt alternative fisheries profession
- development measures to train the beneficiaries interested in fisheries production to tap the subproject fisheries production potential
- poverty alleviation measures to train poor beneficiaries to help adopt low cost profitable fisheries activities
- project orientation, planning and management for different stakeholders

The capacity development plan of the fisheries program will provide training to the following groups:

- LGED and LGED managed officials
- Beneficiaries, and
- Partner Agency officials

## **6.4.3 Livestock Development**

### (1) Functions of Livestock

From the demand-driven activities, there are two important functions in livestock farming: Balanced nutrition supply and source of cash income. The two items are major targets of the development of livestock farming.

#### 1) Balanced nutrition supply

In Bangladesh, the protein intake is still not enough on average. To improve protein intake, development of low-cost protein sources is important. Development of egg and small ruminants are promising areas from the reasons of higher feed efficiency, easy management which can be done by women and children and low initial funds.

#### 2) Useful source of cash income

The results of the interview survey to farmers show that a farming system of rice + livestock was the most favorable type. Livestock is a supplemental business, and it plays an important role in cash income.

### 3) Environment-protecting function

Livestock farming is often called as scavenging livestock which means that animals absorb residues from daily activities and keep environments clean of both of water and lands. Animals have key functions to maintain recycle of food and other things.

#### (2) Livestock Development Strategy

##### 1) Stability of feed supply

- Strengthen animals of high feed efficiency
- Increase feed production in dry seasons to reduce competition with food crops by developing irrigated areas,
- Efficient use of char and other natural feed areas (grazing and pasture lands)

##### 2) Development of animal health

Animal health can be promoted by stabilizing feed supply, veterinary system and clean water supply.

- Develop vaccination system through the upazila function.
- Supply clean water by development of sanitary conditions
- Farmers and UP promote sanitation in rural areas.
- Secure water for bathing of animals

##### 3) Development of aqua-animals

Diversify aqua-animals to more profitable and more professional animal raising: Ex. Geese, etc.

##### 4) Development of new livestock farming

New farming systems such as industrial farming and integrated farming with rice cultivation and livestock farming.

##### 5) Secure water for cleaning of animal houses.

Secure water to maintain sanitary conditions of sheds.

##### 6) Processing/ slaughtering of animals

Secure water for cleaning and processing in dry seasons.

### **6.4.4 Suggestions to Future Development in Agriculture and Livestock**

From the initial field survey and interviews to District/Upazila officials, Union Chairmen and farmers, various potentials and measures for the development of agriculture were obtained. These items shall be examined in detail and discussed further so that there will be useful counter measures in future. Some of the major items are as follows:

#### (1) Rice Terrace Cultivation in. Haor Area

Although most of the lands are flat, small differences of land elevation (50-100 cm) are found in Haor area. The small difference is significant to crops which have root zone of 20-50 cm. Through the observation in haor area of Kishoreganj, the transplanting was changed about 1 month time and rice varieties were also differed. The crop yield and earnings were higher in relatively higher paddy field. In these areas, artificial terraces are likely to be effective for paddy cultivation in these areas.

#### (2) Rural Industrial Complex

As observed in the combination of the Sugar mill and sugarcane cultivation in Upazila Dewanganj, Jamalpur, selling of agricultural products to processing companies is a useful way

to develop agricultural production. Besides sugarcane, the following cycle can also be carried out effectively.

maize => feed mills => livestock/ poultry/ fisheries + meat/ eggs => organic manure => crop production => =>

This is a type of rural industrial complex. If one complex is established in one upazila, it will be a good incentive object.

(3) Development of vaccination system in rural areas.

Vaccination services to cattle and ducks are not well managed in Bangladesh. Enhancement of the vaccination services through upazila office (mainly preservation of vaccines and injection services) is urgently requested.

(4) Efficient Irrigation Technology in Highland Area.

Farmers are more concerned about irrigation than flood control. Soil in highland area is clayey and poor fertility soils. The areas are one of the poorest areas in Bangladesh. Flood water retention for irrigation at early stage of dry season by construction of small pond shall be introduced in this area.

(5) Small Scale Mechanization

Mechanization will be an important item for the future farming system. However, machine is costly, and individual farmers can not afford to purchase by them selves. Cooperative system is not yet developed in rural areas. Community based mechanization under Union Council will be applicable for small farmers. It will be also a stable recipient organization to accept international aide.

(6) Field Training for Seed Production and Processing for Farmers Own Use.

Observing the Seed Exchange Project, possible and simple methods of seed production and processing by farmers to produce HYV seeds continuously shall be introduced.

(7) Development of Rural Recycling in Farming System

The ecologically friendly farming system, such as agricultural waste recycling by manure, shall be introduced for the environmental protection and low-cost agricultural production.

(8) Integrated forestry-livestock farming

National forests are strictly protected by laws. Forests will be destroyed or wildered if no artificial management is involved. To increase pasture lands for animals, approaches from forestry sector will be explored, as non-timber products.

(9) Development of market information system for fish and fresh vegetables

Market information system for fish and fresh vegetables shall be developed for the increase of farm household income..

(10) Human Resources Development

- Development of planning capacity as an additional factor to the current human resources development activities to union council members and other resource persons in grass-root level.
- Integrated training for agriculture-fisheries-livestock in a technical package

## **6.5 Priority Programs**

### **6.5.1 Priority Programs**

In order to implement the SSWRDP smoothly and to assure the expected effects, priority programs will be conducted in parallel with subproject implementation.

### **6.5.2 Collaboration and Coordination among Stakeholders**

Since the SSWRDP is implemented in the rural area. The subproject will be the pilot area for integrated rural development. Not only water resources infrastructure improvement by SSWRDP, but also improvement of other benefiting sector shall be done collaboratively for the pilot area by giving the high priority of extension services of DAE and DoF at minimum one subproject area in each upazila.

Collaboration with relevant government agencies are strongly expected for the implementation of SSWRDP. As established for the Study, national, district and Upazila level government agencies coordination committees are to be maintained and are expected to achieve multiplication effects of the Project. After water resources development project, the infrastructure for the agriculture, fisheries and livestock development will be ready to expand. Then the support of relevant government agencies and NGO will be concentrated to the completed subproject area as a demonstration area of individual sector development.

### **6.5.3 Strengthening of Local Government Engineering Department**

Through site visits, interviews and questionnaire survey to Upazila Engineers, the necessity of improving office equipment and facilities were brought into relief in order to support smooth implementation of daily works of the Project at District and Upazila Level. This will include transportation vehicles, computer and peripherals/software and photocopy machines, etc.

### **6.5.4 Strengthening the Local Government Level Technical Offices**

Since LGED has not been specialized in water resources development, the number of government officers with considerable experience in water resources development planning / engineering is not sufficient. Especially at district and upazila level, there should be more officers and staff with compatible experience. Even though, there were big chances to train water resources engineers during FAP era, the kernel of water resources development planning were kept to foreign consultants. Therefore, technical training programs should be considered for LGED to strengthen the capacity of local government officials for planning and implementation of small scale water resources development. These programs shall be conducted an activity under Rural Development Engineering Center program of LGED and universities lectures may be incorporated.

### **6.5.5 Water Management Associations**

In order to maintain the sustainability of the subproject of SSWRDP, capacity building of WMA core members is indispensable. This is also pointed by post evaluation reports of SSWRDSP-1. These programs will be implemented under the on-going SSWRDSP-2 and in the Project. In parallel with training of WMA members, national level federation of WMA (Water Management Federations) will be formulated to exchange the experiences and information among individual WMA. Also annual evaluation of WMA activities will be

conducted by the WMA federation, and annual awarding system, give the prizes to the good performance WMA, will be introduced

### **6.5.6 GIS and IT**

Currently, GIS database for the water resources are developed by WARPO and BWDB. Also LGED is developing its own GIS database for rural development. Presently, the GIS coordination system between WARPO and LGED is deferent, and cannot be combined smoothly. GIS database among WARPO, BWDB and LGED shall be integrated and standardization is required for exchanging information of GIS. Data exchange needs to be done more smoothly among stakeholders to avoid unnecessary efforts to produce duplicated data.

Inventory of water bodies and existing projects under the NWRD is not completed yet. It is necessary to formulate a nation wide inventory survey of water resources among stakeholders under the coordination of WARPO.

## **6.6 SSWRDP Implementation Plan – Action Plan -**

### **6.6.1 Project Implementation**

#### **(1) Components of the Project**

The Project aims to achieve the sustainable agriculture and improve the farmers living conditions through the increasing of the agricultural production and resources mobilization in the Project Area. The Project is chosen with the high priority by integrating project/programs, which were selected among the required activities proposed in the master plan of the Water Resources Development in the Study Area. The Project consists of two major components; 1) SSWRD Subprojects, 2) Priory programs implementation. The contents of the potential sub projects to be implemented under the Master Plan are summarized in Table 6.6.1., while their location is indicated in Figure 5.4.1.

#### **(2) Basic concept of Project Implementation**

Considering the on-going SSWRDSP-2, implementation of potential SSWRD subprojects identified and prioritized in the Master Plan will adopt the arrangements of the said project with improvement, if appropriate.

The components of the potential subprojects are identified through participation of local stakeholders and verified by the Study Team. The basic technical features of the subprojects are already clarified and ready for the UP to submit to LGED. With the submittal of such proposals, the number of competent proposals for SSWRD will increase. This will reduce the efforts of LGED in persuading the local stakeholders with very limited knowledge on water resources planning to prepare a technical proposal with the Upazila Engineers.

Moreover, the submittal of proposals with a certain level of reliability<sup>1)</sup> is expected to reduce

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<sup>1)</sup> : Though further studies are still required to finalize the technical aspects of the proposed subprojects, the technical outline of how to cope with the development needs of the area are already dictated. This is a significant difference with many of the currently submitted proposals which in many cases lack of technical basis

the recourses used for evaluating proposals that may be far from promising. Accordingly, the rate of potential subprojects passing the appraisal process will increase, consequently leading to a more smooth and efficient implementation.

## **6.6.2 Executing Agency**

### **(1) Executing Agency**

The Project is basically assumed to be implemented by the Bangladesh Government budget with external financial support. The LGED under MLGRD&C will be the executing agency of the Project.

The project management office (PMO) will be established at LGED headquarters headed by a project director, a senior engineer of LGED of the rank of executive engineer or higher. The PMO will have full authority to execute the Project. The PMO will i) coordinate with other agencies concerned, ii) prepare an overall implementation plan and annual project work plans and budgets, iii) review and approve subproject appraisals, iv) review and approve designs, v) supervise LGED district offices in preparing tender documents, evaluating bids, and awarding contracts for equipment, civil works, and other project activities, vi) maintain financial accounts, vii) prepare periodic reports on implementation progress; and viii) monitor project progress and evaluate environmental impact. PMO will procure the consultants to support the PMO on the technical aspects and institutional strengthening.

### **(2) District Level Organizations**

Under close guidance and supervision of the PMO, LGED district offices will be responsible for the day-to-day implementation at the subproject level in coordination with the Upazila offices. The LGED district Executive Engineer will act as Subproject Manager and i) prepare individual subproject implementation plans in consultation with local stakeholders, ii) coordinate with other agencies and NGOs, firms, and institutes concerned, iii) help local stakeholders to organize WMAs with support from facilitators and LGED community organizers, iv) carry out field surveys with support from the PMO quality control assurance (design), v) supervise construction activities and make payments to contractors, and vi) monitor and report subproject development to the PMO.

### **(3) Coordination Committees**

The coordination committees shall be as the same as the coordination committee established for the Study at national and district level.

At National Level, an Inter-ministerial Coordination Committee (IMCC) chaired by the Secretary of MLGRD&C with Chief Engineer of LGED shall be maintained with relevant government institutions to coordinate the inter-agencies on the smooth implementation of the Project.

A district-level Small-scale Water Resources Development Committee (DSSWRDC) chaired by the deputy commissioner with the assistance of the LGED district Executive Engineer, as member-secretary will meet when required, to coordinate the activities of the district level Government agencies. MOLGRDC will issue an order requiring the Upazalia Development Coordination Committee (UDCC), composed of the UP chairpersons and Upazila-level officials, to review the subproject progress in its regular meetings. LGED district offices will

maintain close coordination with BWDB through the Inter-Agency Project Evaluation Committee to ensure that proposed subprojects do not conflict with planned or existing BWDB projects.

### **6.6.3 Implementation Plan**

#### **(1) Procedure of Subproject Implementation**

Identification and appraisal process for an individual subproject on SSWRDSP-2 set by the LGED are as follows:

##### **(1) Formulation of a Preliminary Development Plan**

- 1) The local farmers and fishermen who are familiar with water resources problems and have the first hand ideas on alleviating the problems.
- 2) The work should be done along with their community leader, UP Chairman.
- 3) Plan should be completed in Bengali and signed by UP using the “Subproject Identification Form” prescribed by LGED.
- 4) This Plan is forwarded to the Upazila Engineer.

##### **(2) Arrangement of Subproject Technical Proposal by the Upazila Engineer**

- 1) On receiving the Subproject Identification Form, the Upazila Engineer notifies the concerned UP Chairpersons.
- 2) The Upazila Engineer arranges field inspections and public meetings.
- 3) The Upazila Engineer visits the area to assess the problems and solutions with local representatives.
- 4) When the Upazila Engineer is sure that the subproject has both technical and social potential, he collects more information and prepares a “Subproject Technical Proposal”.

##### **(3) Acceptance by UDCC (Upazila Development Coordination Committee)**

- 1) The Upazila Engineer along with the UP Chairpersons presents the Proposal at the UDCC meeting for acceptance.
- 2) This meeting should include all UPs that might be negatively affected by the proposed subproject.
- 3) Following acceptance of the Proposal by the UDCC, the Upazila Engineer enters the subproject into the Upazila Plan Book and sends the proposal to the district level LGED Executive Engineer.

##### **(4) Subproject Pre-screening Analysis**

- 1) During the subproject pre-screening analysis, it will be decided whether the subproject proceeds to the next stage of investigation or will be dropped.
- 2) The Executive Engineer reviews the subproject in the context of the district strategies and guidelines for SSWRD interventions.
- 3) If it is satisfied that the subproject will contribute to the development objectives of the district, the Executive Engineer forwards it to the Project Management Office (PMO) LGED in Dhaka.

##### **(5) Multidisciplinary Field Reconnaissance**

- 1) If the subproject proposal survives pre-screening, the PMO and ADTA (Advisory Technical Assistance) will organize a multidisciplinary field reconnaissance.
- 2) The multidisciplinary team should inspect the subproject area in the crucial season.
- 3) The successful outcome of the reconnaissance review will trigger the start of the PRA (Participatory Rural Appraisal).
- 4) At this time, detailed data collection and surveys for appraisal (Feasibility Analysis) will be undertaken.

#### (6) PRA (Pre-feasibility Study)

To obtain an independent “participatory” assessment of the subproject impacts and social viability, the LGED will contract services of qualified NGO, institutes and/or consultancy firms to conduct PRA of potential subprojects.

#### (7) Feasibility Analysis and Initial Environmental Examination

- 1) The LGED contracted consultants with experience in water development projects will undertake the data collection and survey.
- 2) The collected data and information, including the PRA results will be used to prepare a comprehensive subproject feasibility study in accordance with established practice to determine the feasibility level investment costs and benefits.
- 3) Review of initial environmental evaluation carried out on the basis of survey instruments specifically designed to provide selected information and on the basis of all the foregoing analysis.
- 4) The PMO will give priority to proposed subprojects from poverty-stricken districts.
- 5) To qualify for being implemented under the SP-2 a subproject will meet the prescribed LGED criteria.

#### (8) Preparation of the Summary Appraisal & SIEE Report

- 1) Preparing the Summary Appraisal & SIEE Report consists mainly of assembling the appropriate information resulting from the analytical process described above into a concise document.
- 2) The IEE Report will be sent to the Department of Environment to clearance.

#### (9) Approval by IAPEC (Inter Agency Project Evaluation Committee)

- 1) A complete feasibility package, including Summary Appraisal & SIEE Report, will be forwarded to Executive Engineer.
- 2) The Executive Engineer will submit it for approval by the district level IAPEC.

#### (10) Detail Design

Detailed engineering design will follow completion of the appraisal process.

The design criteria adopted in SSWRDSP-2 are shown in Table 6.3.1.

#### (11) Formation of WMA (Water Management Cooperative Association)

- 1) If the subproject proposal survives pre-screening [refer to the above (5)], the process of institutionalizing people’s participation will be initiated by bringing various local



stakeholders together into a WMA under the legal framework of the Cooperative Societies Act 2001.

- 2) Existing stakeholders' groups and respected local leaders will be identified and from them, a small number of men and women will be asked to form a "First Management Committee".
- 3) The First Management Committee becomes the focal point for a number of key activities.
  - Membership enrolment
  - Organizing a WMA
  - Applying for registration of the WMA
  - Preparing for the WMA's first election and general meeting
  - Collecting beneficiary contributions
  - Registration of the WMAs is the pre-condition to initiating construction activities.

(12) WMA and LGED Sign on Implementation Agreement

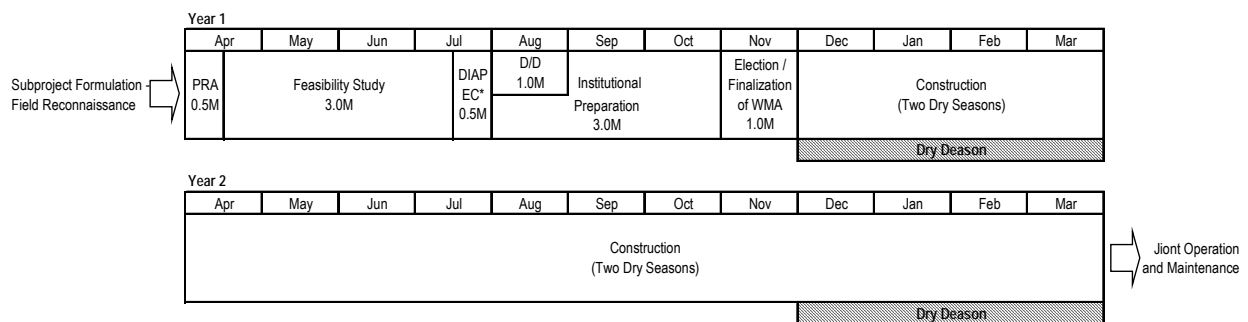
(13) Construction of the Subproject and Trial Operation

(14) WMA prepares O&M plan, agriculture plan, fisheries plan, resource mobilization plan, etc.

(15) Ownership Transfer to LGED and Infrastructure Lease to WMA

## (2) Time Frame for Subproject Implementation

Implementation of the subprojects from subproject appraisal to construction are to be done within two years. In regard that construction of a single subproject will take two dry seasons, the time frame of subproject implementation should be as follows.



\*DIAPEC: District Inter-Agency Project Evaluation Committee

## Time Frame for Subproject Appraisal to Construction

## (3) Priority based Project Implementation

From the project formulation to the O&M stage, most of the field works owe to the Upazila Engineers and his staff in related to SSWRD. A typical subproject will take about two dry

seasons for construction. WMA formulation and training for the subproject management will need a total of more than five years.

As shown in the prioritized subproject list, subprojects with high scores are not equally distributed to each district and upazila. Some Upazila concentrate many high priority subprojects and only few high priority subprojects in some upazila. If subproject selected to implement from higher score, some upazila has no subproject and some upazila concentrate more than 3 subprojects. To avoid these cases, subprojects are selected based on the higher prioritized subprojects in the upazila.

Selection of subprojects in each phase, are set as follows:

Short term (2 years): select to start a subproject highest in each upazila (total 58 subprojects)

Medium term (3 years): select around 30 % of remaining higher priority subproject in each upazila

Long term (5/4 years): select around 70 % of remaining higher priority subproject in each upazila

The subproject selection shall be conducted avoiding subprojects in the same union or those located close with each other. Based on the these consideration the number of subproject in the districts are shown below:

Distribution of Subproject by Phase in each District

District	Total	Short Term	Medium Term	Long Term
Jamalpur	39	7	11	21
Kishoreganj	66	13	19	34
Mymensingh	82	12	25	45
Netrokona	66	10	17	39
Sherpur	31	5	8	18
Tangail	66	11	19	36
Total	350	58	99	193
Share	100%	16.6%	28.3%	55.1%

#### (4) Construction of Subproject

In regard of the scale of contract amount and degree of technical level, civil works of the subprojects will be contracted with local contractors under local competitive bidding (LCB) under the standard LGED procurement procedures. On the other hand, earthwork will be contracted to Labour Contracting Societies (LCSs) as described below. Bidding will be conducted based on the detailed design and tender documents by LGED district Office under the supervision of PMO.

#### (5) Contract of earth works to LCS

NWPo also states that more than 25 % of earth works will be conducted by LCSs. As practiced in SSWRDSP-2, earthworks of small scale khal excavation and simple works which do not require a significant level of technology and experience are to be contracted to LCS supported under WMA. Their works should be technically guided / supported by the Upazila Engineers

(6) Operation and Maintenance of Subproject

After completion of subproject construction, Joint walk is conducted by Upazila Engineer and Assistant Engineer SSWRDSP for one year. Then the subproject, after necessary rectification, is handed over to WMA. WMA will be responsible for the O&M of the water resources infrastructure developed in the subproject. LGED will provide technical support for such activities. The expences of O&M are raised from contribution of the beneficiaries and through various income generating activities undertaken by the WMA.

(7) Implementation of Priority Programs

Priority programs will be implemented in parallel with subproject implementation.

(8) Implementation Schedule of the Project

Implementation schedule of the Master Plan is summarized as shown below:

Implementation Schedule of the Master Plan

Phase	Short Term		Medum Term			Long Term					Total
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
<b>Small Scale Water Resources Development (No. of Subproject)</b>											
Jamalpur	3	4	3	4	4	5	6	5	5		39
Kishoreganj	6	7	6	6	7	8	9	9	8		66
Mymensingh	6	6	8	8	9	12	11	11	11		82
Netrokona	5	5	5	6	6	10	10	10	9		66
Sherpur	2	3	2	3	3	4	5	5	4		31
Tangail	5	6	6	6	7	9	9	9	9		66
Study Area Total	27	31	30	33	36	48	50	49	46	0	350
Monitoring & Evaluation by PMO											
Engineering Services											
<b>Priority Programs</b>											
Capacity Building of Upazila Engineers Office											
Training of WMA Management Board Members											
GIS Database system improvement											
Collaboration works on the Stakholders											

## 6.6.4 Project Costs

### (1) Initial investment cost

The costs for implementing the Master Plan consists largely of: 1) Preparatory works for implementation of sub-projects, 2) Construction of physical infrastructures, 3) Institutional strengthening, 4) Monitoring and quality control and 5) Overall project management.

#### 1) Preparatory work for implementation of sub-projects

Preparatory works for implementation of sub-projects consists of two stages: 1) follow-up of the verified potential sub-projects from proposal submittal to sub-project appraisal and 2) institutional arrangement of local stakeholders. The cost will mainly cover: liaison between LGED staff and local stakeholders to promote the submittal of sub-project proposals, required field meetings and survey / data collection for sub-project appraisal, training of WMA members and deployment of staff for facilitation of implementation procedures.

#### 2) Construction of physical infrastructure

Cost for construction of physical infrastructure covers design and construction of structures and earthwork for the individual sub-projects. This will mainly consist of re-excavation / new excavation of *khals*, installation of water management structures (regulators, culverts, etc.) and rehabilitation / construction of embankments.

#### 3) Institutional strengthening

Cost for institutional strengthening will cover training of WMA members in agriculture and fisheries practices and training of LGED officers for effective planning and implementation of SSWRD sub-projects. Necessary mitigation measures for negative impact on fisheries by the sub-project will also be included along with fishery training. On the other hand training of WMA members will be included in “1) Preparatory work for implementation of sub-projects”.

#### 4) Monitoring and quality control

Cost for monitoring and quality control will cover environmental monitoring activities, overall monitoring and evaluation of the proceedings of Master Plan implementation and mobilization of necessary resources for system operation particularly at the district levels. The cost will also cover improvement of GIS database system.

#### 5) Project Management

Cost for project management covers the operation of PMO in LGED headquarters facilitating the overall proceedings of the project, and managing issues occurring in the course of project implementation.

### (2) Summary of project cost

Summarized project cost is indicated in the following table. A more detail breakdown is indicated in table 6.6.7.

## Summary of project cost

Unit: 1,000 USD

	Preparatory works		Construction of physical infrastructure	Institutional Strengthening			Monitoring and quality control			Project Management	total
	Further arrangements for Implementation	Institutional arrangements of local stakeholders		Agricultural training / extension	fisheries training (including measures for mitigation)	Capacity Building of LGED	Env. monitoring	monitoring and evaluation	system operation		
civil works	0.0	0.0	54,961.2	0.0	0.0	0.0	0.0	0.0	0.0	54,961.2	
land acquisition and contribution	0.0	0.0	2,388.3	0.0	0.0	0.0	0.0	0.0	0.0	2,388.3	
material	0.0	0.0	0.0	1,005.0	0.0	0.0	840.0	0.0	0.0	1,890.0	
vehicles and equipment purchase	0.0	216.8	0.0	96.8	96.8	0.0	60.0	0.0	98.8	629.3	
surveys and investigation	525.0	0.0	525.0	0.0	0.0	100.0	10.0	0.0	0.0	1,160.0	
training	0.0	2,100.0	0.0	1,005.0	2,841.8	1,800.0	35.0	0.0	0.0	7,826.8	
Management information system (GIS)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	200.0	0.0	200.0	
consulting services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	216.0	0.0	7728.8	
supervision and implementation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6,000.0	800.0	
External staff (NGO, etc.)	840.0	1,680.0	0.0	700.0	700.0	0.0	0.0	0.0	0.0	3,920.0	
Vehicles and equipment O&M	0.0	396.8	0.0	120.6	120.6	0.0	60.5	0.0	120.6	819.0	
subtotal	1,365.0	4,393.7	57,874.5	3,017.4	3,759.2	1,900.0	1005.5	416.0	6,219.4	8,588.8	
										88,539.4	

## 6.7 Project Justification

### 6.7.1 Basis of Evaluation

Economic and financial evaluation of the Project was done by two approaches: by confirming the result of economic and financial evaluation of SSWRDSP-2 which has similar components for SSWRD and; by examining the EIRR of the subprojects to be implemented by this Master Plan. Calculation of EIRR was done based on the actual SP contents for cost estimation and amount of benefit born by sample SPs of SSWRDSP-1. Furthermore, the Master Plan was also evaluated in terms of environmental and social acceptability by examining possible adverse impacts and necessary measures for mitigation.

### 6.7.2 Economic and Financial Evaluation

#### (1) Economic and financial evaluation of SSWRDSP-2

The SSWRDSP-2, which is a preceding case of SSWRD intervention carried out in 61 districts throughout the country (excluding the 3 hill track districts), aims to implement 300 SPs for SSWRD. The project is expected to cover some 195,000 ha and benefit over 280,000 farm households. Some of the major benefits of the project are indicated as follows:

- While direct beneficiaries will be families with land, many smallholders and marginal farmers as well as the functionally landless will attain some level of output benefit.
- In addition, increased cropping intensity and a shift to high-yielding crop varieties will increase labor usage and family wage income.
- Drainage infrastructure can bring more land into production and/or allow land to be productive throughout more of the year.
- Flood management projects reduce losses from flooding and allow the use of high-yielding varieties on more land.

- Water conservation schemes will allow supplementary irrigation in addition to increasing retained soil moisture after the rainy season.
- Command area development directly increases irrigation and leads to a shift to higher productivity irrigated agriculture.

Economic and financial analysis for SSWRDSP-2 is done based on the results of SSWRDSP-1, which was the first phase of the project. According to the analysis, farm financial returns (as indicated by increased net cropped income for benefited farms) are expected to range from Tk. 4,400 to Tk. 6,100 per ha, with the EIRR varying from 25 to 56 %. The overall project EIRR was 19 % when costs of the participatory water resource development component (including social mobilization, subproject selection, project management, monitoring, and post-construction agricultural and fisheries programs) are included. If the costs of the institutional strengthening component are also included, the EIRR was 17 %.

## (2) Economic evaluation of the Master Plan

The Master Plan prepared in this Study aims to implement SPs for SSWRD such as those implemented under SSWRDSP-1 and 2 with rational planning. Therefore, the expected benefits derived by implementation of the Master Plan will be reflecting those of the said projects. Implementation of the SPs indicated in the Master Plan is expected to cover some 191,109 ha benefiting about 391,000 households. Also in regard of the scale of the activities, it is expected that the Master Plan can be justified as well as SSWRDSP-2. In this context, EIRR of the SPs indicated in the Master Plan has been calculated based on the below parameters for confirmation of its economic adequacy.

Conditions and Parameters used for Calculation of EIRR

Conditions / Parameters	Remarks
Net benefiting area per 1 SP: 455 ha	Calculated based on the average gross project area of the verified potential SPs and average area of settlements*.
Construction Period: Two dry seasons (18 months)	Based on the practice of the current SSWRDSP-2
Life of SP: 30 years (incl. construction)	Based on the evaluation method indicated in the Project Design Guidelines of LGED
Conversion factor for economic price: Earthwork=0.67, Structure=0.77, O&M costs=0.87	Based on the evaluation method indicated in the Project Design Guidelines of LGED
Incremental benefit by SP per year per ha: TK. 5802.25	Based on result of SSWRDSP-1 (average of the incremental benefit of the SPs used for economic and financial evaluation for SSWRDSP-2)
Initial investment cost per SP: TK. 5,828,115	Based on the amount of earthwork and structures included in the verified potential SPs and other costs as indicated in the evaluation method indicated in the Project Design Guidelines of LGED. Unit costs were collected from LGED
O&M cost per SP: TK. 230,850	Based on the above initial investment per SP and evaluation method indicated in the Project Design Guidelines of LGED.

\* the area was calculated by overlaying the digitized upazila maps of LGED and verified potential SPs on GIS database

The EIRR for the 350 verified potential SPs calculated with the conditions and parameter mentioned in the above table was 18%. This figure largely exceeds the criteria for SPs in SSWRDSP-2 (12%). Furthermore, three alternative cases were examined. These are: 1) increase in project cost be 10%, 2) decrease in benefit by 10% and 3) combined case of 1) and 2) The EIRR in these three cases were 17%, 16% and 15% respectively.

### 6.7.3 Environmental and Social Consideration

#### (1) Categorization and its Reason

The Master Plan, has been categorized as Category B in reference to the JICA Guidelines for Environmental and Social Consideration (JICA, 2004) through discussions held between LGED and JICA Monitoring Team (19<sup>th</sup> – 26<sup>th</sup> July 2004). The main reasons for this were:

- Activities encompassed in the Master Plan will include construction of physical infrastructures and changes of land use and is sure to effect the environment at some extent.
- However, under the National Water Policy, the scale of interventions for Small Scale Water Resources Development is limited to the command area of 1,000 ha. Accordingly, the activities encompassed in the Master Plan will be within this limit, and interventions with larger scale will be excluded. In this regard major impacts such as large scale involuntary resettlement will not occur.
- Moreover, activities will emphasize on enhancing / reinforcing existing activities / infrastructures, which already exist as elements formulating the natural and social environment of the area.

In regard of the findings of the Phase I and II Studies of the Master Plan support that the Master Plan should remain as in Category B. These findings are:

- The average scale of the potential Small Scale Water Resources Development SPs encompassed in the Master Plan is 546ha and falls largely below 1,000, which was one of the important reference of the previous decision.
- Potential SPs which did not involve rehabilitation / enhancing of existing activities / infrastructures were omitted from the Master Plan in the course of prioritization.
- Potential SPs which were considered likely to cause significant negative impact to upstream areas (mainly flooding) were omitted from the Master Plan in the course of prioritization.

However, it is should be noted that under the Environment Conservation Rules 1997, construction / reconstruction / expansion of flood control embankment, polder, dyke, etc. as well as engineering works with capital over ten hundred thousand Taka, are categorized as “Red category”, where IEE is required to identify the possible negative impacts and necessity of EIA. A considerable portion of the subprojects to be recommended in the Study are expected to encompass construction or rehabilitation of flood management facilities, while engineering works also are expected to exceed the said limit. Still yet, environmental laws and regulations of Bangladesh do not necessarily call for Strategic Environmental Assessment (SEA), and there are no provisions in the Environment Conservation Rules, 1997, for environmental and social considerations at Master Plan level. Moreover, the validity of environmental clearance is one year after approval (except for those in Green category, which are three years). In this regard it may be pointed out that there will be a gap of several years between the finalization of the Master Plan and actual implementation of the subprojects. Therefore, based on the environmental legislation of Bangladesh, IEE and subsequent EIA process (where necessary) should be pursued for individual subprojects at the stage of their detailed design.

Therefore, environmental and social consideration at this stage shall be done on premise that

individual considerations will be done at the point of F/S and D/D, and will focus on identification of necessary mitigation options at the upstream of the planning process. Also in this regard, the Master Plan its self should be categorized as “Category B” under the JICA Guidelines, while further consideration should be made at implementation of the individual sub-projects.

## (2) Changes in the Premise of Environmental and Social Considerations

The final contents of the Master Plan do not largely differ from the assumptions made for environmental and social consideration at the end of Phase-1 survey. However, some differences were present for the number of potential interventions identified in the Study Area. The number of potential interventions, which were assumed to be at around 500 at Phase-1 survey were 597 in total after identification in the field. This was some 20% higher than assumed, but after primary screening, 335 were found suitable for implementation as SPs for SSWRD and area and were compiled into the Master Plan. SPs with higher priority were 58. This falls below the amount of 100 and will not conflict with the assumptions made in Phase-1 survey. In regard of these figures, it may be said that the assumptions made environmental and social considerations in Phase-1 survey is also valid for the Master Plan.

## (3) Analysis of Alternatives

For considering possible alternatives for the project, the followings were examined.

- i. No implementation of SSWRD activities
- ii. Implementation of SSWRD without Master Plan
- iii. Implementation of SSWRD with Master Plan

### 1) No implementation of SSWRD activities

The notion of SSWRD was introduced with the aim of efficient and sustainable management of water resources with the participation of local beneficiaries. Without SSWRD, water resources development will mainly be practiced based on conventional large-scale projects. Though large-scale projects have significant importance in specific areas such as large river systems and installation of major production areas, they are not fully efficient in reaching the individual farmers of all areas of the country. Past experiences indicate that beneficiary participation for large-scale projects will be more difficult as they will concern large numbers of various stakeholders. Also with limited government budget for operation and maintenance, large scale projects are likely to have more obstacles for project sustainability compared to SSWRD. Moreover, large-scale water resources development projects are generally more likely to have large impact on the environment, connected to the large area of operation.

### 2) Implementation of SSWRD without Master Plan

As previously mentioned, SSWRD interventions are already being implemented under SSWRDSP-1 and 2. Under the guidelines of these projects, subprojects are designed with participation of local stakeholders. In this procedure, possible environmental impacts and necessary mitigation measures are examined for each sub-project. Under this approach, it may be said that negative impact on environment and society is minimized upon subproject implementation. However, at the current point, there is no scope for assessing the relation between individual SSWRD interventions, nor with large-scale projects. This may leave margin for inefficiency in water resources planning, as water resources should be regarded as an continuum where consumption / discharge in one point is likely effect another. Particularly



with considerable amounts of SSWRD interventions to be implemented in the future may lead to the accumulation of minor negative impacts and resulting in undesirable conditions for the environment. Coordination between subprojects will also be necessary to avoid excessive water flooding the outer-subproject areas and intensive water utilization in subproject areas resulting in water scarcity in downstream areas.

### 3) Implementation of SSWRD with Master Plan

The preparation of the Master Plan will enable rational implementation of subprojects for SSWRD and other related activities, thus is expected to realize efficient utilization and management of water resources. The major items of negative impacts on environmental and social conditions may include quality of water, changes in hydrological environment, temporary disturbance to the aquatic ecosystem and involuntary resettlement. However, these effects at subprojects levels will be at the same magnitude with implementation of subprojects for SSWRD without the Master Plan. Moreover, the Master Plan will reduce pressure on the environment at some extent, through prioritization of subprojects, avoiding indiscriminate implementation. As for the positive impacts, implementation of SSWRD activities based on the Master Plan, will efficiently induce income improvement of the local villagers through increased agricultural production.

### (4) Key Impacts and Mitigation

#### 1) Positive impacts

##### Economic Impacts

The main aim of this Study is to alleviate poverty in the Study Area through improved agricultural production. Efficient utilization of surface water resources, along with enhancement of existing water sources will expand the potential for agricultural production, and will result in increased production. Extension activities for agriculture and fisheries will also lead to more production with better quality. Furthermore, future views on rural development are also encompassed in the Study as recommendations. This includes further agricultural development such as marketing systems and rural industrial complexes. The implementation of the activities encompassed in the Master Plan is expected to have significant positive impact on the rural economy, thus alleviating poverty and contributing to improved livelihood of the local residents.

##### Social Impacts

In overall, implementation of the Master Plan is expected to enhance the social capacity of local stakeholders. Participation of all stakeholders in decision making for the subprojects will be good experience for the locals in future occasions. Mutual trust may be built through co-working of villagers and field officers of LGED. The establishment of WMAs, when properly functioning, will provide a scene for co-operational activities, developing co-working fields besides water resources management. Improvement of roads in relation to installing / rehabilitating embankments, though limited in terms of quantity, will also have a positive impact through improved communication.

##### Environmental Impacts

For the environment, the most significant positive impact will be the realization of better management of water resources. Efficient utilization of surface water resources are in line with the NWPo and NWMP, and will contribute to the national goals of the water sector.

Efficient utilization of surface water resources will reduce pressure on groundwater, which is regarded as a potential issue in Bangladesh. Extension of appropriate knowledge and techniques regarding the use of agrochemicals and fertilizers will also have a positive impact on the environment, as it will reduce overuse / misuse of these materials. Reduction of flood damages will also be a significant effect of the Master Plan, as floods are the most common problem in Bangladesh. Implementation of the Master Plan is also expected to enhance the efficiency of land use, making best use of the land resources. Increased production of certain crops may link to increased fixation of greenhouse substances.

## 2) Negative impacts and measures for mitigation

In the Phase I of the Master Plan Study, scoping of possible negative impact to environmental and social factors in the Study Area were done, based on examination of existing materials and discussion with stakeholders. The negative key impacts of the identified at this stage were as follows.

Key Impacts Identified in Phase I Study

Key Impacts	Description of Impact
Land acquisition / Involuntary resettlement	Involuntary resettlement may occur to a limited extent when installing / rehabilitating physical infrastructures. Due attention should be paid for the consensus amongst stakeholders.
Local economy such as employment and livelihood, etc.	Implementation of the Master Plan is expected to have generally positive effect on economic activities. However, there may be some adverse effect through limiting factors for fisheries.
Water usage or water rights and rights of common	Conflicts on water use may occur in dry season when new but limited water resources are installed. The use of conventional water bodies may also be affected.
Hydrological situation	Improving hydrological conditions in the subproject areas may induce undesirable situations in the areas outside the subproject such as increased floods or insufficient water in downstream.
Flora, fauna and biodiversity	Implementation of subprojects will mainly result in changes in seasonal distribution of vegetation. This may lead to reduction / expansion of conventional habitats in the subproject areas. Because the conventional land use is already agriculture, the quality of the habitats will not largely change. The effect on endangered species is not clear as information is insufficient.
Water pollution	The quality of water in the subproject areas may be negatively effected by excessive / inappropriate use of agricultural inputs (fertilizers, pesticides etc.).
Soil contamination	Reduction in soil fertility, due to excessive / inappropriate usage of agro-chemical and limitations of sediments flowing in with the annual flooding may occur.
Waste	Construction activities such as excavation / re-excavation of <i>khals</i> and rehabilitation of embankments will produce waste such as sediments and excessive earth

As previously mentioned in this section, the contents of the Master Plan have not largely differed from the assumptions made for Environmental and Social Considerations during the Phase I Study. Therefore, examinations for Environmental and Social Considerations has been done based on these identified key impacts. The key negative impacts and mitigation measures are summarized in the following table. A more detailed description on the impacts are shown in Table 6.7.1.

### Key Impacts and Major Measures for Mitigation

Negative key impacts	Major measures for mitigation
Land acquisition / Involuntary resettlement	<ul style="list-style-type: none"> <li>- Consensus building among landowners / users on land acquisition / reclamation</li> <li>- Incorporating presence of consensus into official procedures for project appraisal</li> </ul>
Local economy such as employment and livelihood, etc.	<ul style="list-style-type: none"> <li>- Consideration for fish-friendly structures in feasibility study</li> <li>- Promotion of aquaculture as activity of WMA (FSC) with priority to stakeholders conventionally practicing substantial capture fisheries</li> <li>- Securing access of all stakeholders (including non-WMA members) to fisheries activities (release public water bodies to local residents)</li> <li>- Fishery training to WMA members</li> </ul>
Water usage or water rights and rights of common	<ul style="list-style-type: none"> <li>- Consensus building on water distribution for SPs aiming at WC in WMAs</li> </ul>
Hydrological situation	<ul style="list-style-type: none"> <li>- Avoid SPs which may obstruct the conventional drainage system of the area at planning stage</li> <li>- Operation of regulator should be done with consensus with stakeholders outside of the SP area</li> </ul>
Flora, fauna and biodiversity	<ul style="list-style-type: none"> <li>- Avoid selection of SPs located in / adjacent to Madhupur National Park</li> <li>- Feed back results of Bio-diversity monitoring which is to be carried out under SSWRDSP-2</li> <li>- Habitat restoration through water conservation and tree plantation</li> </ul>
Water pollution	<ul style="list-style-type: none"> <li>- Training for proper fertilizer / pesticide management to WMA members</li> <li>- Monitoring of water quality for selected SPs</li> </ul>
Soil contamination	<ul style="list-style-type: none"> <li>- Training for proper fertilizer / pesticide management to WMA, promotion of organic fertilizers</li> <li>- Monitoring of water quality for selected SPs</li> </ul>
Waste	<ul style="list-style-type: none"> <li>- Examination of sediments / excessive earth at the stage of D/D and estimate recyclable material</li> <li>- Inclusion of plan for waste management in detailed design of the SPs</li> </ul>

#### 6.7.4 Overall Evaluation

The SSWRDSP-2 which is a preceding case of SSWRD which is currently being carried out by LGED is evaluated to be financially acceptable to the local beneficiaries and also economically viable with the overall EIRR of 17%. The Master Plan formulated in the Study, in regard of the similarity of project contents and its meaning in rational planning of SSWRD interventions, is expected to bare benefit similar to the said project. Also, the EIRR of the 350 verified potential SPs indicate a rate of 18% and is considered economically viable. Furthermore, three alternative cases with increase in project cost and decrease of benefit were considered for sensitivity analysis and showed EIRR of 15-17%. Impact of the implementation of the Master Plan on environmental and social factors were also examined, and with necessary measures for mitigation, negative impact is expected to be within an acceptable extent.

Implementation of the Master Plan is expected to bring favorable results to the economy of farm households in the Study Area, contributing to alleviation of poverty. In regard of the above examinations, the Mater Plan is considered economically viable and socially and environmentally sound, and should be implemented as soon as possible.

**Table 6.3.1 Hydrologic and Hydraulic Design Criteria**

Items	Design Parameters	Design Criteria
Hydrology of Basin	Design storm	5-day rainfall with 10-year frequency
	Drainage Modulus	Drainage rate in mm/day, determined from water balance. For small catchments, infiltration, ET, depression storage can be neglected
	FMD drainage criteria i.e. crop damage	If submergence water to depth above 0.30 m for 3-day over area not greater than 5 % of land
Drainage channels (Khals)	Design discharge (m <sup>3</sup> /s)	[Drainage rate (mm/day) X Drainage area (ha)]/8640
	Equivalent design discharge (for tidal channel)	$Q_{\text{Daily average}} \times 24 / (\text{drainage time in 24 hours})$
	Permissible velocity	Minimum : 0.50 m/sec Maximum : 1.0 m/sec
Submergible flood embankment	Design frequency	10-year
	Cross-section	Crest width : 2.5 m Freeboard : 0.30 m (above pre-monsoon flood level) Side slope : 1*2
	Set-back distance	2 times the embankment height or channel depth
High Flood Embankment	Design frequency	20-year
	Cross-section	Side slope : 1:1.5 for height up to 2.0 m 1:2.0 for height up to 4.0 m 1:2.5 for height up to 5.0 m for height above 5.0 m, side slope should be determined from stability analysis Freeboard : 0.60 m (above 1:20 year flood) Crest width : minimum 2.5 m if used as road 2.5 m for Rural road (R3) 3.7 m for Rural road (R2) 4.9 m for Rural road (R1) 7.3 m for feeder road
	Set back distance	Determined based on factor : A max. confinement effect of 0.30 m Sufficient space for borrow pits on the river side Erosion rate of river channel Slope stability, etc.
Sluices and regulator	Design discharge	Runoff generated from 5-day, 10 year return period
	Ventage	Determined by matching design discharge with the discharge capacity at 0.30 m hydraulic head. Countryside water level is assumed as Basin water level
	Stilling basin	Indian standard stilling basin type-1 or USBR type 2 depending on Froude number For safety hydraulic head can be taken as 0.60 m
Sluices and regulator (tidal)	Design discharge capacity	$Q_{\text{av}} \times (\text{Basin WL} - \text{LTL}) / (\text{HTL} - \text{LTL})$ Where $Q_{\text{av}}$ is the average flow during drainage within tide cycle, LTL is low tide level, HTL is high tide level
	Stilling basin	Indian standard stilling basin type-1 or USBR type 2 depending on Froude number
Water Retention Structure (WRS), non tidal zone	Size and capacity	The size is determined from passing discharge under open weir flow condition and hydraulic head of 0.30 m
Invert elevation of hydraulic structure		0.30 to 0.60 m depending on the structure conduit size

**Table 6.4.1 Promising Farming in Various Areas in the Study Area**

Zone	Characteristics	Promising Farming System
Characteristics of char area (New: Unstable)	The area is composed of sandy soil newly sedimented by river water, especially flooding. Almost no vegetation are appeared on the sand, and the land is eroded or sediment; therefore, the land itself are unstable/moving by flood.	Fishing is the major work, and it is performed all year round. However, crops of short growth periods can be grown in these areas during winter. There are no permanent fields, but depending on land conditions short growing crops such as mustard and feed crops can be grown
Char area (Stable)	The soil of the area is silt- sandy, and inhabited without scoring/erosion over 20 years. The agricultural land is porous and has high percolation. It needs frequent irrigation and fertilization. Through the field observation, costs of these inputs were generally 20% higher than ordinary soils. Organic substances in soils are less than other soils. Soil fertility is low but clean in biological infection	In Chadfassion, Bhola, water depth was decreased/ managed by the water works of the SSWRDSP-1. Areas of cropped land was not changed karge, but by its activities HYV of Aus and Aman were introduced instead of LT (Local variety Transplanted) The areas of HYV were increased from 90 ha at pre-project to 364 ha at post-post project. The area of Rabi decreased in the post-project. It indicates that the post-project cultivation still needs appropriate irrigation. Mungbean was changed to potato and lentil. In char area irrigation cost is about Tk. 4,000/acre, while in normal fields irrigation of Tk. 3000-3,500 /acre is required. Other costs are also estimated to be higher in char areas
Haor area	Haor area is covered with deep water about 5-6 m in depth for 4-5 months during rainy seasons. The unusual natural conditions produce various specific characteristics in soil and cropping. Under these conditions types farming system are limited, but specific cultivation can be developed.	Several types are as follows: - Boro-fish (aquaculture) cultivation - Inter-linkage of resort development, environmental protection, rice/ crop production and fisheries needs to be developed. - Seed multiplication (Clean and isolated area)
Lowland	The lowland areas have regularly flooding and sedimentation. Two times rice cultivation can be performed, but flood damages often happened. Intensive fish culture is widely done.	In well managed lowlands an efficient farming system such as Boro-Aman-vegetables is performed. Water management and introduction of short-duration crops are important for successful cropping. 1) Improvement of farming system 2) Community seed production activities
Medium lowland	In the appropriate natural conditions integrated agricultural activities can be widely accepted by various combination of agriculture.	The integrated farming is useful for the development of rural areas. It has already been practiced in various areas , and successful cases are reported. Examples of development projects are: (1) Integrated rice-duck farming (2) Rice-fish farming
Medium highland	The area is flood-free or slightly flooded but no sedimentation area. 'Triple cropping is practiced in the area: Boro-Aman-potato/ vegetables. Due to Boro-Aman crop rotation, soil-born diseases or laterization are limited.	Examples of development projects. (1) Triple paddy + potato cropping after flood-free condition by SSWRDSP-1, Kanmona-Haraboti WCS Subproject, Kalai, Joypurhat> (2) Traditional potato farmers, Kishoreganj (3) Goat rearing by a rural woman of farm household.
Highland area	Highland areas are flood-free, but soil problems such as soil-nematode and laterization always happen. Water is usually supplied to soil only by rainwater. The water is short for crop growth, especially in winter.	Although natural conditions are severe, there are several promising farming systems in these areas. a. Perennial crops such as banana and pineapples b. Rice cultivation in depressed areas. c. High value-added crops can be cropped using DTW. d. Aman-vegetables-livestock (poultry) e. Crop rotation, ex. Eggplant-wheat-leek will be effective Due to no submerged conditions, damages by soil nematode are severe, crop rotation is important as well as chemicals to nematodes
Hilly land	The areas are flood-free, but soil erosion happens, and damages by flush water are also serious problems. Upland terrace and upland ridges will be useful to protect lands from soil erosion. Cover crops are also effective to protect agricultural lands. Livestock is a suitable farming system, but it often accelerates soil erosion, when grasses are eaten from roots by animal.	Due to steep slope, poor irrigation facilities and road network, farming systems vary depending on location. In steep slope area, tree crops such as rubber, tea and fruits are appropriate for marketing. Vegetable growing at homestead area can be developed. In the valley area aman rice can be grown for family consumption. For the cash generating, integrated farming with vegetable/forest-cattle will be promising. Besides the agricultural production, water conservation for Boro cultivation in dry season is also important work in the areas

**Table 6.4.2 Fisheries Development Plan in the Study Area (1/2)**

No	Region	Potential of development fish production in SSWRD
1	Hilly area (AEZ-22: Northern and eastern piedmont and AEZ-29 Northern and eastern hills)	<p>Generally it is not suitable for fish culture. If water remains in ponds/ditches/khals/rivers more than 50cm depth and minimum for 6 months, it may be possible to introduce low cost seasonal fish culture such as;</p> <ul style="list-style-type: none"> <li>• Closed water bodies- pond and ditches Tilapia mono culture, Tilapia with Pangas polyculture, Integrated fish culture; major carps, grass carp or plankton feeder fish with chicken/duck and vegetable crop on the dike,</li> <li>• Open water bodies- Khals and rivers (dries up at dry season ) Small size pen culture (tilapia, major carps, grass carp, plankton feeder fish, rajpunti),</li> </ul>
2	Terrace Area (AEZ-28: Madhupur Tract)	<p>Generally it is a suitable for fish culture. If water remains in ponds/ditches/khals/rivers/beels more than 1m depth and minimum 6-10 months, Such site may be possible to introduce low cost subsistence fish culture or income generating fish culture such as;</p> <ul style="list-style-type: none"> <li>• Closed water bodies- pond and ditch etc., Tilapia with Pangas polyculture, Integrated fish culture; major carps, grass carp or plankton feeder fish with chicken/duck and vegetable crop on the dike, Rice- com fish culture, Rice- com fish culture with duck, Polyculture (major carps, Indian carps, pangus, etc.,)</li> </ul> <p><u>To need investment large amount of finance</u> Integrated fish culture: fish with chicken/duck (poultry house on the pond or side) and vegetable crop on the dike, Fresh water prawn polyculture (prawn with fish, except carnivorous fish) Fresh water ornamental fish polyculture (major carps, indian carps with golden fish and/or fancy carp etc.,) Indigenous/natural fish culture(for indigenous/natural resource propagation) <li>• Open water bodies- Khal/ beel/river Khal: pen or cage culture of pangus or major carps Beel fish culture (stocking cultured fingerling only or with indigenous/natural fish ) Khal, beel and river: Indigenous/natural fish conservation and capture by Katas/ pen (making habitat and fishing ground by some structure) Kuas in beel and khal (like small hole or pool, it becomes fish shelter in low level water)</li> </p>
3a	Floodplain Areas 8 AEZ-9: Old Brahmaputra & Jamuna river)	<p>Generally it is a partly suitable for fish culture. If water remains in ponds/ditches/khals/rivers/beels more than 1m depth and minimum 6-10 months, it may be possible to introduce low cost subsistence fish culture or income generating fish culture such as;</p> <p>Closed water bodies- pond and ditch etc.,, if the flood doesn't break the pond or ditch.</p> <ul style="list-style-type: none"> <li>• Closed water bodies- pond and ditch Tilapia with Pangas polyculture, Integrated fish culture; major carps, grass carp or plankton feeder fish with chicken/duck and vegetable crop on the dike, Rice- com fish culture Polyculture Indigenous/natural fish (fish naturally enters the pond due to a flood) and stocking fish culture</li> </ul> <p><u>To need investment large amount of finance</u> Integrated fish culture: fish with chicken/duck (poultry house on the pond or side) and vegetable crop on the dike, Fresh water prawn polyculture (prawn with fish, except carnivorous fish) Fresh water ornamental fish polyculture (major carps, indian carps with golden fish and/or fancy carp etc.,) Indigenous/natural fish culture (for natural resource propagation) <li>• Open water bodies- Khal/ beel/river Khal: pen or cage culture of Pangas or Major carps Beel fish culture (stocking cultured fingerling only or with natural fish ) Khal, beel and river: Indigenous/natural fish conservation and capture by katas/pen (making habitat and fishing ground by some structure) Kuas in beel, khal (like small hole, pool, it becomes fish shelter in low level water)</li> </p>

**Table 6.4.2 Fisheries Development Plan in the Study Area (2/2)**

No	Region	Potential of development fish production in SSWRD
3b	Deeply Flooded Area	<p>Generally it is not suitable for fish culture because here are flooded for five to six months each year. But if pond/ditch etc., can be defended from flood, it may be possible to introduce low cost seasonal fish culture such as;</p> <ul style="list-style-type: none"> <li>• Closed water bodies- pond and ditch, etc., <ul style="list-style-type: none"> <li>Integrated fish culture; major carps, grass carp or plankton feeder fish with chicken/duck and vegetable crop on the dike,</li> <li>Rice- com fish culture with duck,</li> <li>Polyculture</li> </ul> </li> </ul> <p><u>To need investment large amount of finance</u></p> <ul style="list-style-type: none"> <li>Integrated fish culture: fish with chicken/duck (poultry house on the pond or side) and vegetable crop on the dike,</li> <li>Indigenous/natural fish culture (for natural resource propagation)</li> </ul> <ul style="list-style-type: none"> <li>• Open water bodies- Khal/beel/river <ul style="list-style-type: none"> <li>Khal: pen or cage culture of Major carps</li> <li>Beel fish culture (stocking cultured fingerling only or with natural fish )</li> <li>Khal ,beel and river: Indigenous/natural fish conservation and capture by Katas/ pen (making habitat and fishing ground by some structure)</li> <li>Kuas in beel, khal (like small hole, pool, it becomes fish shelter in low level water)</li> <li>Floating cage culture</li> </ul> </li> </ul>
4	Charlands, River Char Lands(AEZ-7: Active Brahmaputra & Jamuna Floodplain)	<p>It is not suitable for fish culture. But fishing can be conducted at open water surrounding the area to get protein and income.</p> <ul style="list-style-type: none"> <li>• Open water bodies- Khal/ beel/river <ul style="list-style-type: none"> <li>Rivers: Indigenous/natural fish conservation and capture by Katas/ pen (making habitat and fishing ground by some structure)</li> <li>Rivers: Floating cage culture</li> <li>Rivers: Collecting natural fish seed/fry for sale or own fish culture</li> </ul> </li> </ul>
5	Haor Areas (AEZ-16: Middle Meghna River Flood Plain, AEZ-19: Old Meghna Estuarine Flood Plain, and AEZ-21: Syhlet Basin Areas	<p>These areas are not suitable for fish culture because of heavy flooding and strong waves. But if pond/ditch etc., can be defended from flood, it may be possible to introduce low cost seasonal fish culture such as;</p> <ul style="list-style-type: none"> <li>• Closed water bodies- pond and ditch etc., <ul style="list-style-type: none"> <li>Integrated fish culture; major carps, grass carp or plankton feeder fish with chicken/duck and vegetable crop on the dike,</li> <li>Rice- com fish culture with duck,</li> <li>Polyculture</li> </ul> </li> </ul> <p><u>When an initial investment for fish culture is possible:</u></p> <ul style="list-style-type: none"> <li>Integrated fish culture: fish with chicken/duck (poultry house on the pond or side) and vegetable crop on the dike,</li> <li>Indigenous/natural fish culture (for natural resource propagation)</li> </ul> <ul style="list-style-type: none"> <li>• Open water bodies- Beels, haor and river <ul style="list-style-type: none"> <li>Beel fish culture (stocking cultured fingerling only or with natural fish )</li> <li>Beels and rivers: Indigenous/natural fish conservation and capture by Katas/ pen (making habitat and fishing ground by some structure)</li> <li>Kuas in beel, khal (like small hole, pool, it becomes fish shelter in low level water)</li> <li>Floating cage culture</li> </ul> </li> </ul>

**Table 6.6.1 List of Potential Subproject in Jamalpur District (1/4)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
1	Bakshigonj	Bagarchar	A	33907010	Sharmara Ramrampur-Taliapara Embankment SP	FM	511	New Construction of Embankment cum Road at two places of Sharmara Ramrampur and Taliapara touching the existing BWDB Embankment (L=1.5km, W=2.4m, H=1.2m) and Rehabilitation of existing BWDB Embankment (L=4km, W=2.25m, H=1.2m)	None	Flood Control Embankmen.	9,024,271
2	Dewangonj	Par Ramrampur	A	33915050	Lukajura Mora River SP	DIWC	620	Re-excavation of Lukajura Mora river: L=5km, W=15m, D=1.2m	One regulator or rubber dam	None	2,501,136
3	Islampur	Noapara	A	33929060	Kajla-Koritar Embankment SP	FM	705	Renovation of Embankment cum Road from Kajla to Bromothar (L=2.5km, W=4.2m, H=3m)-Hightening of embankment. New construction of Embankment cum Road from Bromothar to Notunpara (L=3.5km, W=4.5m, H=3.6m) and from Rajanagar to Koritar (L=1.5km, W=4.5m, H=3.6m)	None	Flood Controlling Embankment	20,290,887
4	Jamalpur Sadar	Ghoradhap	A	33936120	Nolikhali - Borobila SP	FMDI WC	792	New construction of embankment over the old earthen road along Banar river: L=3km, W=4.8m, H=1.2m; Re-excavation of Nalikhali - Shakbari khal: L=4km, W=9m, D=1.2m; Re-excavation of Borobila khal: L=3km, W=4.6m, D=1.2m	1 regulator at the mouth of Borobila khal on the embankment	None	11,131,992
5	Madargonj	Char Pakerdaha	A	33958010	Kayali Kandi - Char Gobindo SP	FMDI	1,069	Rehabilitation of embankment: L=3km, W=4.8m, H=0.6m; New construction of embankment: L=11km, W=4.8m, H=1m; Re-excavation of Bhanga khal: L=5km, W=30m, D=1.5m	1 regulator on east embankment over Bhanga khal	None	26,845,732
6	Melandah	Nayanagar	A	33961910	Dhamala Beel SP	FM	159	Re-excavation of Gangapara Khal (L=500m, W=6m, D=0.75m) Reexcavation of Dagi Khal (L=800m, W=6m, D=0.6m)	1 sluice gate near Gangapara Bridge	None	3,735,040
7	Sarishabari	Mahadan	A	33985080	Baila Beel Khal SP	DIWC	962	Re-excavation of Baila Beel Khal (L=10km, W=3.6m, D=0.9m)	Re-habilitation of 4 vent sluice gate at Kutirhatkhola of BWDB.	None	11,823,192
8	Bakshigonj	Sadhurpara	B	33907020	Sadhurpara SP	FMDI	786	Re-excavation of Sadhurpara Khal (L=4.5km, W=9m, D=1.5m) and New construction of Embankment (L=4.5km, W=4.27m, D=2.44m)	None	None	15,682,265
9	Dewangonj	Char Amkhaao	B	33915030	Shananda Bari - Moulavir Char Embankment SP	FM	722	New construction of Patadhua Para - Moulavir Char embankment: L=4km, W=6m, H=3m; Rehabilitation of Shananda Bari embankment: L=5km, W=3m, H=1.2m	None	None	18,012,708
10		Dewangonj	B	33915080	Gamaria-Tilakpur Embankment SP	FM	651	New construction of Gamaria-Tilakpur embankment: L=6km, W=4.6m, H=2.2m	None	None	15,758,436
11	Islampur	Belgachha.	B	33929030	Ghutail-Shorabtha-Jarultala Embankment SP	FM	243	Renovation of Embankment cum Road from Jarultala Bazar to Shorabtha (L=3km, W=3m, H=1.8m) and new construction of Embankment cum Road from Ghutail Bazar to Sharabtha (L=3km, W=6m, H=3m)	None	None	6,418,991
12		Gaibandha	B	33929100	Shialdaha Khal SP	WC	316	Re-excavation of Shialdaha Khal (L=3.5km, W=15m, D=1.5m)	1 regulator at Tengrakura Village	None	5,713,886
13	Jamalpur Sadar	Kendua	B	33936150	Satkura Khal SP	DI	230	Re-excavation of Satkura khal: L=1km, W=6m, D=1.5m	None	None	177,638



**Table 6.6.1 List of Potential Subproject in Jamalpur District (2/4)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
14	Jamalpur Sadar	Meshta	B	33936160	Sadarbari Khal SP	DIWC	564	Re-excavation of Sadarbari khal: L=1.5km, W=5m, D=1m	One regulator at the mouth of Sadarbari khal	None	7,365,795
15	Madargonj	Gunaritala & Karaichhara	B	33958020	Char Nagar - Bhang Bari - Bhelamari Embankment SP	FM	999	Rehabilitation of embankment from Char Nagar to Bhang Bari: L=3km, W=5.5m, H=1.8m Rehabilitation of embankment from Bhangbari to Bhelamari: L=6.5km, W=4.8m, H=2.4	Two regulators on the embankment	None	19,744,533
16	Melandah	Fulkocho	B	33961050	Guija-Baida Khal SP	DI	421	Excavation of new Khal (L=1.5km, W=9m, D=1m)	1 sluice gate (W=9m, H=4m) at road side.	None	7,555,275
17	Sarishabari	Sarishabari Pourashava	B	33985070	Kamrabad-Konabari SP	FM	226	None	1 No. 1 vent Regulator (L=3m, W=3m, H=2m) on the existing BWDB Embankment	Flood Controlling Embankment along the bank of the Jhenai River	3,600,000
18		Dowail	B	33985110	Chaparkona Purbachar Rothkhola SP	FM	182	(i). Rehabilitation of the existing BWDB embankment (L=1.5km, W=3.5m, H=3m), (ii). New construction of Embankment (L=2km, W=3.5m, H=3m)	None	Flood Controlling Embankment along the right bank of the Jhenai River	5,725,758
19	Bakshigonj	Bakshigonj	C	33907040	Khorakhali Khal SP <sup>1)</sup>	DIWC	1,186	Re-excavation of Khorakhali Khal (L=6km, W=10.5m, D=1.05m)	1 sluice gate	None	12,575,664
20	Dewangonj	Dangdhara	C	33915010	Tinthopa Beel and Kauniar Char River SP	FMDI WC	1,058	Re-excavation of Tinthopa khal: L=0.3km, W=9m., D=1.5m; Re-excavation of Kauniar Char river: L=4km, W=100m., D=1m	One regulator at the mouth of Tinthopa khal	None	23,338,444
21		Hatibhanga & Par Ramrampur	C	33915041	Pakra Chara Beel - Porabhita Embankment SP	FMDI WC	711	Re-excavation of Katherbeel khal: L=3km, W=15m, D=1m; New construction of Katherbeel - Goirdoba embankment: L=3km, W=4.9m, H=2.4m; Rehabilitation of Hatibhanga (Goirdoba to Bhitakandi) embankment: L=5km, W=4.9m, H=1.8m Rehabilitation of Porabhita (Porabhita to Bablamor) embankment: L=5km, W=4.9m, H=1.8m	One regulator at downstream of Katherbeel khal on embankment	None	15,359,400
22		Chikajani & Chukaibari	C	33915072	Kajla Para - Horindhara (Momin's House to Kelnakata) and Horindhara (Kelnakata to Chakuria Village) Embankment SP	FM	710	New construction of embankment from Kajla Para Adorsho Gram to Momin's house: L=1.5km, W=4.9m, H=3m; Rehabilitation of Horindhara embankment from Momin's house to Kelnakata: L=5km, W=4.9m, H=1.2m Rehabilitation of Horindhara embankment from Kelnakata to Chakuria village: L=2km, W=4.9m, H=1.2m Re-excavation of khal: L=3km, W=6m, D=1m	1 sluice gate (W=15m, H=4m)	None	12,815,795

**Table 6.6.1 List of Potential Subproject in Jamalpur District (3/4)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
23	Islampur	Chinaduli & Islampur	C	33929040	Baliadaha Khal and Bamna Beel, Panchabahala S/P	DIWC	1,121	Re-excavation of Baliadaha Khal (L=4km, W=15m, D=1.8m) Kulkandi-Islampur-Patharsi-Chinaduli-Islampur. L=25-30 km. Re-excavation of Khal (L=6km, W=12m, H=1.5m)	None	None	16,367,870
24		Palabandha	C	33929080	Batikamari Beel SP	FMDI WC	827	Re-excavation of Batkamari Khal (L=6km, W=6m, D=2.1m), New construction of Embankment (L=7km, W=2.4m, H=1m)	1 regulator (Location of the existing regulator need to be changed.).	None	15,111,114
25		Goalerchar	C	33929090	Goalerchar SP	FMDI	567	Re-excavation of Goalerchar Khal (L=4km, W=6m, D=1.5m) and New Construction of Emabnkment (L=6km, W=4.27m, H=3m)	None	None	12,928,504
26		Char Putimari & Shyampur of Melandaha	C	33929130	Degreeerchar and Amdanga - Kazaikata - Uttar Baluchar SP	FMDI WC	884	Re-excavation of Khal (L=7km, W=15m, H=2.1m); Rehabilitation of Embankment cum Road (L=6-7km, W=6m, H=0.9m)	None	None	18,416,197
27	Jamalpur Sadar	Digpaith	C	33936040	Aira - Tarar Bhita Beel SP	FMDI WC	246	Re-excavation of Aira - Nadra khal: L=0.15km, W=2.1m, D=1.5m; Re-excavation of Nadra - Kankati khal: L=0.5km, W=2.1m, D=1.4m; Re-excavation of Poin - Kankati khal: L=0.5km, W=3.7m, D=1m; Re-excavation of Tarar Bhita khal: L=1km, W=6m, D=1.5m	1 regulator at the mouth of Tarar Bhita khal	None	3,955,828
28		Shahbajpur	C	33936060	Banar Shashakhali Khal SP	DI	800	Re-excavation of Banar Shashakhali khal: L=8km, W=6m, D=2m	One culvert	None	9,087,840
29		Ranagachha	C	33936100	Banar Khal SP	DI	724	Re-excavation of Banar khal: L=5km, W=18m, D=1.5m	None	None	3,730,388
30		Banschara	C	33936111	Airakuri - Jhaldhara - Zigatola Beel SP	FMDI WC	346	Re-excavation of Jhaldharar khal: L=2km, W=3m, H=1.2m; Re-excavation of Zigatola khal: L=0.5km, W=4.6m, H=1m;	3 regulators at the mouths of Airakuri, Jhaldhara and Zigatola khals	None	10,250,010
31		Banschara	C	33936112	Shankhola Khal SP	FM	208	None	1 regulator at the mouth of Shankhola khal	None	3,600,000
32	Melandah	Adra	C	33961041	Napithkhali-Challa khali, , SP	FMDI	846	New construction of embankment (L=10km, W=6m, H=2.5m):Rehabilitation of existing embankment (L= 15 km, W=2.7m. H=0.9m.) Re-excavation of Napithkhali Khal (L=3km, W=7m, D=1m), Charaldaha Khal (L=1km, W=7m, D=1m) and Hurikhali Khal (L=0.27km, W=3.6m, D=0.9m)	one sluice gate	None	26,821,064
33		Fulkocha & Ghosherpara	C	33961060	Chinashoka-Morangani Khal, Ghosherpara SP	FMDI	1,019	Excavation of Khal from Gudadanga through Chinashoka (L=5km, W=9m, D=1.5m) Excavation of Khal (L=5km, W=12m, D=1m).	1 sluice gate at Beltali-Pathanpara 3 regulators, one 15m wide and 5m deep, and each of other two 10m wide and 5m deep	None	20,656,688

**Table 6.6.1 List of Potential Subproject in Jamalpur District (4/4)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
34	Melandah	Char Banipakuri	C	33961110	Kalihari Beel SP	FMDI WC	525	Re-excavation of Kalihari-Atbari Khal: L=2km, W=6m, D=1.5m. New construction of Embankment cum Road from Charpolisha (east) to Bhabki Fakirbari (L=5km, W=2.4m, H=1.5m)	1 sluice gate at Atbari	None	11,056,560
35	Sarishabari	Kamrabad	C	33985040	Kamrabad-Konabari SP	FM	928	(ii). Rehabilitation of Road as Embankment (L=4.5km, W=10m, H=3m), (iii). Suapur Khal and Baro Bari khal Re-excavation (L=2.5km, W=5m, D=1m & L=1.5km, W=4m, D=1m)	2 regulators at Baro Bari Khal and at Suapur Khal.	Flood Controlling Embankment	20,979,325
36		Aona	C	33985090	Ponchashi-Kabaribari Embankment SP	FM	929	Rehabilitation of Ponchashi to Kabaribari Embankment (L=7km, W=3.3m, H=2.1m)	None	Flood Controlling Embankment	4,957,943
37		Pogaldigha	C	33985230	Takuria-Malipara Beel SP	FM	728	New Construction of Embankment cum Road from Takuria to Malipara (L=1.5km, W=6m, H=2.4m) and Re-habilitation of Embankment cum Road from Malipara to Gasboira (L=12km, W=2.4m, H=1.5m)	1 sluice gate at Gasboira	None	14,255,518
38	Sarishabari & Jamalpur Sadar	Bhatara & Mesta	C	33985517	Fularpar-Fulbaria Embankment, Chatal Beel SP	FMDI WC	744	Rehabilitation of Fularpara to Fulbaria Embankment cum Road: L=5km, W=4.2m, H=1.2m Rehabilitation of embankment (Mesta): L=7km, W=7m, H=1.5m Re-excavation of Chatal khal: L=1km, W=5m, D=1.5m	One regulator at the mouth of Chatal beel khal	None	13,832,930
39				C	33985618	Hollikhal, Shaplenja Beel SP	DIWC	933	Re-excavation of Hollikhal (L=5km, D=0.9m, W=9m) up to Jhenai river Re-excavation of Shaplenja khal: L=0.5km, W=6m, D=1.5m	One regulator at the mouth of Shaplenja khal	None

**Table 6.6.2 List of Potential Subproject in Kishoreganj District (1/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
1	Austagram	Khoyerpur Abdullahpur	A	34802120	Moraghoper Khal SP	WC	300	Reexcavation of Moraghoper khal: L=1.2km, W=65m, D=1.7m	None	None	4,351,787
2	Bajitpur	Dighirpar	A	34806130	Naldir - Chandair Beel SP	DIWC	496	Re-excavation of khal from Naldir beel - Chandair beel - Bengla river L=2km, W=18m, D=2.1m	One regulator on embankment at North of Bengla river	Humaiapur Haor Project	10,005,251
3	Bhairab	Gazaria	A	34811050	Tatal Char Khal SP	DI	200	Re-excavation of Tatal Char khal: L=2km, W=8m, D=1.5m	1 culvert at downstream of Tatal Char khal which is closed at present	None	1,343,085
4	Hossainpur	Araibaria	A	34827030	Hossainpur Drainage Canal SP	FMDI	304	Re-excavation of drainage canal with lined vertical section: L=1km, W=2m, D=1.8m	One regulator at the downstream	None	4,937,167
5	Itna	Raituti	A	34833021	Suair-Pachassia SP	FMDI	624	Re-excavation of khal: L=2.5km, W=15m, D=2m; New construction of embankment: L=5km, W=3m, H=2.5m (there is no need of embankment along the Eastern side of the project boundary)	Two regulators at the Southern and Western khals on the embankment	None	18,139,200
6	Karimganj	Gundhar	A	34842150	Singua River (Fazil Khali to Chulli) SP	DIWC	623	Re-excavation of Singua river: L=10km, W=8m, D=2m; New construction of embankment: L=20km, W=2m, H=2m	None	None	16,856,000
7	Katiadi	Jalalpur	A	34845020	Arial Khan River Embankment SP	FM	655	New construction of embankment: L=5km, W=4.3m, H=2.7m	One gated drainage outlet at Fakir Bari	None	11,719,922
8	Kishoreganj Sadar	Baulai	A	34849070	Dhubajora - Paniumra - Phul Mogra - Bor Mogra - Machua Beel SP	DIWC	952	Re-excavation of Dhubajora beel - Panimumra beel khal: L=1km, W=3.7m, D=1.5m; Re-excavation of Paniumra beel - Phul Mogra beel khal: L=1.5 km, W=3m, D=1.8m; Re-excavation of Phul Mogra beel → Bor Mogra beel → Machau beel → Proposed regulator: L=0.5km, W=3m, D=1.8m	One regulator on khal from Machua beel → Narsundda river	None	11,729,873
9	Kuliar Char	Ramdi	A	34854020	Kalkara Beel SP	DI	184	Re-excavation of khal from Khalkara beel to Bordor khal: L=2.5km, W=8.3m, D=1.7m	None	None	1,456,233
10	Mithamain	Boirati	A	34859050	Char Khat Khal - Baher Char Village extending up to Taleb Ali's House Embankment SP	FM	902	Construction of new embankment: L=5.5km, W=2.5m, H=1.5m	Three gated drainage outlets	None	14,050,514
11	Nikli	Singpur	A	34876160	Mirkhali Khal SP	FM	353	None	One regulator on Mirkali khal upstream for naviagation	None	3,600,000
12	Pakundia	Egarasindur	A	34879050	Holholia Khal SP	FMDI WC	793	Re-excavation of Holholia khal: L=4km, W=7.6m, D=1.5m	One regulator on east of Bilbhara beel near existing LGED bridge; Repair one BWDB regulator at downsream of Holholia khal	Motkhola - Boiragir Char Embankment Project	9,066,378
13	Tarail	Dhala	A	34892040	Sekandar Nagar SP	FMDI WC	642	New construction of embankment: L=5km, W=4.8m, H=3.0m; Re-excavation of Fuleswari (3.5km) and eastern (1.5km) khals: L=5km, W=6m, D=1.5m	Two regulators: one on Fuleswari khal and another on eastern khal	None	18,480,728

**Table 6.6.2 List of Potential Subproject in Kishoreganj District (2/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
14	Austagram	Kastail	B	34802030	Pedula - Zia Khal SP	DIWC	677	Re-excavation of Pedulia - Zia khal: L=4km, W=10m, D=1.3m	None	None	1,962,381
15	Austagram	Austagram Sadar	B	34802041	Pathairbanda - Narsing Purbabad - Barahaor Khal SP	WC	540	Re-excavation of Khal: L=8km, W=11m, D=4m (for navigation)	None	None	17,179,520
16	Bajitpur	Gazir Char	B	34806060	Ghagotia Khal SP	WC	217	Re-excavation of Ghagotia khal: L=2km, W=19m, D=2.2m; Re-excavation of Ichamoti beel: A=3.1ha, D=2.2m	None	None	5,252,386
17	Bajitpur	Humaiapur	B	34806100	Baruner Khal SP	WC	282	Re-excavation of Baruner khal: L=5km, W=6m, D=2.2m	One culvert on the cross-road from Baruner beel to Dholeshwari river	Humaiapur Haor Project	3,602,634
18	Bhairab	Aganagar	B	34811040	Nalir Khal SP	DIWC	117	Re-excavation of Nalir Khal at two places: From Gokul Nagar bazar to Kodal Ghati (L=1km, W=15m, D=2.4m) and from Bagnamara to Meghna river (L=1km, W=15m, D=1.8m)	None	None	2,415,870
19	Bhairab	Sadekpur	B	34811070	Bajmadorer Beel SP	DIWC	126	Re-excavation of Bajmadorer khal: L=1km, W=3m, D=1m	One regulator at downstream of Bajmadorer beel on Moutopi to Rasulpur Road (Bongoshor)	None	3,742,110
20	Hossainpur	Sahedal	B	34827050	Rohimpur - Chapra Beel SP	DIWC	427	Re-excavation of khal: L=2km, W=5m, D=1.5m	One regulator downstream of Rohimpur Chapra beel; two culverts	None	8,258,865
21	Itna	Raituti	B	34833010	Hulia Khal SP	FMDI WC	321	Re-excavation of Hulia khal: L=0.5km, W=8m, D=2m; New construction of embankment: L=6km, W=3m, H=2.5m	One regulator at downstream of Hulia khal on the embankment	None	13,692,160
22	Itna	Elongjuri	B	34833080	Kaktangur SP	FMDI WC	416	Re-excavation of khal: L=2.3km, W=8m, D=2m; Rehabilitation of embankment: L=3km, W=5m, H=0.5m); New construction of embankment: L=6km, W=3m, H=1.5m	One regulator at downstream of bali beel on the embankment and one check structure between beels	None	13,221,058
23	Itna	Mriga	B	34833120	Bamon Digha SP	FMDI WC	502	Re-excavation of khal: L=0.2km, W=8m, D=1.5m; Rehabilitation of embankment: L=9km, W=5m, H=2m; New construction of embankment: L=4km, W=3m, H=2m	One regulator at downstream of Bamon Digha beel on the embankment	None	15,620,569
24	Karimganj	Guzadia	B	34842010	Kala Huliya Beel SP	DIWC	132	Re-excavation of Kala Huliya khal: L=2km, W=5m, D=2m	One regulator on Kala Huliya khal before confluence with bethai river	None	3,760,560
25	Karimganj	Kadir Jangal	B	34842030	Aamayna Bari - Pachahara Beel SP	DIWC	837	Re-excavation of khal: L=4km, W=5m, D=1.5m	Two regulators on the khal: one before confluence with Damini river and another downstream of Aamayna Bari beel	None	9,573,730
26	Karimganj	Dehunda	B	34842110	Khamar Dehunda Boro Beel SP	DIWC	143	Re-excavation of Kamar Dehunda beel khal: L=1.5km, W=6m, D=1.5m	One regulator at the downstream	None	4,186,204
27	Katiadi	Lohajuri	B	34845030	Char Kaunia Khal - Latia Badh Khal SP	FM	570	Rehabilitation of embankment: L=5km, W=3.6m, H=1.5m	Three regulators on the embankment: one at Char Kaunia khal, another at Latia Badh khal and the other is a pipe regulator at Jirarpur	None	9,426,015
28	Kishoreganj Sadar	Dana Patuli & Korsha Kariail	B	34849060	Khaikhodia Khal SP	DIWC	705	Re-excavation of Khaikhodia khal upstream: L=2.5km, W=6m, D=1.2m; Re-excavation of Khaikhodia khal downstream: L=3.5km, W=24m, D=1.5m; New excavation of khal from Shaloin beel to Singua river: L=1.4km, W=3m, D=1.5m	One regulator on Khaikhodia khal at the mouth of Singua river near Sonamuddi's house	None	12,807,260
29	Mithamain	Gopedighi	B	34859020	Ghorbhanga River SP	WC	729	Re-excavation of Ghorbhanga river: L=5km, W=8m, D=2.4m	None	None	7,238,136

**Table 6.6.2 List of Potential Subproject in Kishoreganj District (3/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
30	Nikli	Nikli	B	34876070	Sojoni Khal and Roda Khal SP	WC	371	Re-excavation of Roda khal: L=1.5km, W=20m, D=1.5m; Re-excavation of Sojoni khal: L=2km, W=60m, D=1.8m	None	None	8,709,211
31	Nikli	Chattiarchar & Nikli	B	34876080	Doparpar - Shapmari Khal, Borolia Khal SP	WC	926	Re-excavation of Doparpar - Shapmari khal: L= 5km, W=30m, D=1.5m Re-excavation of Borolia khal: L=2km, W=12m, D=1.8m	None	None	9,309,626
32	Nikli	Nikli	B	34876140	Horchoki Beel SP	WC	384	Re-excavation of Horchoki beel: A=20ha, D=1.5m	None	None	9,474,000
33	Pakundia	Charfaradi & Pakundia	B	34879020	Narsunda Khal, Anwar Khali - Molongsha - Jugir Gang Khal SP	DIWC	876	Re-excavation of Narsunda khal: L=5km, W=9m, D=3m Re-excavation of Anwar Khali khal: L=5km, W=8m, D=1.8m	One regulator	Embankment , Regulator	14,036,104
34	Austagram	Deoghar	C	34802010	Noli Khal SP	WC	550	Re-excavation of Noli khal: L=2.5km, W=16.7m, D=2.7m New excavation of lined drainage canals (total): L=3km, W=1m, D=0.3m	None	Modhkholo-B hairagir Char Sub-Project	10,344,386
35	Austagram	Deoghar	C	34802020	Boro Khal SP	WC	136	Re-excavation of Boro khal: L=1.5km, W=11.7m, D=2.7m	None	Modhkholo-B hairagir Char Sub-Project	2,014,409
36	Austagram	Austagram Sadar	C	34802042	Beelbolli Beel SP	DIWC	699	Re-excavation of Beelbolli khal: L=1km, W=11m, D=3m Reexcavation of khal: L=0.8km,W=20m, D=3m	One regulator at downstream of Beelbolli Khalbefore confluence with Kalni river	None	10,525,374
37	Austagram	Banglapara	C	34802050	Goja Khal and Jora - Charer Beel SP	FMDI WC	240	Re-excavation of Goja khal: L=1.6km, W=15m, D=1.7m	One regulator at Char Protep	None	5,107,503
38	Bajitpur	Pirijpur	C	34806010	Rupar Khal SP	DI	81	Re-excavation of Rupar khal: L=1.5km, W=9m, D=1.8m	None	None	997,612
39	Bajitpur	Halimpur	C	34806020	Boiddonodir Khal SP	DIWC	168	Re-excavation of Boiddonodir khal: L=2km, W=4.6m, D=2.1m	One regulator on the road near to Chapadangar beel	None	4,627,929
40	Bajitpur	Hilachia & Sararchar	C	34806031	Tejkhali Khal, Agarpur Khal SP	WC	958	Re-excavation of Tejkhali khal (down stream): L=5km, W=15m, D=1.5m Re-excavation of Tejkhali khal (up stream): L=5km, W=8m, D=1.5m Re-excavation of Agarpur khal: L=4km, W=7m, D=1.5m	None	None	8,266,065
41	Bajitpur	Dilalpur	C	34806070	Nagner Khal SP	WC	333	Re-excavation of Nagner khal: L=2km, W=48m, D=1.5m	None	None	4,760,685
42	Bajitpur	Maijchar	C	34806090	Boro Khal SP	FMDI WC	301	Re-excavation of Boro khal: L=5km, W=15m, D=1.5m	One regulator on Boro khal over the embankment	Humaiapur Haor Project	8,685,663
43	Bhairab	Kalikaprasad	C	34811010	Kalikaprasad Khal SP	FMDI WC	260	Re-excavation of Kalikaprasad khal from Biswa road to Imam bari: L=1.5km, W=9m, D=2.1m	One regulator at Imam bari bridge	None	5,808,646
44	Bhairab	Shimulkandi	C	34811030	Kodalkati Khal SP	WC	501	Re-excavation of Kodalkati khal (L=4km, W=70m, D=1m)	None	None	9,031,880
45	Hossainpur	Sahedal	C	34827040	Narasunda River (Kawna - Rampur - Char Pumdii) SP	DIWC	584	Re-excavation of Narasunda river: L=12km, W=15m, D=2m	None	None	13,642,560
46	Itna	Badla	C	34833022	Shizly Khal SP	FMDI	636	Re-excavation of Sizly khal: L=1km, W=10m, D=2m; Embankment rehabilitation: L=2km, W=5m, D=2m; New embankment construction: L=4km, W=3m, H=2m	2 regulators at the Southern side	None	14,897,240
47	Itna	Badla	C	34833050	Saluar Khal SP	DIWC	649	Re-excavation of Saluar Khal: L=7.5km, W=16m, D=1.5m Rehabilitation of embankment: L=15km, W=3m, H=2m	None	None	15,927,469
48	Itna	Elongjuri	C	34833070	Naluya-Mukti Beel SP	FMDI WC	385	Re-excavation of khal: L=1.5km, W=10m, D=1.5m; Rehabilitation of embankment: L=8.5km, W=5m, H=1.5m; New construction of embankment: L=4.5km, W=2m, H=2m	One regulator at downstream of Mukti beel on the embankment and one check structure between beels	None	11,961,241

**Table 6.6.2 List of Potential Subproject in Kishoreganj District (4/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
49	Itna	Itna	C	34833090	Geol Khal SP	FMDI WC	249	Re-excavation of khal: L=1.5km, W=5m, D=2m; Rehabilitation of embankment: L=0.6km, W=5m, H=1.5m; New construction of embankment: L=0.4km, W=5m, H=1.5m	One regulator at downstream of Geol beel on the embankment	None	5,025,560
50	Itna	Dhanpur	C	34833100	Katakhali SP	FMDI WC	359	Re-excavation of Katakhali khal: L=1.5km, W=15m, D=1.5m; Rehabilitation of embankment: L=12km, W=5m and H=1.5m	One regulator at downstream of Katakhali khal on the embankment	None	12,981,631
51	Itna	Joysiddhi	C	34833130	Nali-Azur Beel SP	FMDI WC	556	Re-excavation of Nali - Azur beel khal: L=5km, W=8m, D=1.5m; Rehabilitation of embankment: L=6km, W=5m, H=2m	One regulator at downstream of Nali-Azur beel on the embankment	None	14,484,473
52	Itna	Joysiddhi	C	34833140	Dudbon - Duair Beel SP	FMDI WC	856	Re-excavation of Dudbon - Duair beel khals: L=1km, W=30m, D=1.5m; New construction of embankment: L=5km, W=3m, H=2m (there is no need of embankment along the Northern side of the project boundary)	Two regulators at the downstream of Dudbon and Duair beels before confluence with Boutai and Kalni rivers	None	16,875,583
53	Karimganj	Noabad	C	34842070	Kumuria - Hugli Beel SP	DIWC	628	Re-excavation of khal (Kumuria - Fata beels): L=1km, W=4.5m, D=1.2m; Re-excavation of khal (Fata - Singua beels): L=2km, W=4.5m, D=1.2m; Re-excavation of khal (Singua - Jaldua beels): L=2km, W=4.5m, D=1.5m; Re-excavation of khal (Hugli - Noabad beels): L=2km, W=6m, D=1.5m; Re-excavation of khal (Noabad -Jaldua beels): L=1.5km, W=6m, D=1.5m	One regulator at downstream of Noabad beel	None	9,923,538
54	Karimganj	Baragharia	C	34842080	Joka - Gudhar Khal SP	DIWC	824	Re-excavation of Joka - Gudhar khal: L=9km, W=6m, D=1.5m	Three regulators: one downstream of Joka beel; another between Tan and Nawa Singua beels; the other on Joka - Gudhar khal at downstream of confluence with Kayemarghuna beel	None	14,317,223
55	Karimganj	Niamatpur	C	34842120	Narasunda river (Sakhua Bridge to Nakasindi) SP	FMDI	855	Re-excavation of Narasunda river: L=10km, W=15m, D=1.5m; New construction of embankment: L=4km, W=5m, H=1.5m	None	None	22,409,885
56	Karimganj	Niamatpur & Sutar Para	C	34842130	Rohabaid - Charitolla Beel, Rajjani Khal SP	FMDI WC	1,106	Re-excavation of upstream of Rajjani khal: L=1.5km, W=6m, D=1m Re-excavation of Rajjani khal: L=5.5km, W=15m, D=2.4m	One regulator at downstream of Rohabaid Charitolla beel One regulator at downstream of Rajjani khal before confluence with Dhanu river	None	18,908,797
57	Karimganj	Sutar Para	C	34842160	Pangay Beel SP	FMDI WC	329	Re-excavation of Pangay khal: L=2.5km, W=18m, D=2.1m	One regulator before confluence with Dhanu river	None	7,106,564
58	Katiadi	Mosua	C	34845010	Sorbomongal - Meratola Khal and Betal Doba Khal SP	DI	1,033	Re-excavation of Sorbomongal Meratola Khal: L=6km, W=8.4m, D=1.8m with lining of 0.25 km along the left bank (North-East side) in the downstream	Upgrading of existing BWDB sluice gate by one new vent (bypass gate)	Ramdi - Digambordi Embankment Project	15,065,810
59	Kishoreganj Sadar	Latibabad	C	34849021	Makua - Vashker Khali, Hutzra Ghati and Bhorai Ghati Khal SP	DI	440	Re-excavation of Makua - Vashker Khila khal: L=3.7km, W=6m, D=1.5m; Re-excavation of Hutzra Ghati khal: L=1.2km, W=6m, D=1.5m; Re-excavation of Bhorai Ghati khal: L=1.5km, W=6m, D=1.5m	One culvert on Huzra Ghati khal	None	2,873,136

**Table 6.6.2 List of Potential Subproject in Kishoreganj District (5/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
60	Kuliar Char	Faridpur	C	34854050	Faridpur-Akanbaid Khal, Ali Nagar East Faridpur Embankment SP	FMDI	615	Re-excavation of Faridpur - Akanbaid khal: L=5km, W=7.5m, D=1.2m New construction of embankment: L=10km, W=4.3m, H=3.0m	One regulator on embankment at Akanbaid khal	Katkhal Sluice Gate	20,312,984
61	Nikli	Karpasha	C	34876020	Shaharmul Imam Khal SP	WC	197	Re-excavation of Shaharmul Imam khal: L=3km, W=15m, D=1.8m	None	None	3,018,416
62	Nikli	Karpasha	C	34876030	Mojlishopur Kata Khal SP	WC	64	Re-excavation of Mojlishopur Kata khal: L=2km, W=12m, D=1.8m	None	None	1,671,214
63	Nikli	Singpur	C	34876060	Jailbhanga - Ghagani Khal SP	DIWC	1,008	Re-excavation of Jailbhanga khal: L=4km, W=60m, D=1.8m; Re-excavation of Ghagani khal: L=1km, W=45m, D=1m	None	None	26,524,945
64	Nikli	Chattiarchar	C	34876100	Cheenardir Khal SP	DIWC	247	Re-excavation of Cheenardir khal: L=2km, W=7m, D=1.8m	One regulator at downstream of Cheenardir khal	None	5,702,774
65	Nikli	Singpur	C	34876150	Lalpur Khal SP	FM	441	None	One regulator at Lalpur khal mouth for navigation	None	7,200,000
66	Pakundia	Charfaradi	C	34879040	Borsha Gati Khal SP	DIWC	811	Re-excavation of Borsha Gati khal: L=6km, W=6m, D=1.8m	None	None	2,967,257
67	Pakundia	Chandipasha	C	34879060	Biharir Khal SP	DIWC	261	Re-excavation of Biharir khal: L=3.5km, W=6m, D=2.1m	One regulator at Ghagra	None	5,723,834
68	Tarail	Tarail Sachail	C	34892020	Kaiknar Beel SP	FMDI WC	414	Rehabilitation of embankment: L=3km, W=3.7m, H=1.5m; Re-excavation of Nondipur and Rajjani khals: L=3km, W=9m, D=3m	Two regulators at mouth of Nondipur and Rajjani khals	None	12,392,816



**Table 6.6.3 List of Potential Subproject in Mymensingh District (1/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
1	Bhaluka	Uthura	A	36113100	Bajuajora Khal SP	WC	536	None	1 regulator	None	7,200,000
2	Dhobaura	Dakshin Majipara	A	36116030	Shashi Khal SP	DIWC	292	Re-excavation of Shashi khal: L=5km, W=9m, D=1.2m	None	None	5,646,384
3	Fulbaria	Balian	A	36120010	Kalmina Khal SP	FMDI	567	New construction of Embankment (L=1km, W=6m, D=2m), Re-excavation of Kalmina Khal (L=1km, W=6m, D=2m) and Re-excavation of Hugli Khal (2km, W=2.25m, D=1.05m)	1 regulator	None	9,481,506
4	Gaffargaon	Rasulpur	A	36122010	Bangalil Khal - Chat Beel Khal SP	FMDI WC	629	Re-excavation of Chat beel khal: L=2km, W=10m, D=2.5m; Re-excavation of Bangalil khal: L=6km, W=10m, D=2.5m Re-excavation of Chater Khal: L=2.5km, W=10m, D=2.5m Re-excavation of Barail Khal: L=2km, W=10m, D=2.5m	One regulator	None	18,169,531
5	Gouripur	Mailakanda	A	36123020	Bogadia Khal SP	DI	691	Re-excavation of Khal (L=1.3km, W=6m, D=2.1m)	None	None	788,853
6	Haluaghat	Bildora	A	36124090	Kala Anda - Jam Beel SP	FMDI	1,129	Re-excavation of Kanakuri Kanda khal: L=3km, W=6m, D=1m; Re-excavation of Haora khal: L=1.5km, W=15m, D=1m; Re-excavation of Bhangar khal: L=1km, W=8m, D=1m; Re-excavation of Kala Anda khal: L=3km, W=15m, D=1m	One regulator	Auti to Futkai Ferryghat Embankment	14,155,375
7	Iswarganj	Atharabari	A	36131110	Dholai Beel - Kachamatia River Khal SP	DI	171	Re-excavation of Khal: L=4km, W=4.5m, D=1.8m	None	None	1,637,107
8	Mymensingh Sadar	Dapunia	A	36152050	Kasma Beeler Khal SP	DI	172	Re-excavation of Kasma Beeler Beel Khal: L=1.5km, W=6m, D=2.4m	None	None	1,091,405
9	Muktagachha	Baragram	A	36165030	Tekhala - Nowdhara - Katajora Khal SP	DIWC	986	Re-excavation of Tekhala, Nowdhara and Katajora khals: L=4km, W=6m, D=1.2m	One regulator at the mouth of Katajora khal	None	5,782,355
10	Nandail	Gangail	A	36172091	Betai River SP	DI	660	Re-excavation of Betai river: L=7km, W=9m, D=1.5m	Upgrade BWDB 4-vent sluice gate at Tarail	Embankment from Gatipara to Sundail via Nasratpur Bridge	10,930,388
11	Phulpur	Bishka	A	36181170	Mesera Embankment SP	FM	690	Rehabilitation of embankment: L=3.5km, W=4.3m, H=2.1m	One regulator on Soai river	None	10,009,501
12	Trishal	Mokshapur	A	36194060	Medoari River Embankment SP	FMDI	851	Rehabilitation of Medoari river embankment: L=6.5km, W=4.9m, H=3m; Re-excavation of Doradi khal: L=2km, W=10m, D=2.5m; Re-excavation of Boali khal: L=1km, W=6m, D=1.8m; Re-excavation of Kuch Khali khal: L=2km, W=10m, D=2.5m	Three regulators on embankment at Narai river, Boali khal and Doradi khal	None	27,195,166

**Table 6.6.3 List of Potential Subproject in Mymensingh District (2/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
13	Bhaluka	Kachina	B	36113030	Shalda Khal SP	WC	419	Re-excavation of Shalda Khal (L=4km, W=20m, D=0.9m)	One 1-vent sluice gate	None	9,627,239
14	Dhobaura	Ghoshgaon	B	36116020	Ghoshgaon-Bhuiyanpara SP	DIWC	1,135	Re-excavation of Tarai khal: L=3km, W=18m, D=1.2m; Re-excavation of Pachai khal: L=3km, W=12m, D=1.2m; Three new lined irrigation canals: L=7km, W=3m, D=1.5m	One weir (instead of originally proposed rubber dam) on Nitai river	None	35,240,056
15	Fulbaria	Bakta	B	36120100	Baza Beel Khal SP	DIWC	157	Re-excavation of Baza Beel Khal (L=1km, W=6m, D=1.5m)	1 regulator	None	3,990,803
16	Fulbaria	Fulbaria	B	36120110	Naligang Khal SP	FMDI WC	217	Re-excavation of Naligang Khal (L=3km, W=6m, D=3m)	1 regulator	Re-excavation of Ishail Beel Khal	6,584,310
17	Fulbaria	Radhakanai	B	36120140	Boga-ora Khal SP	FMDI WC	393	Re-excavation of Boga-ora Khal (L=4km, W=9m, D=3m)	1 regulator	None	8,715,960
18	Gaffargaon	Masakhali	B	36122060	Ubakuri Khal SP	DI	237	Re-excavation of Ubakuri khal: L=4km, W=9m, D=1m	None	None	1,326,360
19	Gaffargaon	Gaffargaon	B	36122070	Bhatiar Beel SP	FMDI WC	1,067	Re-excavation of Bhatiar khal: L=9km, W=15m, D=3m; Re-excavation of Bhatiar Kennar khal: L=3km, W=10m, D=2.5m	One regulator on Bhatiar khal downstream of confluence with Kennar khal	None	30,683,558
20	Gouripur	Achintapur	B	36123040	Suria River SP	DIWC	464	Re-excavation of Suria River (L=9km, W=30m, D=1.5m)	None	None	11,501,318
21	Gouripur	Dowhakhola	B	36123062	Angrail-Beel Kalia-Shalpa Dowhakhola-Kaladia Khal	FMDI	1,163	Re-excavation of Khal (L=4km, W=1.5m, D=0.45m)	None	None	10,923,636
22	Haluaghat	Jugli	B	36124020	Tukiar Khal SP	WC	811	Re-excavation of Tukiar khal: L=2.5km, W=9m, D=1.8m	One regulator	None	12,462,687
23	Haluaghat	Dhara	B	36124050	Silka Khal SP	DI	703	Re-excavation of Silka khal: L=4.5km, W=7.6m, D=1.2m	None	None	1,603,001
24	Iswarganj	Sohagi	B	36131080	Doran Barabagh Khal SP	FMDI	522	Re-excavation of Doranborbogh Khal: L=5km, W=6m, D=2m New excavation of Khal: L=1km, W=6m, D=1.5m New construction of flank embankment on both sides of the proposed regulator: L=0.5km, W=5m, H=2.5m	One regularor	None	11,715,128
25	Iswarganj	Atharabari	B	36131120	Dholeswari Khal SP	DI	515	Re-excavation of Dholeswari Khal: L=5km, W=7.5m, D=1.8m	None	None	2,899,044
26	Mymensingh Sadar	Kushtia	B	36152010	Dari Kushtia SP	DI	217	Re-excavation of Dari Kushtia Khal: L=1.5km, W=20m, D=3m	None	None	3,481,695
27	Mymensingh Sadar	Borarchar	B	36152030	Char Ragabpur Embankment SP	FM	456	Improvement of existing kacha road into road cum embankment: L=4km, W=5m, H=3m	One gated outlet	Flood Control Drainage Project	13,136,040
28	Muktagachha	Ghoga	B	36165010	Haora Khal SP	DIWC	619	Re-excavation of Haora khal: L=4km, W=5m, D=1.2m	One regulator at Chanpur village	None	4,630,771
29	Muktagachha	Daogaon	B	36165020	Khaila Beel SP	DIWC	615	Re-excavation of Ganiar khal: L=7km, W=10m, D=1.2m	One regulator at downstream of Khaila beel at Porabari	Embankment and sluice gate (inoperative)	10,330,210
30	Nandail	Singrail	B	36172080	Bhedapuri - Narsunda Khal SP	DI	988	Re-excavation of Bhedapuri khal: L=5km, W=6m, D=1.5m; Re-excavation of Narsunda khal (uppermost stream of Narsunda river): L=5km, W=15m, D=1.5m	One regulator on Narsunda khal near Sayed Ali's house	Baroikhali Sluice Gate to Dhakipara Embankment Project	11,639,675

**Table 6.6.3 List of Potential Subproject in Mymensingh District (3/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
31	Nandail	Chandipasha	B	36172092	Dholeswari River SP	FMDI	513	Re-excavation of Dholeswari river from Basati C&B road to Narsunda river: L=5km, W=9m, D=1.5m	One regulator on Dholeswari river at confluence with Narsunda river	Re-excavation of Dholeswari River	9,864,563
32	Nandail	Pourashava	B	36172130	Borbori Beel SP	DIWC	218	Re-excavation of Borbori khal: L=0.5km, W=9m, D=1.2m	One regulator on downstream of Borbori khal before confluence with Narsunda river	None	4,804,638
33	Phulpur	Dhakua	B	36181120	Tukanda - Kathuri Embankment SP	FM	498	Rehabilitation construction of embankment: L=5km, W=4.3m, H=2.4m	None	Excavation of Dhalai River	14,890,724
34	Phulpur	Kamargaon	B	36181130	Kamargaon - Kalika Ferryghat Embankment SP	FM	678	Rehabilitation of embankment: L=10km, W=4.3m, H=3.7m	None	None	10,797,600
35	Phulpur	Galagaon	B	36181140	Dharakandi Khal SP	DI	519	Re-excavation of Dharakandi khal: 3km, W=11m(B=6.1m), D=1.2m (khal re-excavation need to be extended 3km upstream up to Phenera beel)	None	None	1,796,270
36	Trishal	Mathbari	B	36194040	Dubura Chara Beel SP	DIWC	376	Re-excavation of Dhobra Chara khal: L=5km, W=6m, D=1.8m	One regulator at mouth of Dhobra Chara khal	None	6,072,714
37	Trishal	Balipara	B	36194110	Dobadanga Khal SP	DIWC	555	Re-excavation of Dobadanga khal: L=6km, W=6m, D=1.2m	One regulator on Dobadanga khal over road at upstream of Bonna beel	None	8,973,533
38	Bhaluka	Bhaluka & Bharadoba	C	36113061	Chullar Khal - Afainya/Harar Khal SP	DIWC	940	Re-excavation of Chullar Khal: L=3km, W=42m, D=1.5m Re-excavation of Afainya/Harar Khal: L=10km, W=6m, D=1.5m	None	Existing 5-vent regulator	20,996,393
39	Bhaluka	Birunia	C	36113080	Langolhata Khal SP	DIWC	896	Re-excavation of Langolhata Khal (L=6km, W=30m, D=1.5m)	One 1-vent sluice gate	BWDB Embankment	19,966,095
40	Dhobaura	Baghber	C	36116010	Tarai Khal SP	DIWC	757	Re-excavation of Tarai khal: L=6km, W=9m, D=1.5m	One regulator at the union boundary	None	10,397,475
41	Fulbaria	Naogaon	C	36120030	Foliar Khal SP	FMDI	783	Re-excavation of Jalkhora Beel Khal (L=2km, W=6m, D=2m), Fariar Khal (4km, W=15m, D=3m), Bengachonar Khal (L=3km, W=7m, D=5m) and construction of embankment (L=1km, W=4.5m, D=1.5m)	None	None	23,521,163
42	Fulbaria	Enayetpur	C	36120050	Thanar Khal SP	FMWC	729	Re-excavation of Thanar Khal (L=2.5km, W=6m, D=2m), New construction of embankment (L=4.5km, W=4.5m, H=2m)	1 regulator	None	14,311,305
43	Fulbaria	Achim Patuli	C	36120070	Doradia SP	DIWC	860	Re-excavation of Doradia Khal (L=1km, W=20m, D=3m), Sripolia Khal (L=2.5km, W=15m, D=3m), Kalail Khal (L=2.5km, W=12m, D=3m), Simulia Khal (L=1.5km, W=10m, D=2.5m), Chand Khal (L=2.5km, W=10m, D=2.5m) and Khapsaker Khal (L=2km, W=10m, D=2.5m)	1 regulator	None	28,161,105
44	Fulbaria	Kaladaha	C	36120080	Ghazakuri Khal SP	FMDI	846	Re-excavation of Guzakuri Khal (L=4km, W=3m, D=2.1m) and New construction of Embankment (3km, W=4.5m, H=1.5m)	1 regulator	None	15,209,160
45	Fulbaria	Bakta	C	36120090	Salnar Khal SP	DIWC	605	Re-excavation of Salnar Khal (L=2km, W=4.5m, D=0.9m)	1 regulator	None	7,532,537
46	Fulbaria	Deokhola	C	36120120	Kalibazail-Laxmipur SP	DI	1,137	Re-excavation of Bazail Khal (L=7.5km, W=15m, D=3m), Laxmipur Khal (L=2.5km, W=10m, D=2.5m)	None	None	16,569,631
47	Fulbaria	Fulbaria, Radhakani	C	36120130	Chhagalchira Khal - Radher Khal SP	FMDI WC	796	Re-excavation of Chhagalchira Khal (L=3km, W=6m, D=3m) Re-excavation of Radher Khal (L=3km, W=18m, D=4.5m)	1 regulator	Re-excavation of Ishail Beel Khal	20,735,978
48	Gaffargaon	Jessora	C	36122020	Kura Beel Khal SP	FMDI WC	232	Re-excavation of Kura khal: L=4km, W=6m, D=1.5m	One regulator	None	5,163,210
49	Gaffargaon	Barabaria	C	36122030	Charipara Khal SP	FMDI	483	Re-excavation of Charipara khal: L=2.5km, W=4.6m, D=1.5m	One regulator on Charipara khal	None	8,011,211

**Table 6.6.3 List of Potential Subproject in Mymensingh District (4/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
50	Gaffargaon	Masakhali	C	36122050	Kuti Beel Khal and Adbander Khal SP	DI	325	Re-excavation of Kuti beel khal: L=1km, W=4.5m, D=1m; Re-excavation of Adbander khal: L=1.5km, W=4.5m, D=1m	None	None	473,700
51	Gaffargaon	Char Algi	C	36122110	Char Algi SP	FMDI	1,198	Rehabilitation of east embankment: L=3.5km, W=3.7m, H=1.8m; Re-excavation of Nayapara - Char Algi khal: L=2km, W=4.8m, D=1m; Re-excavation of Adiakhali khal: L=1.5km, W=3m, D=1m; Re-excavation of Char Moslanda - Kurutalipa khal: L=2km, W=3m, D=1.5m; Re-excavation of Char Moslanda - Hatimara khal: L=2.5km, W=3m, D=1.5m	None	Char Algi Flood Embankment (almost flushed out)	14,598,360
52	Gaffargaon	Raona	C	36122130	Julnar Khal SP	DI	439	Re-excavation of Julnar khal: L=3km, W=15m, D=1.2m	None	None	1,909,958
53	Gouripur	Sidhla	C	36123010	Bora Beel -Sidhlong Beel Khal SP	FMDI	668	Re-excavation of Khal (L=6km, W=1.5m, D=0.45m)	None	None	7,385,454
54	Gouripur	Bokainagar	C	36123070	Maizga Khal SP	FMDI WC	513	Re-excavation of Khal (L=1.5km, W=1.5m, D=0.45m)	1 sluice gate	None	7,246,363
55	Haluaghat	Dhurail	C	36124040	Mora Kangsha SP	DIWC	1,147	Re-excavation of Mora Kangsha river: L=7km, W=60m, D=1.8m; Re-excavation of Chakua beel khal: L=1.5km, W=6m, D=1m; Re-excavation of Komila beel khal: L=1.5km, W=4.5m, D=1.5m	None	None	25,783,728
56	Haluaghat	Swadeshi	C	36124070	Swadeshi - Baushi SP	DI	523	Re-excavation of Baushi khal: L=2km, W=7.6m, D=1.8m; Re-excavation of Swadeshi Gatar khal: L=1km, W=7.6m, D=1.2m	None	Konapara-Futkai Embankment	1,527,209
57	Haluaghat	Sakuai	C	36124080	Balijuri-Sakuai Embankment SP	FMDI	767	Rehabilitation of embankment: L=4km, W=3.7m, H=1.2m	Two regulators	Batta-Otipara Embankment	8,516,722
58	Haluaghat	Gazir Bhita	C	36124110	Shimulkuchi - Borak Ghoshgaon SP	WC	683	None	One regulator	None	7,200,000
59	Iswarganj	Tarundia	C	36131030	Zia Khal SP	DI	772	Re-excavation of Zia Khal: L=1km, W=10.5m, D=2.7m Re-excavation of Mirkhali Khal	None	None	1,240,620
60	Iswarganj	Uchakhila	C	36131041	Bot Tol Beel SP	DIWC	633	Re-excavation of Bot Tol Beel Khal: L=2km, W=6m, D=2m New excavation of Khal: L=0.5km, W=5m, D=1.5m	Two regulators	None	8,698,596
61	Iswarganj	Barahit	C	36131042	Shamara - Sakrail Beel Khal SP	DIWC	454	Re-excavation of khal: L=6km, W=10m, D=1.2m	1 regulator	None	9,883,037
62	Iswarganj	Iswarganj	C	36131070	Sinduk Khal SP	DI	384	Re-excavation of Sinduk Khal: L=3km, W=6m, D=2.4m	1 regulator	None	5,782,810
63	Iswarganj	Sarisha	C	36131100	Baugola - Dhalai Beel Khal, Bhangnamari SP	DI	821	Re-excavation of Khal: L=5km, W=7.5m, D=2.1m	None	None	3,531,434
64	Mymensingh Sadar	Kushtia	C	36152020	Ganginar Khal SP	DIWC	544	Re-excavation of Ganginar Khal: L=3km, W=10m, D=3m Re-excavation of Gori Khal: L=4km, W=10m, D=3m	One regulator	None	16,816,110
65	Mymensingh Sadar	Ghagra	C	36152060	Indrajan Khal SP	DIWC	688	Re-excavation of Indrajan Khal: L=7km, W=10.5m, D=2.5m	1 regulator	None	14,798,938
66	Muktagachha	Dulla	C	36165045	Kuripara Kuhur Khali Khal SP	DI	372	Re-excavation of Kuripara Kuhur Khali khal: L=1.5km, W=10m, D=2m	None	None	1,231,620
67	Muktagachha	Kheruajani	C	36165050	Singra Khal SP	DI	839	Re-excavation of Singra khal: L=10km, W=2.7m, D=1.2m	None	None	1,705,320
68	Muktagachha	Kheruajani	C	36165060	Kejakuri Khal SP	DIWC	628	Re-excavation of Kejakuri khal: L=2km, W=6m, D=1.5m	One regulator at mouth of Kejakuri khal	None	5,381,605

**Table 6.6.3 List of Potential Subproject in Mymensingh District (5/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
69	Nandail	Betagair	C	36172010	Char Lakshmidia to Char Uttar Bandh SP	FMDI WC	807	Re-excavation of Char Lakshmidia to Char Uttar Bandh khal: L=5km, W=10m, D=1.8m	None	Ujanpara - Komorbhanga Embankment SP	14,409,594
70	Nandail	Kharua	C	36172030	Komola Narendrapur Khal SP	DIWC	819	Re-excavation of Komola Narendrapur khal: L=7km, W=9m, D=1.2m	One regulator on upstream of Bapail beel at Abdullahpur	None	13,664,938
71	Nandail	Sherpur	C	36172040	Brahman Khali Khal SP	DIWC	933	Re-excavation of Brahman Khali khal: L=6.5km, W=15m, D=1.2m	One regulator on Brahman Khali khal downstream of confluence with Kantoiler khal at Hashimpur - Shekher Dagar	None	16,111,361
72	Nandail	Achargaon	C	36172070	Noldighir Khal SP	DI	216	Re-excavation of Noldighir khal: L=3km, W=6m, D=1.2m	None	None	4,486,766
73	Nandail	Rajgati	C	36172100	Rairar Khal SP	DI	890	Re-excavation of Rairar khal: L=5km, W=9m, D=1.5m	Upgrade BWDB 4-vent sluice gate at Tarail	Sukajuri Embankment Project	8,264,563
74	Nandail	Achargaon	C	36172120	Tongi Khal SP	DI	719	Re-excavation of Tongi khal: L=5km, W=9m, D=1.2m	None	None	2,046,384
75	Phulpur	Kakni	C	36181080	Pungai Bastala Khal SP	FMDI WC	948	Re-excavation of Pungai Bastala khal: 8km, W=11m, D=1.5m	One regulator	None	15,821,220
76	Phulpur	Balikhon	C	36181090	Balikhon Khal SP	DIWC	300	Re-excavation of Balikhon Khal (L=4km, W=14.1m, D=1.5m)	None	None	6,697,998
77	Phulpur	Banihala	C	36181110	Digarkanda - Banihola Embankment SP	FM	594	Rehabilitation of embankment: L=4km, W=4.3m, H=2.4m	One regulator	Gazipara to Diaranadi Khal re-excavation and construction of embankment	11,128,579
78	Phulpur	Kamaria	C	36181152	Khoiyapuri Khal - Datter Khal SP	DI	516	Re-excavation of Nao Dhara khal: L=2km, W=21m, D=1.2m; Re-excavation of Khoiyapuri khal: L=2km, W=21m, D=1.2m Re-excavation of Datter khal: L=1.5km, W=15m, D=1.2m	None	None	4,411,094
79	Phulpur	Tarakanda	C	36181180	C&B Bridge - Dhali Kanda Embankment SP	FM	476	Rehabilitation of embankment: L=3km, W=4.3m, H=2.1m	None	Tarakanda-Rangsha Nadi Embankment	9,608,144
80	Trishal	Mathbari	C	36194050	Bolon - Dawhail - Kechuri - Gerakuri Beel SP	DIWC	721	Re-excavation of Bolon khal: L=0.5km, W=7.5m, D=0.6m; Re-excavation of Dawhail khal: L=2km, W=6m, D=1.2m; Re-excavation of Kechuri khal: L=3km, W=6m, D=1.5m; Re-excavation of Gerakuri khal: L=1km, W=7.5m, D=0.6m; Rehabilitation of embankment along Khiru river: L=5.5km, W=4.3m, H=2.4m	Four regulators at mouths of beels	None	14,604,126
81	Trishal	Kanihari	C	36194090	Budhir Khal SP	DIWC	433	Re-excavation of Budhir khal: L=4km, W=6m, D=1.4m	One regulator at mouth of Budhir khal	None	8,632,469
82	Trishal & Bhaluka	Amirabari & Dhitpur	C	36194140	Amirabari - Gopalpur, Shimulia Khal SP	DIWC	1,180	Re-excavation of Noa beel khal: L=5km, W=10m, D = 3m Re-excavation of Simulia khal (Trishal side): L=3km, W=7m, D=3m Re-excavation of Hoinder beel khal: L=1.5km, W=8m, D=3m Re-excavation of Shimulia Khal (Bhaluka side): L=8km, W=21m, D=1.5m	Four culverts	None	22,212,375

**Table 6.6.4 List of Potential Subproject in Netrakona District (1/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
1	Atpara	Sarmaisa	A	37204010	Pagla Beel SP	FMDI WC	532	Re-excavation of Uzakhali khal: L=5km, W=3.3m, D=1m (Sart: Ujakhali Bridge and End:Beel Jalalpur/Barhatta Upazila). Reconstruction of embanked road: L=5km, W= 3.7m, H=0.7m (Start: Pagla beel/Ghagra bazar and End: Kunapara).	Two regulators (regulator at Ujakhali Bridge and at Pagla beel).	None	8,286,935
2	Barhatta	Asma	B	37209090	Asma - Bagmara - Ujangaon - Rauha Beel SP	DI	690	Reexcavation of khal (total): L= 9 km, W=6-7 m, D=4-5 m Kangsha river - Kullabhanga beel	One regulator at Kangswa river.	Suigar Beel Bundh	15,547,700
3	Durgapur	Durgapur Sadar.	A	37218021	Chandiaghona Mayanagar - Minkifande amol - Farangpara SP	WC	785	Re-excavation of cannal (Total): L=8km, W=13.3m, D=2.7m	Two water retention structures	None	13,509,684
4	Khaliajuri	Chakua	A	37238010	Surania-Dalimati (Chowtara) embankment SP	FM	289	Embankment Rehabilitation. L=4km, Top=5.4m, H=2.1m	None	Submersible embankment constructed by WDB & LGED	7,226,381
5	Kalmakanda	Nazirpur	A	37240050	Bakla - Ulukanda-Koir River SP	DI	949	Re-excavation of Bakla river: L=9km, W=6.6 m, D=2.5m. Start: Atrakhali river, End: Ubdakhal river. Construction of new embankment: L=2km, W=4m, H=1.5m	One regulator at Koila.	None	8,799,258
6	Kendua	Noapara	A	37247231	Bahrail Beel SP	DI	165	Re-excavation of Telekhali khal: L=2km, W=6.7m, D=0.9m	None	None	304,115
7	Madan	Madan	A	37256090	Ganganagar and Kapashatia Khal SP	DIWC	492	Re-excavation of Ganganagar Khal and Kapashatia Khal: Ganganagar Khal (L=3km, W=3m, D=1.5m), Kapashatia Khal (L=2km, W=3m, D=1.5m)	None	FC embankment to the south of the project area along the right bank of Bali River	7,910,550
8	Mohonganj	Gaglajore	A	37263060	Katchador Khal SP	WC	780	Re-excavation of Katchador khal downstream: L=4km, W=3m, D=1m	None	Hajda Embankment Sub-Project.	7,578,960
9	Netrakona Sadar	Maugati	A	37274020	Kaisnar beel - Bawal Beel SP	DI	239	Re-excavation of Kaisnar khal: L=1.5km, W=6m, D=1.5m Re-excavation of Bawal khal: L=1km, W=6m, D=1.5m	None	Kangsha River SP	4,044,094
10	Purbadhala	Bairati	A	37283100	Chitrong Beel SP	DI	545	Re-excavation of Chitrong Khal and Mogra River: Chitrong Khal (L=1km, W=10m, D=3m) and Mogra River (L=6km, W=15m and D=3m)	None	None	13,689,690
11	Atpara	Sonai	B	37204020	Monsurpur Embankment SP	FMDI	211	Rehabilitation of existing embankment: L=5km (1km reconstruction +4 km rehabilitation), W=1.7m, H=0.7m (Start:Atpara-Barhatta road, and End:Monsurpur Mosque). Note: 1 km reconstruction is pvt. and 4 km rehabilitation is khas land. Re-excavation of Poddas Khal: L=0.5km, W=4m, D=1.5m	One water retension structure/Sluice at Podder khali	None	4,129,373
12		Sonai	B	37204030	Kawakhali Embankment SP	FMDI	365	Rehabilitation of existing embankment: L=5km, W=1.7m, H=0.7m (Start: Atpara-Barhatta road, End: Hath-kata khal) New construction of embankment: L=0.5km, W=1.7m, H=0.75m (Start: Guatala, End: Shahbajpur to Hath-kata khal)	One regulator at Hath-kata khal	None	4,235,889
13	Durgapur	Gaokandia	B	37218050	Someswani river embankment SP	FM	743	Rehabilitation of old embankment: L=2.5km, W=4m, H=1.5m Construction of new embankment: L=4km, L=4m, H=1.5m	None	None	11,869,203

**Table 6.6.4 List of Potential Subproject in Netrakona District (2/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
14	Khaliajuri	Mendipur	B	37238020	Dulni-Ziakora Khal SP	DIWC	706	Re-excavation of Dulni and Ziakora Khal: Dulni (L=3km, W=5m and D=1.5m) and Ziakora (L=3km, W=5m and D=1.5m)	None	BWDB embankment to the northwest of the project area	9,075,852
15	Kalmakanda	Kailati	B	37240090	Pukuria-Shampur khal SP	FMWC	805	New construction of embankment: L=8.5km, W=1.5m, H=4m Reexcavation of Khal: L=2.5km Start: Pakuria, End: Chandual	One regulator at Sakua	Someswari Embankment	24,519,404
16	Kendua	Garadoba	B	37247110	Sutikhali & Dhayel Khal SP	DIWC	332	Re-excavation of Sutikhali lhal: L=4km, W=4m, D=1.3m Re-excavation of Dhayal khal: L=2km, W=4m, D=1.3m	None	None	4,585,296
17		Balaishimul	B	37247160	Jawla, Shouljan & Kichuria Beel SP	FMDI	199	Excavation of new khal from Jawla beel to Saiduli river: L=1km, W=6m, D=1.5m Excavation of new khal from Chakowa beel to Saiduli river: L=0.25km, W=12.5m, D=1.5m Re-excavation of Muriya khal: L=1.5km, W=3.0m, D=0.9m and Re-excavation of Goboddiya khal: L=0.5km, W=3.0m, D=0.6m Construction of new embankment: L=3km, W=3.0m, H=1.5m	One regulator at Goboddiya.	None	6,349,534
18		Chirang	B	37247190	Gorkai Khal SP	DI	703	Re-excavation of khal from Tigla beel to Mona beel: L=3km, W=8.3m, D=2m Re-excavation of khal from Mona beel to Kalian beel: L=2km, W=8.3m, D=2m Re-excavation of Gorkai khal: L=3km, W=8.3m, D=2m.	None	None	2,677,984
19		Muzafferpur	B	37247210	Sunui Haor Embankment SP	FMDI	361	Re-excavation of Fuleswari khal and Kaliar khal: L=3.5km, W=7.5m, D=1.5m New construction of embankment: L=5km, W=2.44m, H=1.5m	One regulator	Sukhaijuri-Betai SP	8,993,200
20	Madan	Nayekpur	B	37256020	Bashuri Molajan SP	FMWC	288	None	1 regulator	None	3,600,000
21		Changaon	B	37256040	Shahpur Chowrabari Changaon SP	FM	394	Embankment along the east bank of Boirawala River (L=5.5km, W=5m, D=1.5m).	None	One regulator at Ratnapur +4 pipe sluice.	4,068,020
22	Mohonganj	Tentulia	B	37263070	Kur Beel SP	WC	191	Re-Excavation of Kur beel: A=5ha, D=2m	None	Hajda Embankment Sub-Project.	3,158,000
23	Netrakona Sadar	Kailati	B	37274070	Alongir Khal and Embankment SP	FMDI	385	Re-excavation of Alongia khal: L=2km, W=6m, D=1.5m. New khal excation: L=3 km, W=6m, D=1.5m. New construction of embankment (Bichipara-Chapan): L=7 km, W=2.4m, H=1.5m	One regulator at road side to drain out the water.	None	10,109,987
24		Lakshmiganj	B	37274120	Ghagra Khali Khal and Embankment SP	FMDI	591	Re-excavation of Ghagra khali khal khal: L=6km, W=6.1m, D=1.83m. Start: Mogra, and End: Mogra/Saiduli river. Construction of embankment. L=6 km, W=6 m, H=2-3m. Start: At the border of rural road of the UP, and End: up to theUpazila road.	Two regulators: One regulator at mouth of khal	None	18,088,822
25		Madanpur	B	37274130	Saiduly River Embankment SP	FM	251	New construction of embankment: L=4km, W=2.44m, H=1.5m	None	None	7,618,920

**Table 6.6.4 List of Potential Subproject in Netrakona District (3/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
26	Purbadhala	Purbadhala	B	37283070	Holida Beel SP	FMDI	492	Re-excavation of Bamankhali Khal (L=4km, W=10m, D=4m)	1 regulator at Bamonkhali.	None	9,221,120
27		Dhalamalgaon	B	37283120	Dhalamalgaon SP	FMDI	505	New Construction of embankment (L=5km, W=3m, D=2.5m) + Hightening of existing road is needed. Re-excavation of Kupar Khali Khal (L=1.5km, W=3m, D=2m)	2 gated outlets. One regulator already exists. One Box Culvert is needed.	Kangsa River Flood Control Project	14,953,220
28	Atpara	Loneswar	C	37204040	Loneswar Embankment SP	FMDI WC	455	Rehabilitation of existing embankment: L=5km, W=4.7m, H=0.6m New construction of Narayanpur khal embankment: L=5km, W=4.7m, H=1m	One regulator at Narayanpur khal.	Not Functioning	11,242,464
29		Sukhari	C	37204070	Karimkhali Khal and Tarachapur-Gajra Embankment SP	FMDI	362	Re-excavation of Bangai khal: L=1.5km, W=9m, H=1.25 m Re-excavation of Karimkhali khal: L=2.5km, W=9m, H=1.25 m Re-excavation of Badaur khal: L=1.5km, W=9 m, H=1.25m New construction of Embankment: L=4km, W=4.5m, H=1.5m	One regulator at Karimkhali	None	9,850,577
30		Baniajan	C	37204080	Baniajan Embankment SP	FM	388	Rehabilitation of embankment: L=3.5km, W=3.66m, H=1m New construction of embankment L=2km, W=3.66m, H=1m	One regulator at BRAC Office Baniajan	None	5,612,716
31	Barhatta	Bausi	C	37209030	Dauki beel - Noa beel - Hara beel SP	DI	912	Re-excavation of khal (Total): L=12km, W=6-7 m, D=3-4 m Dauki beel - Kangsa river	One regulator at Bausi the mouth of the khal	Suigar Beel Bundh	5,305,320
32	Durgapur	Kullagora	C	37218010	Bongal Khal SP	FM	630	None	One water retentiona structure	None	7,200,000
32		Kakaigara	C	37218070	Balach River (Bayra-Ura to Dakshin Lakshmipur) and Kolonja - Dewtokon via Gondaber Embankment SP	FMW C	781	Reexcavation of River: L=5km, W=10-15 m, D=1.5-2.5 m Start: Laksmipur, End: Bayra-Ura Rehabilitation/reconstruction of embankment: L=8 km, W=2.5m, H=1.5 m	One water retentiona structure (at Bayra-Ura).	River protection by BWDB	14,608,958
4	Khaliajuri	Mendipur	C	37238030	Dhopundha Khal SP	DIWC	468	Re-excavation of Dhopunda Khal: Dhopunda (L=2.5km, W=5m and D=1m)	None	None	7,863,180
35		Mendipur	C	37238040	Ramchandra Ghonar Khal SP	DIWC	339	Re-excavation of Ramchandra Ghonar Khal: Ramchandra Ghonar (L=1.5km, W=8m and D=1.5m)	None	None	4,580,559
36	Kalmakanda	Kalmakanda Sadar	C	37240070	Kalihala river embankment SP	FMW C	766	New construction of Embankment: L=7.5km, W=4m, H=2.5 m Start: Kalihala School, End: Chandual. Beel : Aigana	One regulator at Chakpara	Kalihala Right Embankment	18,988,688
37		Kailati	C	37240100	Bhogai river excavation SP	FMW C	962	New construction of embankment: L=6-7 km, W=4m, H=2.5m Reexcavation of Khal: L=10km	One regulator at Uzakhali	None	23,579,150
38		Bara Kharpan	C	37240110	Jatrabari khal -Jangia beel closure subproject	FMW C	853	New construction of embankment: L=4 km, W=4m, H=2.5m	None	None	17,087,300
39		Bara Kharpan	C	37240120	Rica bazar - Bariundha bazar embankment subproject	FM	546	New construction of cross-dam (enclosure) Embankment L=4 km, W=3.66 m, H=2.5 m Re-excavation of khal/canal (Bariunda-Meda beel+Rica khal) L=2 km, W=10-12 m, H=1 m. Start: Rica bazar, End: Bariunda bazar	Two regulators: one at Rica bazar-Hailati, one at Bariunda bazar.	BWDB Regulator	17,643,182
40	Pogla	C	37240131	Gumai - Sholi River, Bakla - Ubdakhale River Embankment SP	FMW C	1,112	New construction of embankment (Gumai - Sholi River): L=9km, W=4m, H=2 m Start: Koilati. End: Sunui river. New construction of embankment (Bakla - Ubdakhale River): L=5km, W=4m, H=2.5m Start: Sholi river. End:Udba khali river.	One regulator at the mouth of Ban beel	None	29,454,805	



**Table 6.6.4 List of Potential Subproject in Netrakona District (4/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
41	Kendua	Roailbari	C	37247060	Masuaail Beel SP	DI	176	Re-excavation of khal from Masuaail beel to Kaikha beel: L=1km, W=8.3m, D=2m Re-excavation of Kumar khali khal: L=2km, W=8.3m, D=2m	None	None	1,004,244
42		Roailbari	C	37247070	Chapar Khal and Koch-Koicha Beel SP	DI	342	Re-excavation of khal from Chapur village to Koch-Koicha beel: L=4km, W=6.7m, D=1.7m. Since this S/P is within the command area of BWDB, so it should be discussed with and confirmed by the BWDB. Re-excavation of Kandapara khal: L=1km, W=6.7m, D=1.7m & Re-excavation of khal from Koch-Koicha beel to Suti river: L=2.5km, W=6.7m, D=1.7m	None	None	1,670,977
43		Paikura	C	37247080	Shariya, Balia & Shingroil Beel SP	FMDI	720	Re-excavation of Futa khali khal: L=2km, W=3.3m, D=0.75m Re-excavation of Kana khal: L=1.5km, W=3.3m, D=0.6m Re-excavation of Sharia khal: L=10km, W=6.7m, D=1.7m	One regulator at Mojlishpur-inlate of Suti river.	None	9,678,083
44		Mashka & Roaibari	C	37247100	Shuchia Beel & Kaithkirmar Khal, Nuneswari Beel SP	FMDI	1119	Re-excavation of Shoriya khali khal: L=1km, W=6.7m, D=0.6m Re-excavation of Sumar khal: L=1.5km, W=8.3m, D=0.6m Re-excavation of Parus khal: L=1km, W=8.3m, D=0.6m Re-excavation of Kaithkirmar khal: L=2.5km, W=5m, D=0.6m Re-excavation of Nagor khal: L=1km, W=6.7m, D=0.75m Re-excavation of khal from Chanderkuri beel to Nuneswari beel: L=2.5km, W=6.7m, D=1.7m Re-excavation of khal from Dharail beel to Neneswari beel: L=2.5km, W=6.7m, D=1.7m Re-excavation of khal from Ghorail beel to Nuneswar beel: L=2km, W=8.3m, D=1.7m Re-excavation of khal from Nuneswari beel to Suti river: L=1km, W=6.7m, D=1.7m	One regulator	None	6,340,868
45		Asujia	C	37247140	Chatal Beel SP	FM	387	New construction of embankment: L=6 km, W=3 m, H=1.5m	None	None	8,188,380
46		Balaishimul	C	37247150	Chowka & Jugni Beel SP	DI	456	Re-excavation of Choitali khal: L=3km, W=4m, D=1.3m	None	None	492,648
47		Kandiura	C	37247180	Amasheya Beel SP	FMDI	718	Re-excavation of Amasheya-Digabalia khal: L=5km, W=8.3m, D=1m Re-excavation of Doboria khal: L=1.5km, W=6.7m, D=1.3m New construction of embankment: L=10km, W=3.3m, H=2m	None	None	19,651,850
48		Muzafferpur	C	37247200	Jaliar Haor Embankment SP	FMDI	950	Re-excavation of Giakhali khal: L=5km, W=8.3m, D=1.7m Re-excavation of Kalaria khal: L=3km, W=8.3m, D=1.7m Re-excavation of Dairar khal: L=6km, W=8.3m, D=1.7m New construction of embankment: L=10km, W=2.7m, H=1.7m	Two regulators	Sukhajuri-Betai SP	23,585,112
49		Noapara	C	37247232	Baora Beel SP	DI	97	Re-excavation of Bhora khal: L=2km, W=5m, D=0.9m	None	None	207,481
50		Madan	Kaitail	C	37256010	Dhiga Beel SP	DIWC	349	Re-excavation of Bazaner Khal (L=1.5km, W=3m, D=0.5m) Re-sectioning of Embankment surrounding the beel (L=5km, W=3m, D=1.5m)	None	One regulator at Boro khal.
51	Nayekpur		C	37256030	Nargilla-Magoria SP	FMWC	569	New construction of embankment (1.5km, 4m, 3m)	3 regulators (3ft x 3ft at Asha, 2ft x 3ft at Chandratola and 2ft x 3ft at Golardentola)	None	11,717,198

**Table 6.6.4 List of Potential Subproject in Netrakona District (5/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
52	Madan	Madan	C	37256100	Bali-Chelai River SP / Bali Ferry Ghat to Bribarikandi SP	FMDI	744	Re-excavation of Kaia Khal (L=2.25km, W=5m, D=1.5m) New Construction of embankment along the right bank of Bali River towards north and along the right bank of Chelal River towards south (L=5.5km, W=5m, H=1.5m)	One regulator	FC embankment to the south of the project area along the right bank of Bali River	12,881,122
53		Gobindasri	C	37256110	Bauch Kanda SP	FMW C	423	Rehabilitation of embankment (L=3km, W=3m, D=2m). Re-excavation of Dairer Khal up to the end of road (L=4km, W=20m, D=2m)-Dhulia beel.	1 regulator at Tokerkanda.	None	13,383,620
54		Madan	C	37256120	Boalia Bora Beel SP	FM	499	Rehabilitation of embankment over Dariakhali khal (L=5km, W=3m, H=0.6m)	2 regulators	None	7,766,622
55	Mohonganj	Barokashia Birampur	C	37263030	Madhupur Khal SP	DI	309	Re-excavation of Madhupur khal: L=5km, W=3m, D=1m	None	Hajida Embankment Sub-Project	4,073,700
56		Suair	C	37263080	Maida Beel SP	DI	230	Re-excavation of Maida khal: L=1.5km, W=5m, D=1.5m	None	None	3,795,401
57	Netrakona Sadar	Kaliara Gabragati	C	37274010	Bolosh - Satia Khal SP	DIWC	938	Re-excavation of Balosh Khal: L=7.5km, W=10m, D=2.3m Re-excavation of Satia khal: L=3km, W=6.7m, D=1.7m New construction of embankment: L=4km, W=4m, H=1.5m	One water retention structure at mouth of Balosh khal and one regulator at mouth of Satia khal	None	15,975,276
58		Rauha	C	37274030	Mana, Gudia, Digha, Kanta Beel SP	FM	584	Re-excavation of Khal: L=4km, W= 5.3m, D=2.3m New construction of embankment: L=3km, W=5.3m, H=2.7m	One sluice gate	None	13,567,042
59		Chalisha	C	37274040	Guingajuri Khal and Embankment SP	DIWC	1,022	Re-excavation of Guingajuri khal: L=10km, W=6.7m, D=2.0m; Construction of Embankment. L=6 km, w=3.6 m, H=2.5 m	One regulator.	None	18,938,050
60		Dakshin Bishiura	C	37274050	Aily Beel SP	FMDI	701	Re-excavation of Bezkhali lhal: L=3km, W=6.0m, D=1.5m Re-excavation of Mogra river: L=4.5km, W=12m, D=2.5m	One regulator	None	10,663,931
61		Kailati	C	37274060	Kairkhali Khal SP	DI	359	Re-excavation of Kairkhali khal: L=4 km, W=6m, D=1.5m	None	None	710,550
62		Medni	C	37274100	Krisnakhali - Keronkhola Khal SP	FMW C	817	Re-excavation of Krisnakhali khal: L=4.5km, W=9m, D=1.5m Re-excavation of Keronkhola khal: L=3km, W=6m, D=1.5m:	One regulator at Krishna khal near to the existing bridge.	1. Kangsha River SP (ADP) 2. Dupikhali Khal Re-excavation (FFW)	12,771,776
63	Thakurakona	C	37274110	Shishuala Beel, Swair Beel SP	DI	1,061	Re-excavation of khal from Shishuala beel to Kangsha river: L=3.5km, W=6.7m, D=2.3m Re-excavation of khal from Swair beel to Kangsha river: L=4.5km, W=6.7m, D=2.3m	Repair of one BWDB regulator	BWDB Embankment along Kangsha River	12,688,484	
64	Purbadhala	Khalishaur	C	37283080	Rawha beel-Shakunia Beel SP	DI	386	Re-excavation of Mashkanda Khal up to Kaya beel and Shakuna Khal: Mashkanda Khal (L=2.5km, W=10m, D=3m), Shakuna Khal (L=2km, W=10m, D=3m)	None	None	5,944,815
65		Gohalakan da	C	37283090	Bhander Beel SP	DI	764	Re-excavation of Kakuakhali Khal and Soai River: Kakuakhali Khal (L=4km, W=15m, D=4m), Soai River (L=4km, W=30m, D=3m)	None	None	21,411,000
66		Narandia	C	37283110	Dullah Khal SP	DI	298	Re-excavation of Dullah Khal up to Sunai river (L=5km, W=10m, D=3m)	None	Saralia Sluice Gate	6,205,350

**Table 6.6.5 List of Potential Subproject in Sherpur District (1/2)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
1	Jhenaigati	Malijhikanda	A	38937050	Dargar khal SP	DI	386	Re-excavation of Dargar khal from East Baniarpar Dargar khal- Hashlibatia. L=1 km, W=15 m, D=3m.	1 Regulator	None	5,594,770
2	Nakla	Chandrakona	A	38967080	Mehedidanga Beel SP	DIWC	445	Re-excavation of Mehedidanga Khal: L= 4.5 km, W=7.5m, D=2 m	The existing regulator constructed by BWDB is now inoperative. Reconstruction of One regulator at Jankipur (Chandrakona)	Janokipur Khal Regulator.	5,878,990
3	Nalitabari	Nalitabari	A	38970070	Aliakhali - Shoalmari Embankment SP	FMWC	915	Re-excavation of Alia Khali Khal: L=2.75km, W=12m, D=1.5m Re-excavation of Showlmary Khal: L=3.75km, W=12m, D=1.5m Re-habilitation and hightening of embankment: L=5km, W=4.2m, H=2.4m.	None	None	7,858,834
4	Sherpur Sadar	Char Mucharia	A	38988070	Kamarchar Bazar - Tankasar SP	FM	850	Rehabilitation of embankment: L=2km, W=9.6m, H=3.6m	None	Embankment by BWDB	16,239,571
5	Sreebordi	Bhelua	A	38990040	Ruparpara to Fulkarchar Khal SP	DIWC	466	Re-excavation of Ruparpara to Fulkarchar Khal (L=4km, W=15m, D=3m)	1 WRS 1).	None	11,179,080
6	Nakla	Baneswardi	B	38967051	Muzarkanda - Aria Kanda Eidgah Embankment SP	FM	53	Rehabilitaion New construction of Embankment (Muzarkanda - Aria Kanda - Endgah): L=2km, W=10.8m, H=2.4m	None	None	518,054
7	Nakla	Char Ashtadhar	B	38967100	Debuarchar Embankment SP	FM	798	Rehabilitation of embankment: L=1.5km, W=4.2m, H=2.4m New construction of embankment: L=5km, W=4.2m, H=3m	None	None	18,777,438
8	Nalitabari	Jogania	B	38970101	Sutarbari Khal - Harikhali Khal SP	WC	670	Re-excavation of Harikhali Khal: L=3km, W=7.5m, D=1.5m Re-excavation of Sutiari Khal: L=2.5km, W=7.5m, D=1.5m	None	None	8,567,809
9	Nalitabari	Jogania	B	38970110	Kapasias SP	WC	538	None	One regulator at Aria	None	7,200,000
10	Sherpur Sadar	Char Pakhimari	B	38988090	Char Mucharia - Dakpara Guchhagram Embankment SP	FM	947	Rehabilitation of embankment: L=10km, W=9m, H=2.4m	None	Embankment by BWDB.	25,694,064
11	Sherpur Sadar	Baliar Char	B	38988100	Paikartala - Kurmer Char Adarsa Gram Embankment SP	FMDI	778	Re-excavation of Khal: L=3.5km, W=6m, D=1.8m New construction of embankment: L=6km, W=10.8m, H=1.8m	None	None	19,170,283
12	Sherpur Sadar	Char Pakhimari	B	38988160	Satpakia beel-Das Ani river SP	DI	546	Excavation of Satpakia beel-Das Ani river -via Das Ani Khal: L=2km, W=6m, D=1.5m	None	None	7,555,275
13	Sreebordi	Sreebordi	B	38990030	Chatla Beel, Buchadaha Beel and Boysa Beel Khal SP	DI	845	Re-excavation of Khal (L=3km, W=4.5m, D=1.5m)	None	None	639,495

**Table 6.6.5 List of Potential Subproject in Sherpur District (2/2)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
14	Jhenaigati	Dhansail	C	38937020	Kalgusha Khal SP	DI	887	Re-excavation of Kalgusha Khal: L=5.5km, W=15m, D=3.6m	None	None	16,802,726
15	Nakla	Baneswardi	C	38967052	Kobutormari - Garapaddi Rampur Road Junction Embankment SP	FM	85	Rehabilitaion <del>New construction</del> of embankment (Kobutormari - Garapaddi Rampur Road Junction): L=3km, W=10.8m, H=2.4m	None	None	777,082
16	Nakla	Talki	C	38967060	Kursa Beel - Kharia Beel SP	DIWC	799	Re-excavation of khal (Kursa - Kharia): L=7km, W=10.5m, D=1.8m	1 regulator at Miskipara bridge.	None	10,303,682
17	Nakla	Talki	C	38967070	Rangarkuri Beel - Kursa Beel SP	DIWC	578	Re-excavation of khal (Ranger Kuri - Bara): L=2.5 km, W=7.5m, D=1.5m	None	None	7,821,731
18	Nakla	Pathakata	C	38967090	Burodubi Beel - Godadanga Beel SP	DIWC	861	Re-excavation of Khal: L=4km, W=9m, D=2.4m	1 regulator at Kajaikata bridge.	None	12,437,107
19	Nalitabari	Ramchandrakura Mondaliapara	C	38970040	Fulpur (village under the UP) - Mondoliapara Embankment SP	FM	146	Rehabilitation of embankment: L=5km, W=4.2m, H=2.1m	None	None	1,983,177
20	Nalitabari	Baghber	C	38970060	Jingira Khal - Dudua Khal Embankment SP	DIWC	459	Re-excavation of Jingira Khal: L=4.5km, W=9m, D=1.5m New construction of Simultala-Kalinagar embankment: L=3.5km, W=2.5km, H=1.5m	One regulator at Kalinagar	Chilla Khali System Rehabilitation Project	11,127,373
21	Nalitabari	Kakarkandi	C	38970080	Kakardi Bazar Bridge - Sutia Nadi SP	WC	877	Re-excavation of Khal: L=5km, W=15m, D=3m	One regulator at Kalapagla	Khal by BWDB but silted up.	15,773,850
22	Nalitabari	Rupnarayanкура	C	38970090	Moragang Khal SP	DI	773	Re-excavation of Moragang Khal: L=5km, W=15m, D=2.4	None	None	11,520,144
23	Nalitabari	Marichpuran	C	38970120	Hosikhal Khal SP	DIWC	652	Re-excavation of Hosikhal Khal: L=6km, W=12m, D=1.8m	One regulator at Rajmotkhal	None	10,371,895
24	Sherpur Sadar	Kamarer Char	C	38988010	Dhandibidhi-Katakhal SP	DI	888	Re-excavation of Khal: L=6.5 km, W=9m, D=3 m	None	Brahmaputra River Left Bank Embankment Project	13,571,145
25	Sherpur Sadar	Char Sherpur	C	38988020	Goaldanga-Kaladanga SP	DIWC	764	Re-excavation of Khal: L=4.5km, W=7.6m, D=1.5m	None	Mrigi River System	1,140,433
26	Sherpur Sadar	Dhala	C	38988060	Singa Beel - Dhala Beel - Biri Beel SP	DI	817	Re-excavation of khal: L=7km, W=6m, D=2.4m	None	None	1,273,306
27	Sherpur Sadar	Betmani Ghugrakandi	C	38988110	Gomaitala Beel - Shobhoner Char Beel SP	DI	207	Re-excavation of khal: L=3km, W=6m, D= 3m	None	Embankment by BWDB	4,026,330
28	Sherpur Sadar	Bhatsala	C	38988120	Mrigi River (Chhankanda Eidgah - Kotorakanda) SP	DI	781	Re-excavation of khal: L=4km, W=5m, D=2.4m	None	None	7,624,435
29	Sherpur Sadar	Betmani Ghugrakandi	C	38988130	Agrakhal Beel SP	DI	393	Re-excavation of khal: L=6km, W=6m, D=3 m	None	Embankment by BWDB	4,452,660
30	Sherpur Sadar	Kamaria	C	38988140	Roshekura Beel - Chaira Beel - Chinikari Beel SP	DI	320	Re-excavation of Khal: L=3.5km, W=6m, D=2.5m	None	None	4,221,731
31	Sherpur Sadar	Rauha	C	38988150	Char Ranjagannath - Charkhawa Char Embankment SP	FM	340	New construction of embankment: L=3.5km, W=4.2 m, H=1.8m	One regulator	None	5,377,906

**Table 6.6.6 List of Potential Subproject in Tangail District (1/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
1	Basail	Kanchanpur	A	39309080	Borokati Beel SP	FMWC	278	Hightening of existing submersible road L=6km, W=3m, H=1.5m Jaotaki -Moteswar	1 No. of 1 vent sluice at Moteswar	None	5,178,380
2	Bhuapur	Gobindasi	A	39319050	Khamerbari-Chithalipara SP	FM	194	Rehabilitation of embankment cum road (L=3.5km, W= 3m, H=1.35m). Star: Khanurbari-Bhalkuria upto Matikata.	One regulator at Khanurbari.	Flood Control Embankment and Sluice	4,067,396
3	Delduar	Delduar	A	39323040	Charpara Beel - Lohajang River SP	DI	444	Re-excavation of Khal: L=4km, W=15m, D=3m	None	Embankmnt by BWDB	7,389,720
4	Ghatail	Deopara	A	39328110	Padmakuri Beel-Ranadaha Beel-Kalyan Beel SP	DIWC	562	(1) : Re-excavation of Khal (L=5 km, W=10m, D=1.5m) Start: Kallyan-Ranadah-Bongsai river. (2): Re-excavation of Bhua Pancha beel-Deopara-Taltala-Bangsai river	2 regulators. One at Molajani for (1) and another at Golabari for (2).	None	12,101,413
5	Gopalpur	Nagdasimla	A	39338040	Doga Beel SP	FMDI WC	388	Re-excavation of Cheragali Khal (L=2km, W=6m, D=1.5m), Rehabilitation of Embankment (L=1.5km, W=5m, H=2m)	1 No. of 2 vent regulator	None	9,195,795
6	Kalihati	Kok Dohora	A	39347101	Charan Beel SP	FMDI WC	724	Re-excavation of Charan Khal (L=6km, W=5m, D=2m), New excavation of Boalia Khal-Louhojong river (L=3km, W=5m, D=2m), Rehabilitation of embankment (L=2.5km, W=3m, D=2m), New construction of embankment (L=3km, W=3m, D=2.5m)	2 Nos. of 2-vent regulators	None	18,179,670
7	Madhupur	Birtara	A	39357010	Goalia Beel SP	DIWC	162	Re-excavation of Goalia Beel khal (L=2.5km, W=5m, D=1.5m) Start: Goalia beel and End: Shapla khal. Re-excavation of Shapla Khal (L=1.5km, W=5m, D=2m).	1 No. of 2 vent regulator	None	5,032,943
8	Mirzapur	Gorai	A	39366100	Kodalia - Rahimpur Embankment SP	FM	403	New construction of Embankment: L=3km, W=3.7m, H=3m Re-excavation of Kadalia Khal L=1km, W=3m, D=1.5m	One regulator	None	6,623,297
9	Nagarpur	Salimabad	A	39376030	Charghumipara Khal SP	DIWC	166	Re-excavation of Charghumipara Khal (L=2.5km, W=6m, D=4 m)	None	One regulator at Ghunipara.	3,789,600
10	Sakhipur	Jadabpur	A	39385050	Berbari - Shanasipara Embankment SP	FM	157	Improvement of existing road into road cum embankment: L=3km, W=3.7m, H=1.2m	One regulator	None	4,377,082
11	Tangail Sadar	Hugra	A	39395062	Begundal Khal SP	WC	709	Re-excavation of Begundal Khal: L=1.5km, W=10m, D=2.1m	One regulator at Fatehpur.	None	6,146,157

**Table 6.6.6 List of Potential Subproject in Tangail District (2/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
12	Basail	Fulki	B	39309010	Maddhyapara-Nirail SP	FM	406	Hightening of embankment (L=4km, W=3 m, H=3m) connecting to the existing BWDB embankment. Fulki Madhapara-Karotia-Bathuli pucca road	3 Pipe sluices: i. Fulki Madhapara-1, ii. Nirail (South & North)-2 Regulator-1: At Karotiapara Khal.	Embankment	12,956,760
13	Bhuapur	Aloya (Birhati)	B	39319070	Nikle Beel-Gabaira Beel SP	DI	894	New excavation of Khal (L=5km, W=4m, D=2m) Start: Nikla beel-Amula Daha Bhorotto-Dhaleswari river.	Two regulators: one at Nikla gopal and another at Nikla.	None	11,782,600
14	Delduar	Deoli	B	39323030	Barair Beel - Dewan Bari Beel - Dhaleswari River SP	DI	288	Re-excavation of khal: L=3 km, W=9 m, D= 1.5 m	None	Embankment by BWDB (Kamar Naogaon Project )	1,598,738
15		Delduar	B	39323100	Bhatkee Beel SP	DI	561	Re-excavation of Bhatkee-Alsha-Lauhojong river L=3 km, W=9 m, D=1.5 m	None	None	1,598,738
16	Ghatail	Deulabari	B	39328010	Boroitala Khal SP	DIWC	574	Re-excavation of Boroitala Khal (L=6km, W=9m, D=1.5m) Start: Tok river -Inai river	One regulator at Shaliajan bazar bridge	None	7,797,475
17	Gopalpur	Hemnagar	B	39338050	Kholishakuri Beel SP	DI	285	Re-excavation of Khal (L=1.5km, W=5m, D=1.75m) and New Excavation of Khal (L=0.5km, W=5m, D=2m)	1 No. of 2 vent regulator	Naypara-Sakharia SP	4,584,733
18		Mirzapur	B	39338080	Borashila Beel SP	FMDI	256	Re-excavation of Borashila Khal (L=2 km, W=5m, D=1.5m)	2 regulators of 1m x 1.5m each	None	6,186,865
19	Kalihati	Narandia	B	39347030	Narandia Khal SP	DIWC	477	Re-excavation of Narandia Khal (L=6km, W=6m, D=1.5m), Re-excavation of Ghoria Khal (L=1km, W=5m, D=1.5m)-Louhojong river.	2 regulators	None	10,088,248
20		Bangra	B	39347060	Bartha Beel SP	DIWC	493	Re-excavation of Khal (L=2km, W=5m, D=1.75 m), Rehabilitation of embankment (L=6km, W=8 m, D=3m)	1 No. of 3-vent regulator	None	15,561,041
21		Bir Basunda	B	39347130	Birbasunda Beel SP	FMDI WC	860	Re-excavation of Khal (L=5km, W=6m, D=1.75m), New excavation of Khal (L=4km, W=5m, D=1.5m), Rehabilitation of embankment (L=6km, W=3m, D=2.5m), New construction of embankment (L=1km, W=3m, D=2m)	2 Nos. of 2-vent and 1 No. of 3-vent regulator	None	22,823,013
22	Madhupur	Musuddi	B	39357030	Musuddi SP	FMDI	680	Re-excavation of Khal (L=1km, W=3m, D=2m) New excavation of Khal (1.5km, W=3m, D=2m) New construction of embankment (L=1 km, W=8m, H=1.5m) Start: Roya beel to Bongsai river.	1 No. of 1 vent regulator (1.5m x 2m)	None	5,179,405
23		Dhopakhali	B	39357050	Charbhanga Khal SP	FMDI WC	486	Re-excavation of Charbhanga Khal (L=7km, W=6m, D=1.75m) New Excavation of Charbhanga Khal (L=2km, W=6m, D=1.5m) Start: Boiran river, and End: Paitka-Bongsai river.	One regulator at Charabhanga	None	8,198,229
24	Mirzapur	Anaitara	B	39366060	Barinda Bazar - Badebharra Khal SP	DI	209	Re-excavation of Barinda Bazar - Badebharra Khal: L=3.5km, W=20m, D=1.8m. Start: Atiamahmudpur-Barindabazar-Nagarpur Upazila.	None	None	4,516,256
25		Uarsi	B	39366070	Andipara - Ruail Khal SP	DI	548	Re-excavation of Andipara - Ruail Khal-Louhojong river: L=5km, W=10m, D=1.8m	None	None	3,609,594

**Table 6.6.6 List of Potential Subproject in Tangail District (3/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
26	Nagarpur	Mokhna	B	39376090	Nataung - Gohuli Khal SP	DIWC	859	Re-excavation of Khal: L=6.75km, W=10m, D=2m. Re-habilitation of BWDB embankment: L=1.5km, W=10m, H=3m	Two regulators. One regulator at Jogtala and another at Buhuri.	Embankment by BWDB	19,580,130
27		Pakutia	B	39376100	Basta Khola Khal SP	DIWC	515	Re-excavation of Basta Khola Khal: L=5km, W=10m, D=3.5m	One regulator at Pulsuria of Dighalia UP	None	15,627,913
28	Sakhipur	Hatibandha	B	39385060	Goalia River SP	FMDI WC	925	Reexcavation of Goalia khal-Hatibandha. L=3 km, W=22 m, D=1.5 m	One regulator at Bajail.	None	20,046,168
29	Tangail Sadar	Magra	B	39395040	Bashalia Khal SP	DI	159	Re-excavation of Bashulia Khal: L=5km, W=15m, D=1.5m	None	?	4,085,663
30		Gharinda	B	39395100	Gharinda Khal SP	DI	632	Re-excavation of Gharinda Khal: L=4km, W=8m, D=1.8m	Two drainage pipes, one at Darun beel, and another at Ghorinda beel L=1km, Di=0.9m	None	3,432,923
31	Basail	Kashil	C	39309040	Kashil-Nagashim Embankment SP	FM	154	Rehabilitation of embankment cum road (L=3km, W=4.5 m, H=1.2m. Nayachim bridge-Kashil (Raja master's house)-Pichuri Kachu Khal.	A sluice gate internal drainage	3 Km BWDB Embankment	3,867,055
32	Bhuapur	Phulda	C	39319020	Terilla Beel SP	FMDI	687	Excavation of Khals (L=5.5km, W=3m, D=1.5m)	4 regulators of 1 vent (1m x 1.5m).	None	12,367,809
33	Delduar	Elasin	C	39323050	Agelasin - Singaragi Beel - Daleswari River SP	DI	856	Re-excavation of khal connecting Agelasin and Daleswari River via Singaragi Beel: L=6km, W=15m, D=3m	None	Embankment by BWDB	11,084,579
34		Fazilhati	C	39323060	Maishia SP	FM	259	None	One regulator only at Moishia for controlling flood water.	None	3,600,000
35		Fazilhati	C	39323080	Fazilhati Khal SP	DI	517	Re-excavation of Putijani beel-Lauhojong (to Elasin UP and Lauhati UP and ultimate to Mirzapur Upazila ). L=2 km, W= 10m, D=2 m Re-excavation of Fazilhati Khal: L=4km, W=15m, D=1.5m	None	None	4,910,689
36	Ghatail	Ghatail	C	39328040	Boithakata Khal SP	DI	62	Re-excavation of Baihakata Khal (L=1km, W=3.6m, D=2.4m) Start: Tok river-Pungli beel-Boitakhata khal-Konabari-Sankarpur-Jhenai river.	None	None	545,702
37		Anehola	C	39328070	Dakatia Khal SP	DIWC	903	(1):Re-excavation of Dakatia Khal (L=5km, W=9m, D=1.8m) Start: Moladah beel-Anehola beel-Dakatia beel-Salla beel-and End:Jhenai river. (2): Sankhali beel-Jhenai river Re-excavation S/P (L=1 km, W=9m. D=1.5m)	2 regulators. One at Dakatia beel and another at Hatkora Mouza	None	13,058,287
38		Digalkandi	B	39328080	Biara Khal SP	DIWC	950	Re-excavation of Biara Khal (L=9.5km, W=15m, D=1.35m). Start: Biara-Noicha beel-Badey beel-Jhenai river.	1 sluice gate at Shalenka.	None	11,495,355

**Table 6.6.6 List of Potential Subproject in Tangail District (4/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
39	Gopalpur	Jhaoil	C	39338010	Digder beel-Dhali beel Khal SP	FMDI	269	Re-excavation of Khal (L=2km, W=5m, D=1.5m): Digder beel-Dhali beel Khal	One regulator	Naypara-Sakharia SP	4,286,865
40		Jhaoil	C	39338030	Jhaoil SP	DI	1,038	Re-excavation of Khal (L=6km, W=6m, D=1.5) Start : Golabari khal-Jhenai river-Golla beel-Noilla beel-Digder beel-End: Kanmola khal.	1 No. of 1 vent, 2 Nos. of 2 vent and 1 No. of 3 vents regulators: One at Pakutia khal, one at Jhawail khal, one at Golabari khal and one at Sowanipara khal.	Harindhara FC Embankment	16,894,815
41		Alamnagar	C	39338060	Hara-Halencha Beel SP	FMDI WC	519	Excavation of Khal (L=2km, W=7m, D=2m): Start at Jhenai river-via-Hara beel-End: at Helancha beel. New embankment (L=2km, W=3m, H=2.5m)	2 Nos. of 2 vent regulators: One regulator at Madarjani khal and another regulator at Sundar Gopalpur Bhedakhali Mohona.	None	11,302,000
42	Kalihati	Durgapur	C	39347010	Louhajong River SP	DI	198	Excavation of Beripotal khal-Lowhojong dead river through Beripotal beel. L=2 km, W=21 m, D=2 m	1 regulator at Shamshoil.	None	5,781,680
43		Elengga	C	39347040	Bhurbhura Beel SP	DIWC	380	Re-excavation of Khal (L=12km, W=5m, D=1.5m), New excavation of Khal (L=2km, W=5m, D=2m)	1 No. of 3-vent regulator	Embankment along the bank of Louhajong River	10,131,750
44		Bangra	C	39347070	Bhangra Beel SP	DIWC	348	Re-excavation of khal (L=3.5km, W=6m, D=2.5m), Rehabilitation of embankment (L=2.5m, W=8 m, D=3m)	1 No. of 2-vent regulator	None	11,016,019
45		Sahadebpur	C	39347080	Shahadebpur SP	DI	745	Re-excavation of Langulia Khal (L=5.5km, W=5m, D=1.5m), Re-excavation of Subidar Khal (L=2km, W=5m, D=1.5m)	2 regulators	Embankment	10,119,176
46		Kok Dohora	C	39347102	Posna-Bheradoha Beel SP	FMDI WC	618	Re-excavation of Bheradah beel Khal (L=3km, W=5m, D=1.5m), New excavation of Gonokbari Khal (L=3km, W=5m, D=2m), Rehabilitation of embankment (L=2km, W=3m, D=2.5m), New construction of embankment (L=2km, W=3m, D=2m)	2 Nos. of 2-vent regulators	None	14,284,098
47		Bir Basunda	C	39347120	Kumreshe Beel SP	FMDI	376	Re-excavation of Uzimara Khal (L=4.5km, W=5m, D=1.75m), New excavation of Khal (L=0.4km, W=5m, D=1.5m), Rehabilitation of embankment (L=4.5km, W=3m, D=2m)	2 Nos. of 2-vent regulators	None	12,201,107
48	Paikara	C	39347150	Khorsilla-Chhotihati Beel SP	DI	710	Re-excavation of Khal (L=5.5km, W=5m, D=2m), New excavation of Khal (L=1km, W=5m, D=1.5m)-Satbila -Balla UP	1 No. of 2-vent regulators	None	6,922,473	



**Table 6.6.6 List of Potential Subproject in Tangail District (5/5)**

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Construction Cost
								Earth Work	Structure		
49	Madhupur	Paiska	C	39357040	Kuichamara Khal SP	DI	584	Re-excavation of Kuichamara Khal (L=1.5km, W=5m, D=1m). Start: Boiran river (Paiska bazar, and End: Kuichamara (Ramkrishnabari).	1 regulator at Paiskabazar.	None	3,907,905
50		Alokdia	C	39357090	Benai Beel SP	FMDI	756	Re-excavation of Benai Beel Khal (L=3 km, W=6m, D=1.5m): Start: Bagmara-Benai beel-Depbania beel-Dubail beel-Inai river. New excavation of Khal (L=1.5km, W=6m, D=2m): Start: Dubail beel-Inai river.	1 No. of 3 vent regulator at Bagmara.	None	6,985,068
51		Alokdia	C	39357100	Dubail Beel SP	FMDI	653	Re-excavation of Dubail Beel Khal (L=4km, W=5m, D=1.75m) and New excavation of Khal (L=2km, W=5m, D=2m)	1 No. of 2 vent regulator at Chapar kona.	None	6,696,143
52		Golabari	C	39357110	Katakhali Khal SP	DIWC	912	Re-excavation of Katakhali khal (L=7km, W=10m, D=3m) New excavation of khal (L=0.5km, W=5.0m, D=1.75m).	3 Nos. of 1 vent and 1 No. of 3 vent regulators: at Boil beel, Nakli beel, Bagajora beel and Tetulia beel	None	22,776,808
53		Golabari	C	39357130	Debipur Khal SP	DIWC	288	Re-excavation of Debipur khal. Start: Debipur, and End: Debipur Boiran river. L=1 km, W=10m, D=3m.)	One regulator at Debipur	None	4,973,730
54	Mirzapur	Jamurki	C	39366010	Lohajang Khal SP	DI	686	Re-excavation of Lohajang Khal: L=6km, W=60m, D=1.8m	None	None	21,384,713
55		Banail	C	39366020	Nordana Khal SP	DI	659	Re-excavation of Nordana Khal: L=8km, W=22m, D=1.8m	None	Regulator be BWDB	11,232,374
56		Anaitara	C	39366140	Barinda Bazar - Atiamahamudpur - Kumulli Beel - Bodebharna - Nadona Khal SP	DI	302	Barindabazar-Atiamahmudpur-Kumulli beel-Badebharra-Nadona khal. L=3 km, W=25 m, D=1.8 m.	None	None	8,323,736
57	Nagarpur	Salimabad	C	39376020	Modhudewan Khal SP	WC	209	None	1 sluice gate at Salimabad Pashchimpara.	None	3,600,000
58		Dhuburia	C	39376040	Dhubaria-Balarampur Khal SP	WC	512	Re-excavation of Dhubaria-Balarampur Khal (L=7 km, W=15m, D=3m)	None	None	12,932,010
59		Sahabatpur	C	39376070	Nalsanda-Khamardholla Flood Management SP	FM	521	Rehabilitation of emabnkment at Narsanda-Khamardholla L=5km, W=4m, H=1.5m	1 sluice gate at Tokadair	Bharra-Betwaja ni Embankment	5,960,925
60		Sahabatpur	C	39376110	Tokadair-Sahabatpur Khal SP	DI	399	Excavation of khal. Tokadair-Sahabatpur (New).L=3 km, W=8 m, D=4 m.	1 sluice gate at Kokadair.	None	8,905,440
61	Sakhipur	Jadabpur	C	39385070	Bari Khal Embankment SP	WC	220	Heightening Salda river embankment: L=0.7km, W=3.6m, H=2.5m	One regulator	None	4,825,599
62		Gazaria	C	39385080	Goalia Jhara Khal SP	DI	1080	Re-excavation of Goalia Jhura Khal: L=4km, W=22.5m, D=1.35m	None	None	4,182,297
63	Tangail Sadar	Baghil	C	39395030	Basiria Khal SP	DIWC	245	Re-excavation of Basuria Khal: L=3km, W=13m, D=1.5 m	One regulator at Basuria.	None	5,767,178
64		Dyenna	C	39395070	Binnafoir Khal SP	DI	503	Re-excavation of Binnafoir Khal: L=10km, W=25m, D=1.5m	None	CPP embankment	12,908,325
65		Dyenna	C	39395080	Shingerghona - Ghotokbari - Boro Beel - Dhara Kutia SP	DI	292	Re-excavation of khal: L=4.5km, W=4m, D=1.8m	None	CPP embankment	1,713,847
66		Karatia	C	39395110	Lahajong Khal SP	DI	733	Re-excavation of Lahajong Khal: L=10km, W=30m, D=1.8m	None	None	18,587,988

**Table 6.6.7 Breakdown of Estimated Cost**

Unit: 1,000USD

Preparatory works		Construction of physical infrastructure	Institutional Strengthening			Monitoring and quality control			Project Management	total
Further arrangements for Implementation	Institutional arrangements of local stakeholders		Agricultural training / extension	fisheries training (including measures for mitigation)	Capacity Building of LGED	environmental monitoring	monitoring and evaluation	system operation		

Investment costs

civil works											
civil works: design & Supporting Cost		4,252.2									
civil works: structures		23,003.8									
civil works: earth works		27,705.2									
subtotal	0.0	0.0	54,961.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54,961.2
land acquisition and contribution	0.0	0.0	2,388.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2,388.3
material	0.0	0.0	0.0	1,050.0	0.0	0.0	840.0	0.0	0.0	0.0	1,890.0
vehicles and equipment purchase											
vehicles	0.0	180.0	0.0	60.0	60.0	0.0	30.0	0.0	60.0	60.0	450.0
equipment	0.0	36.8	0.0	36.8	36.8	0.0	30.0	0.0	39	0.0	179.3
subtotal	0.0	216.8	0.0	96.8	96.8	0.0	60.0	0.0	98.8	60.0	629.3
surveys and investigation	525	0.0	525	0.0	0.0	100.0	10.0	0.0	0.0	0.0	1,160.0
training											
training: WMAs and beneficiaries	0.0	2,100	0.0	1,050	2,841.8	0.0	35	0.0	0.0	0.0	6,026.8
training: Staff	0.0	0.0	0.0	0.0	0.0	1,800.0	0.0	0.0	0.0	0.0	1,800.0
subtotal	0.0	2,100.0	0.0	1,050.0	2,841.8	1,800.0	35.0	0.0	0.0	0.0	7,826.8
Management information system (GIS)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	200.0	0.0	0.0	200.0
consulting services											
foreign exchange consulting services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4,060.8	4,060.8
local currency consulting services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	216.0	0.0	3,668.0	3,884.0
subtotal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	216.0	0.0	7,728.8	7,944.8
supervision and implementation const											
staff costs											
project staff	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3,600.0	0.0	3,600.0
implementation support costs											
office costs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
office O&M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2,400.0	800.0	3,200.0
subtotal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6,000.0	800.0	6,800.0
NGO staff	840.0	1,680.0	0.0	700.0	700.0	0.0	0.0	0.0	0.0	0.0	3,920.0
Vehicles and equipment O&M	0.0	396.8	0.0	120.6	120.6	0.0	60.5	0.0	120.6	0.0	819.0
<b>Total</b>	<b>1,365.0</b>	<b>4,393.7</b>	<b>57,874.5</b>	<b>3,017.4</b>	<b>3,759.2</b>	<b>1,900.0</b>	<b>1,005.5</b>	<b>416.0</b>	<b>6,219.4</b>	<b>8,588.8</b>	<b>88,539.4</b>

**Table 6.7.1 (1/2) Summary of Negative Key Impacts and Measures for Mitigation**

Negative key impacts	Measures for mitigation	Action to be taken	Timing
Land acquisition / Involuntary resettlement	Consensus building among landowners / users on land acquisition / reclamation	District LGED staff shall facilitate meetings with relevant stakeholders at the stage of feasibility study. The location and area of land to be acquired / reclaimed along with the amount and procedures for compensation will be explained. WMA preparation committee, with the support of LGED will discuss the issues and the final decision will be agreed between the land owner / user, WMA preparation committee representative and LGED District Office	Feasibility Study to Implementation Agreement
	Incorporating presence of consensus into official procedures for project appraisal	Agreement of landowners / users to cooperate to implementation of the SP will be prepared in a written form to be added to the Implementation agreement between WMA and LGED	Implementation Agreement
Local economy such as employment and livelihood, etc.	Consideration for fish-friendly structures in feasibility study	Necessity of fish friendly structures for FM SPs shall be examined by LGED consultants at the stage of feasibility study.	Feasibility Study
	Promotion of aquaculture as activity of WMA (FSC) with priority to stakeholders conventionally practicing substantial capture fisheries	District LGED staff and facilitators shall support the formulation of Fisheries Sub-Committee under the WMA at the stage of WMA formulation. SP-wise fishery development plan shall be prepared by FSC with the support of LGED and DoFish, and necessary technical support should be provided to initiate aquaculture activities	WMA formulation to 1 year after handover
	Securing access of all stakeholders (including non-WMA members) to fisheries activities (release public water bodies to local residents)	District LGED shall support preparation of the above mentioned fishery development plan so that promotion of aquaculture for FSC will be done mainly for fishponds and leasing of beels consisting of khash land will be avoided at the extent possible. The extent of public water bodies to remain with free access shall be defined through discussion with non WMA stakeholders. LGED shall facilitate such meeting during preparation of fishery development plan.	WMA formulation to 1 year after handover
	Fishery training to WMA members	LGED, with the support of DoFish shall arrange intensive training for core members of FSC, during trial operation of WRD facilities. For further support, means to obtain technical support from LGED and / or DoFish shall be clarified and noticed to FSC	Trial Operation to end of Project
Water usage or water rights and rights of common	Consensus building on water distribution for SPs aiming at WC in WMAs	The Issue of water deficiency shall be discussed in the periodical meetings of WMA in order to build consensus on water distribution. LGED shall arrange a venue for discussion between WMA preparatory committee and the down stream stakeholders (land owners / users, matabors, UP members) at the stage of feasibility study to discuss the issues. After completion of construction works, LGED shall clarify the means for the down stream stakeholders to state further opinions, and facilitate discussion meetings when required.	Feasibility Study to end of Project

**Table 6.7.1 (2/2) Summary of Negative Key Impacts and Measures for Mitigation**

Negative key impacts	Measures for mitigation	Action to be taken	Timing
Hydrological situation	Avoid SPs which may obstruct the conventional drainage system of the area at planning stage	The contents and layout of the SPs shall be examined at the point of identification of SPs qualified for SSWRD. Such SPs should be excluded from implementation plan. District LGED shall review SPs accordingly whenever substantial changes are made in SP contents and layouts.	SP identification to Feasibility Study
	Operation of regulator should be done with consensus with stakeholders outside of the SP area	LGED shall arrange a venue for discussion between WMA preparatory committee and the up stream stakeholders (land owners / users, matadors, UP members) at the stage of feasibility study to discuss the issues. After completion of construction works, LGED shall clarify the means for the up stream stakeholders to state further opinions, and facilitate discussion meetings when required.	Feasibility Study to end of Project
Flora, fauna and biodiversity	Avoid selection of SPs located in / adjacent to Madhupur National Park	The contents and layout of the SPs shall be examined at the point of identification of SPs qualified for SSWRD. Such SPs should be excluded from implementation plan.	SP identification to qualification
	Feed back the results of Bio-diversity monitoring which is to be carried out in the haor areas under SSWRDSP-2	The results of monitoring shall be reviewed by PMO. When any significant linkage is identified between the interventions of SSWRD and wild-life species in the haor areas, necessary measures for mitigation (including establishment of sanctuaries) shall be examined.	Beginning of Project to end of Project
	Habitat restoration through water conservation and tree plantation	Subprojects planning and operation of water resources facilities must be done with due consideration so that the water, particularly that of beels and haor areas will not be completely drained out. Tree plantation shall be planned in suitable areas.	F/S, D/D, Preparation of O&M Plan, During operation of SP
Water pollution	Training for proper fertilizer / pesticide management to WMA members	LGED, with the support of DAE shall arrange intensive training for core members of WMA, during trial operation of WRD facilities. For further support, means to obtain technical support from LGED and / or DAE shall be clarified and noticed to WMA	Trial Operation to end of Project
	Monitoring of water quality for selected SPs	2 sites shall be selected from each district among the Priority A SPs, while 1 non-SP site shall be selected as control. Collection of surface water samples (6 times / yr) shall be carried out by District LGED with guidance by LGED headquarters. The samples will be analyzed in the Environmental Laboratory to be established under SSWRDSP-2, and will be monitored by PMO. The Selected sites may be changed during the process according to their implementation / non-implementation.	Beginning of Project to end of Project
Soil contamination	Training for proper fertilizer / pesticide management to WMA, including promotion of organic fertilizers	Same means as for "Water Pollution"	Same timing as for "Water Pollution"
	Monitoring of water quality for selected SPs		
Waste	Examination of sediments and excessive earth that will occur from the SPs at the stage of detailed design and calculation of recyclable material	The contractors for Detailed Design are to examine the amount of sediments and excessive earth that will occur from the SPs and prepare plans for management as appropriate during their assigned work period. PMO will review the plan in view that earth will not be taken from / renounce to agricultural land with out approval of the land owner / user and will instruct the contractor for necessary amendments of the plan.	Detailed Design
	Inclusion of plan for waste management in detailed design of the SPs		

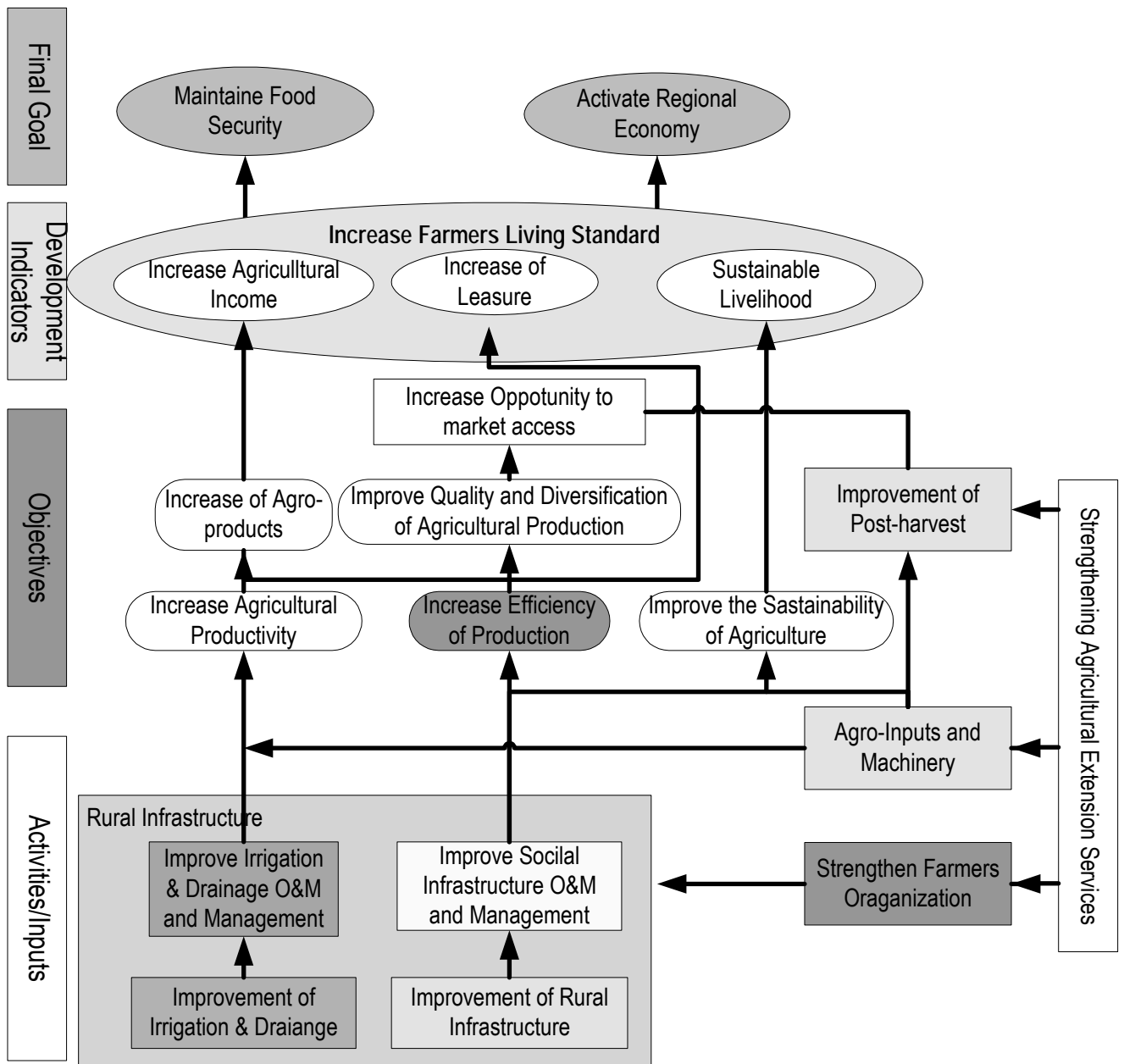


Fig. 6.1.1 Diagram of Integrated Rural Development

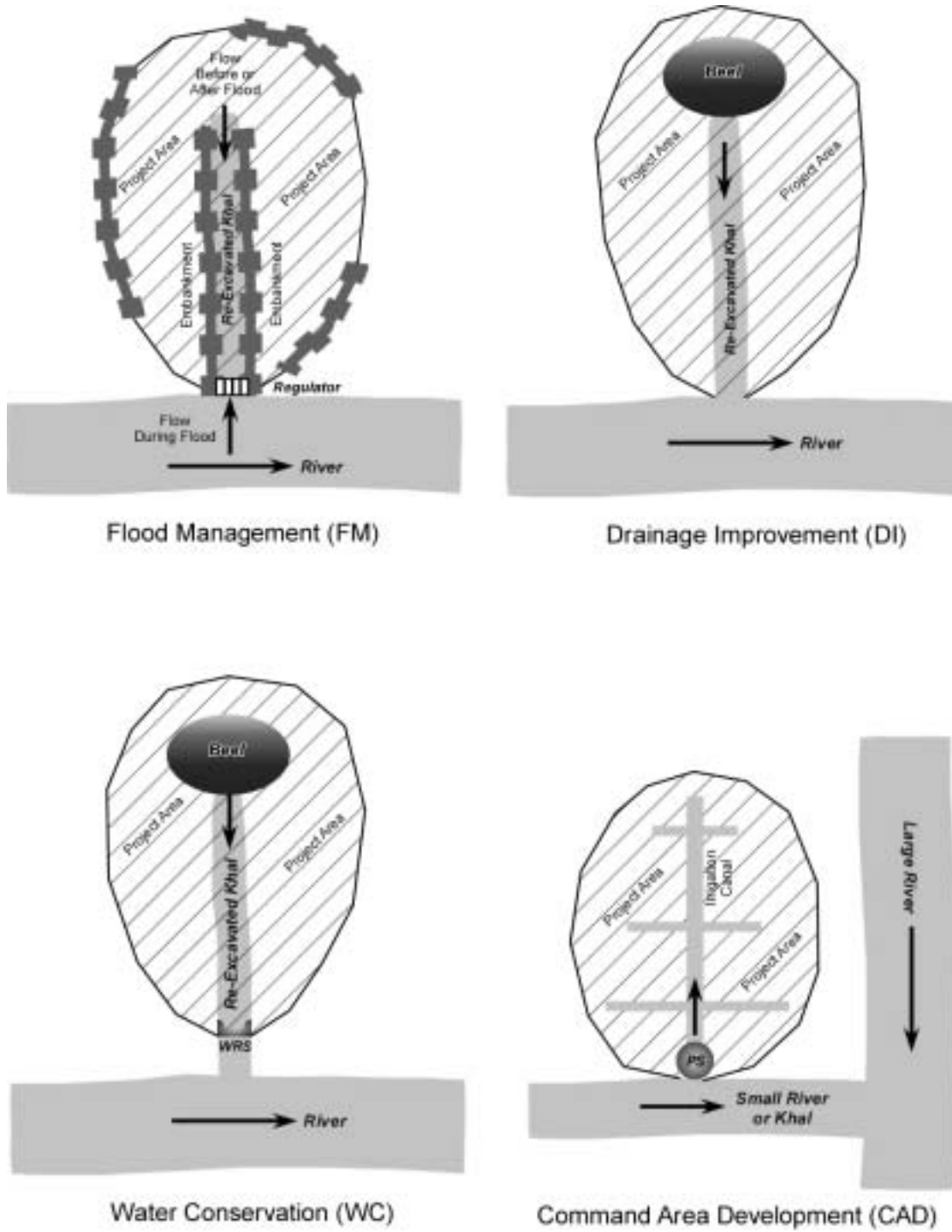


Figure 6.3.1 Types of Subprojects in SSWRDSP-2

## **CHAPTER 7**

### **CONCLUSION AND RECOMMENDATIONS**

#### **7.1 Conclusions**

Small Scale Water Resources Development Sector Project (SSWRDSP-1) started in 1996 and successfully completed in 2002. Now the phase 2 of SSWRDSP (SSWRDSP-2) is under processing. These SSWRDSPs are designed by participatory approach to the water resources development, covering from the project formulation up to the O&M stages. The Study is understood as an expansion of the SSWRDSPs.

SSWRDSP-2 owes the implementation of the water resources development from subproject appraisal up to construction within 2 years. In order to conduct the construction of water resources development smoothly within the limited period, master plan formulation was expected.

The Master Plan Study on Small Scale Water Resources Development for Poverty Alleviation through Effective Use of Surface Water in Greater Mymensingh aims to contribute to poverty reduction by realizing effective and efficient development and management of surface water resources. Through implementation of the Master Plan, an environment where surface water can be safely and effectively used for production purpose will be created. This includes not only conservation of surface water for direct utilization, but also an environment where agriculture, fisheries and livestock produce can be produced up to their potentials, not being hampered by floods and inundation. This environment will facilitate economic activities and lead to improved income of the local villagers.

The Study was designed to apply participatory planning as same as SSWTDSP-2. Many large-scale projects failed the sustainability at the insufficient performance of O&M stage. In order to achieve the sustainability of the project, it was recognized stakeholders' participation from the project formulation stage was indispensable.

Identified and qualified SSWRD subprojects cover the 11% of the Study Area, which estimated 400,000 households and 1.8 million populations as beneficiaries. They are benefited through the water resources development such as flood management, drainage improvement, water retentions and irrigation improvement. As proved by SSWRDSPs, the Project will contribute the poverty reduction through increase of agricultural products. Also the beneficiaries will be empowered through the implementation of people-centered project.

On the other hand, the Master Plan will contribute the NWMP on the several activities as shown in Table 7.1.1. Therefore it is strongly recommended to implement the master plan of small-scale water resources development as soon as possible in collaboration with relevant government agencies, NGO and other stakeholders.

For the expected benefit of the Master Plan, the findings of the External Evaluation on SSWRDSP-1, conducted by ADB, IFAD, GoN and GoB can be referred to. Cropping intensity has significantly increased from an average of 176 % to 237 %. Average yield of crops have also increased for Aman (63%), Boro (31%), and Aus (21%) and other crops (wheat, onion). Flood number of landowners claiming flood problems in the subproject areas

decreased from 74% to 9%. For 30 subprojects studied in the above evaluation, 424,000 man-days of employment is estimated to be newly created.

## **7.2 Recommendations**

### **7.2.1 Small Scale Water Resources Development**

#### **(1) Participation of stakeholders for the Development**

NWPO declared the necessity of the participatory water management. It encourages the stakeholders and private sector for the water management. Through the field survey in phase I of the Study, the Study Team uncovered the communication gap between upazila – union and Union-shimaju. In case of the large-scale flood management subproject, many stakeholders did not know the subproject and what subproject started the construction without any notice or explanation to local peoples. In this case, the Study Team confirmed, through discussions with all stakeholders, that they could solve conflicts among stakeholders. Also the Study Team confirmed that Upazila engineers can facilitate meetings and discussions among stakeholders with providing venues, which can formulate the consensus and find out the countermeasures by participants themselves.

#### **(2) Consensus Formulation and Submission of Proposal for the Subproject**

After discussing with villagers in the field, the surveyor/enumerator of water resources engineers identified subprojects. Identified subprojects were also confirmed with UDCC consultation meetings. Even though, because of the limited time, surveyor/enumerator could not share time for formulating consensus in the field. The Study Team requested participants of UDCC consultation meetings that Upazila Engineer /UP chairperson arrange the venue to explain the subproject components and discuss among beneficiaries for formulation of consensus as soon as possible. Then subproject proposal could be prepared under the assistance of Upazila Engineers and officials. Upazila engineers are expected to follow up the UDCC consultation meeting results on this matter.

#### **(3) Coordination of Large and Small Scale Subprojects**

The Study dealt with small-scale water resources development only. Sometimes, it became difficult to formulate the small-scale water resources subprojects, even through there were some needs to develop, because of the plan of large-scale project was no clear. Hence large-scale water resource development plan also shall be studied by BWDB based on the old study during the FAP. In the case of the study, LGED Upazila Engineer can support them.

#### **(4) Application of Survey and Planning Method to Formulate Plans of Other Districts.**

The Study was expected as the pilot study for further extension of small-scale water resources master planning within short period and with minimum input. Besides that counterparts of LGED are expected to apply the approach and methodology of the Study to other district by themselves.

In the Study, PCM workshops of problem identification, PRA, Union Questionnaire survey, inventory survey, union questionnaire verification survey and farm household interview survey were applied as the tool of the Study. The results of the field survey were explained and discussed at UDCC, DSSWRDC and National workshops. There were some surveys such as union questionnaire, whose information on the replying paper sometimes misunderstands



the truth in the field. Those questionnaires were prepared and distributed to UP Chairperson by dispatched Upazila Engineer. Those results were scheduled to analyze answers at office in Dhaka. So it was one of lessons obtained that simple correspondence with documentation sometimes causes misunderstandings. To secure the collection of accurate information, direct communication with local people is indispensable. Especially Bangladesh has insufficient topographic information; therefore, direct confirmation in the field is the most important measures especially water related development. For identifying potential subproject area, collation of the results of union questionnaire survey with field verification will be the best method for the smooth implementation of field survey.

#### (5) Formulation of Demonstration Area for Rural Development.

Small-scale water resources development improves the infrastructure for the agriculture and fisheries in the field. Without improvement of economic activities in the subproject area, improvement of infrastructure will be meaningless. In order to increase the economic value, DAE, DoF and DOL are requested to concentrate the technical support in the subproject area and to generate the success story of rural development in the regions.

### **7.2.2 Agriculture, Fisheries and Livestock**

#### (1) Characteristics of Agriculture Development Plan

The objectives of the proposed agriculture development plan in the SSWRDP are to carry out the sustainable farming, which can be realized by following factors.

- a) Rational nutrition-linked agriculture developing pro-protein farming system and food system as like integrated rice-fish cultivation and or rice-livestock/poultry combination, to diversify farming and to enhance synergetic effects on sound farm production.
- b) Improvement and stabilization of farmers' economy.
- c) Improvement of living standard, especially under coexistence and mutual prosperity of the weaker and the stronger in rural society.
- d) Enough and timely supply of farm materials and enough supply of farm machinery
- e) Strengthening of farming basis of farmers themselves by commencing cooperative works as the first step to approach for establishing cooperative in future, which will have an advantage of joint selling of farmers' products and added values of products by processing to prevent beating down the prices by wholesalers.

The plan was made under consideration of these factors.

#### (2) To Strengthen Agricultural Extension System

Farmers have integrated farming practices such as rice-livestock, rice-fish-poultry. Integrated training covering several fields in one course is needed.

Farmers target agricultural diversification, high profitable crops (Potato, wheat, chili, etc.), as integrated farming. Extension system needs to cover the diversified practices by introducing integrated training system.

In order to upgrade Block Supervisors' (BS) capability in agricultural technology, interchange of research and extension is important. It is appropriate to reorganize the extension system.

### (3) To Enhance Capacity Building

Establish rural (Upazila level) vocational school (Agricultural high school) to develop agriculture, nutrition and health, rural industry and marketing, targeting to innovate the current BS system, develop integrated training, and formulate rural middle technologist class for production of branded products.

Strengthening Agricultural Technical Extension System are required for;

- Senior extension officers who have experience in research and bridge the both activity.
- Specialized extension workers: Cropping, soil, machinery, poultry, livestock, fisheries, marketing, family management and forestry

Upgrading capacity building of Union staff is indispensable to develop local government's capability to formulate and to conduct project efficiently. Several aspects required urgently are as follows:

- Planning capacity
- Documentation ability
- Project watching

### (4) To Develop Farmers' Organization

Farmers are apt to practice independently and not in a position to organize cooperative works. However, when farmers try to reduce production costs and to sell their products at profitable price, they have to organize cooperatives to take advantages of joint work. It is recommended to organize marketing cooperatives at first with a view to commence activities close to cash generating.

### (5) Agribusiness

Even though agribusiness related facilities are generally obsolete from technical and economic point of views, they need to be renovated in terms of energy saving and quality-improvement of products, because the products of agribusiness are usually sold to international market and owes the task of international exchange.

Light industry products and foods are promising commodities for export from Bangladesh. Marketing commodities from rural areas to large markets generate the first step of cash flow. To stabilize the flow export of these commodities are necessary. Bangladesh has advantages in exporting agricultural products, especially winter crops. Further studies are required.

## **7.2.3 Environmental and Social Considerations**

Apart from the necessary environmental and social considerations indicated in the Master Plan, many of the potential subprojects are expected to go through environmental clearance as indicated in the Environmental Conservation Rules, 1997. Since there is no way that SSWRD subprojects will have absolutely no negative impact (needless to say of positive impact), detailed examination should be done at the time of detailed design in a scientifically attested manner and in conformance with the legislations of Bangladesh.

Table 7.1.1 Contribution of the Master Plan to the Activities indicated in the NWMP

MIS Ref	Programme Name	Lead Agency	Contribution	Remarks
ID 001	Local Government Needs Assessment for Water Management	LGD	Partial	Needs for institutional setup and human resources development for planning and implementation of SSWRD subprojects by LGED in effective coordination with relevant government agencies at local level, UP chairpersons and members, and local stakeholders will be indicated in the Master Plan. This basic ideas indicated in the Master Plan could be effectively utilized for water resources management by LGIs.
ID 005	Local Government Capacity Building for Water Management	LGIs	Major	The Master Plan will enhance the capacity of Upazila level govt. officers including UE and UNO, UP chairmen and members, other local representatives and stakeholders in participatory planning and development of SSWRD interventions. This process is sure to contribute to the goals of the programme when LGIs will be officially initiated
AW 005	Improved Water Management at Local Government Level	LGED	Major	Government officers at district and upazila level have been and will be actively involved in the planning and implementation of activities indicated in the Master Plan. This process is sure to contribute to the goals of the programme when LGIs will be officially initiated
AW 006	Improved Water Management at Community Level	LGED	Major	One of the major issues that the Master Plan considers is water management with the incentive of local stakeholders. Activities of the Master Plan will directly contribute to the goals of the programme by realizing water management through WMAs
AW 007	Rationalization of Existing FCD Infrastructure	BWDB	Indirect	Though the programme targets FCD exceeding 1,000 ha, rationalization of small scale FCD infrastructure which will be done under the Master Plan will supplement the programme in achieving it's goals
EA 001	National Pollution Control Plan	Mol	Indirect	Possible indirect contribution through training for appropriate use of agro-chemicals and raising awareness to obtain wide stakeholder participation
EA 003	National Water Quality Monitoring	DOE	Indirect	Water quality data obtained through monitoring activities under environmental and social consideration may be utilized for this purpose
EA 004	National Fisheries Master Plan	DoFish	Indirect	Coordination may be made in order to practice fishery related activities under WMA (fish culture, training, etc.) collaboratively with the contents of the National Fisheries Master Plan
EA 007	Improved Water Management in the Haor Basins of the North East Region	HWDB	Indirect	In subprojects with designated water bodies, WMA can contribute through considering the requirements indicated by the programme in water resources management activities.
EA 008	Environmentally Critical Areas and Integrated Wetland Management	DoFish	Indirect	In subprojects with designated water bodies, WMA can contribute through considering the requirements indicated by the programme in water resources management activities.
DM 004	National, Regional and Key Feeder Roads – Flood Proofing	RHD	Partial	Rehabilitation, upgrading and new construction of road cum embankments planned in the Master Plan may consequentially contribute in achievement of the programme
DM 006	Supplementary Irrigation and Drought Proofing of Rural Water Supply	DAE	Indirect	Though the programme aims at installation of HTWs, WC components of the subprojects proposed in the Master Plan will support it's goal through mitigating the risk of drought risk at some extent
ID 003	FCD and FCD / I Management Rationalization	BWDB	Indirect	The practice of O & M by the local beneficiaries to be carried out under the Master Plan may be referred to for increasing the efficiency of the programme
EE 002	Field Testing of Participatory Management Model	BWDB	Partial	The system and institutional set up for SSWRD developed through SSWRDSP and the Master Plan can be one of the effective schemes to achieve participatory management of SSWRD interventions
EE 013	Alternative Financing Methods for Water Management	WARPO	Partial	O&M budget of infrastructure proposed in the Master Plan will be born by local stakeholders. This will contribute to the goals of the programme.
TR 002	Rural Arsenic Mitigation	DPHE	Indirect	Some WC subprojects may be partially utilized for domestic use provided that necessary treatment is done
TR 007	Large and Small Town Flood Protection	BWDB	Partial	Certain areas of the towns selected in the programme, particularly in the rural areas may benefit from FM components of the subprojects indicated in the Master Plan

Appendix - A	Scope of Work for the Study .....	A - 1
Appendix - B	Minute of Meeting on the Scope of Work .....	B - 1
Appendix - C	Minute of Meeting on the Inception Report.....	C - 1
Appendix - D	Minute of Meeting on the Interim Report .....	D - 1
Appendix - E	Minute of Meeting on the Draft Final Report .....	E - 1
Appendix - F	List of JICA Study Team and Counterparts .....	F - 1

**MINUTES OF MEETING  
ON  
THE INCEPTION REPORT  
FOR  
THE MASTER PLAN STUDY  
ON  
SMALL SCALE WATER RESOURCES DEVELOPMENT  
FOR POVERTY ALLEVIATION  
THROUGH EFFECTIVE USE OF SURFACE WATER  
IN  
GREATER MYMENSINGH OF BANGLADESH  
AGREED UPON BETWEEN  
THE LOCAL GOVERNMENT ENGINEERING DEPARTMENT  
AND  
THE STUDY TEAM  
OF  
JAPAN INTERNATIONAL COOPERATION AGENCY**

**Dhaka, July 26, 2003**



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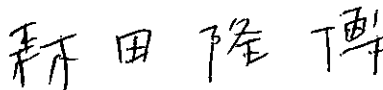
**Mr. Md. Nurul Islam  
Superintending Engineer  
Integrated Water Resources Management Unit,  
Local Government Engineering Department**



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**Mr. Keiji Matsumoto  
Leader  
JICA Study Team**

Witness :



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**Mr. Takahiro Morita  
Leader, JICA Monitoring Team,  
JICA Head Office, Tokyo**

The Study Team organized by Japan International Cooperation Agency (hereinafter referred to as "The Study Team") for the Study on The Master Plan Study in Small Scale Water Resources Development for Poverty Alleviation through Effective Use of Surface Water in Greater Mymensingh of Bangladesh (hereinafter referred to as "the Study"), headed by Mr. Keiji Matsumoto presented the Inception Report for the Study to the Local Government Engineering Department, represented by Mr. Md. Nurul Islam, Superintending Engineer of the Integrated Water Resources Management Unit, the Local Government Engineering Department, the Peoples Republic of Bangladesh (hereinafter referred to as "LGED").

In accordance with the Scope of Works for the Study signed between the Economic Relations Division through the Local Government Engineering Department of Local Government Division under the Ministry of Local Government, Rural Development & Cooperatives on February 25, 2004, the Study Team officially submitted twenty (20) copies of the Inception Report to LGED on July 20, 2004.

The Meeting on the Inception Report was held with LGED in Dhaka on July 20, 2004. Both the Bangladesh and Japanese sides have agreed upon the following.

1. The Bangladesh side agreed with the contents of the Inception Report which had been prepared in due compliance with the conditions set forth in the Scope of Work for the Study, agreed between Government of Bangladesh and Japan International Cooperation Agency on February 25, 2004.
2. Both sides agreed to cooperate for the effective and timely implementation of the present Study in such manner as to accomplish the objectives of the Study, to keep work schedule as contemplated in the Inception Report, and to conduct the Study with due consideration of the comments expressed by the LGED side in the discussion on the Inception Report (attachment II).
3. Both sides confirmed the importance of the full involvement of the counterpart personnel for the Study. Therefore, the counterpart personnel shall be assigned on a full time basis until the completion of the Study.
4. The Bangladesh side suggested the Japanese side to keep close communication between the Study Team and LGED to provide an effective outcome of the Study.



Attachment I

LIST OF PARTICIPANTS

BANGLADESH SIDE

LGED

Mr. Saroj Kumar Sarker	Additional Chief Engineer
Mr. Md. Nurul Islam	Superintending Engineer, Integrated Water Resource Management Unit (IWRMU)
Mr. Md. Habibur Rahman	Executive Engineer, IWRMU
Mr. Md. Jamal Uddin	Executive Engineer (O&M) and Project Director, Livelihood Improvement for the Poor Project
Mr. Saleh Ahmed	Assistant Engineer (Environment), IWRMU
Ms. Tahmina Hossain	Assistant Engineer (O&M), IWRMU
Ms. Shahana Akhter	Assistant Engineer (Planning & Design), IWRMU
Mr. GM Akram Hossain	Deputy Team Leader, Advisory Technical Assistance (ADTA), SSWRDSP-2
Mr. M.Sultan Mahmud Khan	Water Management Cooperative Association Management Specialist, IWRMU
Mr. M.Eklimur Reza	Water Resource Planning Specialist, IWRMU
Dr. Q. R. Islam	Agronomist, ADTA, SSWRDSP-2
Mr. A.K. M. H. Talukder	Environmental Specialist, ADTA, SSWRDSP-2
Mr. Ashfaqui Izam	O&M Specialist, ADTA, SSWRDSP-2

JAPANESE SIDE

JICA Monitoring Team

Mr. Takahiro Morita	Leader
Ms. Naho Aizu	Project Management

JICA Study Team

Mr. Keiji Matsumoto	Team Leader/ Development Planning
Mr. Sumitada Okamoto	Irrigation and Drainage Engineer/ Project Evaluation
Ms. Kumiko Adachi	Aquaculture Specialist
Mr. Naohito Watanabe	Environment and Social Consideration/ Coordinator

JICA Bangladesh Office

Ms. Miyako Kobayashi	Deputy Resident Representative
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JICA Expert

Mr. Yoshitaka Kamigatakuchi	Advisor to LGED
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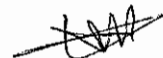
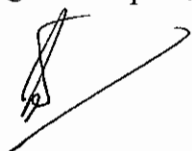


## Attachment II

### COMMENTS MADE AMONG THE STUDY CONTENTS

In the discussion on the Inception Report presented by the Study Team to LGED, the following comments were expressed by the LGED side.

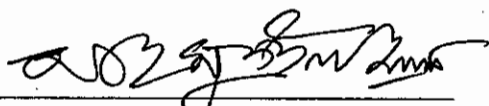
- The agro-eco zones may be difficult to apply for the zoning for SSWRD, and this warrants due consideration. In this context, it was pointed out that without effective zoning, selection of samples for survey may be difficult.
- Together with the aerial photographs by BWDB, the Upazila land use directory with maps (1:50,000) prepared by SRDI which contains some useful information may be used.
- The wording “unsuccessful” should be avoided for describing the results of sub-projects completed under SSWRDSP-1, as it gives completely negative impression. Although some deficiencies on certain aspects may be observed in some sub-project implemented under SSWRDSP-1, yet some positive impacts have been observed in those sub-projects in consideration of some other aspects.
- The linkage of SSWRD and poverty alleviation did not seem to be clear, and will need clarification.
- Strategy should not be determined in advance. It should be determined in consultation with local people according to their needs, such as, conversion of land (e.g. poorly drained land to paddy fields) should be carefully considered, as most land in Bangladesh is being utilized for one or the other purposes (e.g. fisheries).
- The main aims of the study should be to increase agricultural production through : i) flood management, ii) drainage improvement, iii) water conservation and iv) irrigation improvement.
- Though areas under large-scale water resources development projects are not directly covered by the Master Plan, the Study should review these areas if there are potentials for SSWRD interventions for better water management.
- Sub-regional differences, particularly in hydrology should be considered in preparation of the Master Plan.
- Water resource availability should be added to the prioritization criteria of the sub-projects
- The construction of embankment/ roads around the sub-project area of big dimension may not be feasible in terms of land acquisition
- Massive support for fisheries is being done in Sherpur. This should be kept under consideration.
- Publication of information may not reach the local people when provided through the Internet.
- Though surface water management is not a popularly practiced measure, particularly in terms of SSWRD, it should be considered upon as appropriate. Drainage improvement is said to have significant positive effect on productivity.





Minutes of Meeting  
for  
The Master Plan Study  
on Small Scale Water Resources Development for Poverty Alleviation  
through Effective Use of Surface Water in Greater Mymensingh of Bangladesh  
agreed upon between  
Economic Relations Division  
through Local Government Engineering Department of Local Government Division  
under the Ministry of Local Government, Rural Development & Cooperatives  
and  
Japan International Cooperation Agency

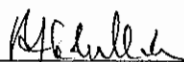
Dhaka, February 25, 2004



Mahmudul Huq Bhuiyan  
Deputy Secretary  
Economic Relations Division,  
Ministry of Finance and Planning  
Government of Bangladesh



Mitsuhiko Ota  
Leader  
The Preparatory Study Team  
Japan International Cooperation Agency



Md. Abdullah  
Deputy Chief  
Local Government Division  
Ministry of LGRD & Cooperatives  
Government of Bangladesh



Md. Nurul Islam  
Superintending Engineer (IWRM)  
Local Government Engineering Department  
Local Government Division  
Ministry of LGRD & Cooperatives  
Government of Bangladesh

## I. INTRODUCTION

In response to the request of the Government of Bangladesh, the Preparatory Study Team headed by Mr. Mitsuhiro Ota (hereinafter referred to as "the Team"), was sent to Bangladesh by the Government of Japan through the Japan International Cooperation Agency (hereinafter referred to as "JICA"), from February 17 to March 5, 2004 for the purpose of discussing and confirming the Scope of Work for the Master Plan Study on Small Scale Water Resources Development for Poverty Alleviation through Effective Use of Surface Water in Greater Mymensingh of Bangladesh (hereinafter referred to as "the Study").

The Team held a series of discussions with the relevant authorities of the Government of Bangladesh represented by Local Government Engineering Department (hereinafter referred to as "LGED").

As a result of the discussions, the Bangladesh side and the Team agreed on the Scope of Work for the Study.

The following are the main issues discussed and agreed upon by both sides in relation to the Scope of Work for the Study. The list of participants and resource persons in the series of meetings is attached as Annex 1.

## II. RESULTS OF DISCUSSIONS

### 1. Title of the Study

Both sides confirmed the title of the Study as "The Master Plan Study on Small Scale Water Resources Development (hereinafter referred to as "SSWRD") for Poverty Alleviation through Effective Use of Surface Water in Greater Mymensingh of Bangladesh".

### 2. Objectives of the Study

Both sides confirmed the objectives of the study as follows:

- (1) To formulate Master Plan for SSWRD in Greater Mymensingh comprising strategies, priority programs, and the scope for follow-on investment projects which include effective use of surface water; and
- (2) To enhance and strengthen the capacity of the counterpart in preparation of Master Plan for SSWRD.

### 3. Study Area

Both sides confirmed that the Study shall cover greater Mymensingh that stands for six districts of Mymensingh, Tangail, Sherpur, Jamalpur, Netrokona, and Kishoreganj.

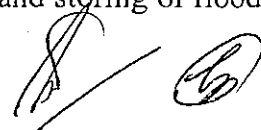
### 4. Framework of the Study

- 4.1 Both sides confirmed that Small Scale Water Resources Development (SSWRD) is defined as studying, planning, implementing and managing projects / sub-projects having benefit area of 1,000ha or less as stated in the National Water Policy.
- 4.2 Both sides agreed that the Master Plan for SSWRD shall cover flood management, irrigation and drainage, agriculture and fishery extension, rural water supply, arsenic mitigation, and institutional strengthening.
- 4.3 Both sides agreed "flood management" as defined in National Water Policy and may include construction of flood embankments, excavation of existing canals and storing of floodwater in the canals.



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- 4.4 Both sides agreed that strategy and priority programs on “rural water supply” means advice on rural water supply based on other studies.
- 4.5 Both sides agreed that strategy and priority programs on “arsenic mitigation” means advice on arsenic mitigation based on other studies.
- 4.6 Both sides agreed that “institutional strengthening” includes capacity building.
- 4.7 Both sides agreed that “Guidelines for Project assessment” is defined as that for assessing sub-projects.
- 4.8 Both sides agreed that “Action Plan” is defined as an implementation plan that includes time schedule to formulate and implement sub-projects according to the priorities.

### **5. Target year**

LGED requested that the time frame for implementation of the Master Plan would be around ten (10) years.

### **6. Counterpart persons**

LGED side assigned counterpart personnel as in Annex2

### **7. Formalities for finalization of Master Plan**

Regarding the item 4, "IV. SCOPE OF THE STUDY" of the Scope of Work, LGED promised to organize the consultation meetings with Upazila Development Coordination Committee (UDCC), District Small-scale Water Resources Committee (DSWRC) and national level workshop. Bangladesh side requested in this regard, the cost of the meetings and workshops to be borne by JICA. The Team promised to convey it to the JICA headquarters in Tokyo.

### **8. Equipment, facilities and other necessary support for the Study**

- 8.1 LGED promised to provide the Team for the Study with one telephone line and suitable office space in the building of LGED and in each district as required.
- 8.2 LGED requested JICA to support LGED with necessary equipment such as vehicles including operational cost, auto levels, GPS, digitizer, plotter, personal computer and laptop computer, laser printer, multimedia projector, photocopy machine, scanner, air conditioner and office furniture. The Team promised to convey it to the JICA headquarters in Tokyo.

### **9. Training of counterpart personnel**

LGED requested training in Japan and other countries to strengthen capacity of LGED in the preparation of Master Plan for SSWRD. The Team promised to convey it to the JICA Headquarters in Tokyo.

### **10. Report**

The both sides agreed that the Final Report should be opened to the public.





**LIST OF PARTICIPANTS****Bangladesh Side****ERD, Ministry of Finance and Planning**

Mr. Mahmudul Huq Bhuiyan Deputy Secretary

**LGD, Ministry of LGRD & Cooperatives**

Mr. Md. Abdullah Deputy Chief  
Mr. Sharful Alam Director General

**LGED**

Mr. Md Shahidul Hassan	Chief Engineer
Mr. Saroj Kumar Sarker	Additional Chief Engineer
Mr. Md. Nurul Islam	Superintending Engineer, IWRMU
Mr. Md. Wahidur Rahman	Superintending Engineer, M & E
Mr. Bashir Uddin Ahmed	Project Director, SSWRDSP-2
Mr. Md. Zahargir Alam	Project Director, Low Cost Bridge
Mr. Md. Ismail Hossain	Project Director, Rubber Dam Project
Mr. J.R. Rinfret	Team Leader, SSWRDSP-2
Mr. GM Akram Hossain	Deputy Team Leader, Project Consultant, SSWRDSP-2
Mr. H. Werszuo	Planning & Monitoring Advisor, ADTA Team, SSWRDSP-2
Mr. M. Eklmur Reza	Water Resources Planning Specialist, IWRMU
Mr. M. Sultan Mahmud Khan	WMA Management Specialist, IWRMU
Mr. Md. Nurul Islam Sardar	Team Leader, Japan Fund for Poverty Reduction
Mr. Md. Habibur Rahman	Executive Engineer, IWRMU
Mr. Md. Jamal Uddin	Executive Engineer (O&M), IWRMU
Mr. Md. Shahidul Haque	Executive Engineer (Planning & Design), SSWRDSP-2
Mr. Niranjam Das	Executive Engineer, Rubber Dam Project
Ms. Shahana Akhter	Assistant Engineer (Planning & Development), IWRMU
Mr. Saleh Ahmed	Assistant Engineer (Environment), IWRMU

**Japanese side****Preparatory Study Team**

Mr. Mitsuhiro Ota	Leader
Mr. Shigeru Maeda	Irrigation and Drainage
Mr. Shiro Mukai	Rural Society and Infrastructure
Mr. Toshikatsu Imai	Water Resources Development
Mr. Tasuku Ishibashi	Project Formulation

**JICA Bangladesh Office**

Mr. Sayedul Arefin Deputy Director

**JICA Expert**




Mr. Yoshitaka Kamigatakuchi Advisor to LGED  
Mr. Kanezo Takeuchi RDEC project





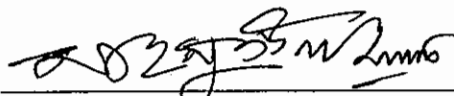
**LIST OF COUNTERPART PERSONNEL**

1. Mr. Md. Nurul Islam, Superintending Engineer, IWRM Unit, LGED.
2. Mr. Md. Habibur Rahman, Executive Engineer, IWRM Unit, LGED.
3. Mr. Md. Jamal Uddin, Executive Engineer, IWRM Unit, LGED.
4. Mr. Md. Shahidul Haque, Executive Engineer, SSWRDSP-2, LGED.
5. Mr. Md. Mosiur Rahman, Executive Engineer, SSWRDSP-2, LGED.
6. Mr. Nirranjan Das, Executive Engineer, Rubber Dam Project, LGED.
7. Executive Engineer, LGED, Mymensingh/Tangail/Jamalpur/Sherpur/Netrokona/Kishoregong.
8. Mr. Saleh Ahmed, Assistant Engineer, IWRM Unit, LGED.
9. Ms. Shahana Akhter, Assistant Engineer, IWRM Unit, LGED.
10. Ms. Thamina Hossain, Assistant Engineer, IWRM Unit, LGED.
11. Assistant Engineer, LGED, Mymensingh/Tangail/Jamalpur/Sherpur/Netrokona/Kishoregong.
12. Upazila Engineer, LGED, Upazila of Mymensingh/Tangail/Jamalpur/Sherpur/Netrokona/Kishoregong



Scope of Work  
for  
The Master Plan Study  
on Small Scale Water Resources Development for Poverty Alleviation  
through Effective Use of Surface Water in Greater Mymensingh of Bangladesh  
agreed upon between  
Economic Relations Division  
through Local Government Engineering Department of Local Government Division  
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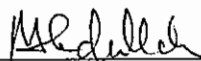
Dhaka, February 25, 2004



Mahmudul Haq Bhuiyan  
Deputy Secretary  
Economic Relations Division,  
Ministry of Finance and Planning  
Government of Bangladesh



Mitsuhiro Ota  
Leader  
The Preparatory Study Team  
Japan International Cooperation Agency



Md. Abdullah  
Deputy Chief  
Local Government Division  
Ministry of LGRD & Cooperatives  
Government of Bangladesh



Md. Nurul Islam  
Superintending Engineer (IWRM)  
Local Government Engineering Department  
Local Government Division  
Ministry of LGRD & Cooperatives  
Government of Bangladesh

## I. INTRODUCTION

In response to the request of the Government of Bangladesh (hereinafter referred to as "GOB"), the Government of Japan decided to conduct the Master Plan Study on Small Scale Water Resources Development (hereinafter referred to as "SSWRD") for Poverty Alleviation through Effective Use of Surface Water in Greater Mymensingh of Bangladesh (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for implementing the technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned in Bangladesh.

The present document sets forth the scope of work with regard to the Study.

## II. OBJECTIVES OF THE STUDY

The overall goal of the Study is to secure safe and sustainable water resources management and to increase farmers' income.

The objectives of the Study are as follows:

- (1) To formulate Master Plan for SSWRD in Greater Mymensingh comprising strategies, priority programs, and the scope for the follow-on investment projects which include effective use of surface water; and
- (2) To enhance and strengthen the capacity of the counterpart in preparation of Master Plan of SSWRD.

## III. STUDY AREA

The Study shall cover greater Mymensingh (Mymensingh, Tangail, Sherpur, Jamalpur, Netrokona, and Kishorganj districts).

## IV. SCOPE OF THE STUDY

In order to achieve the above objectives, the Study shall consist of the following items.

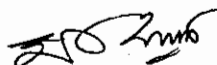
### 1. Data collection and analysis

- 1.1 Collect and review the existing data and information on physical, socioeconomic and institutional settings, including hydrology, water availability and quality, land use, population, poverty and other human development indices, income, gender issues and occupational patterns; and collate the same with project objectives and outputs.
- 1.2 Assess the performance and issues of the economic activities of the Sub-districts (Upazila), including agriculture, fishery, forestry, and other natural resources, roads and road transport, water supply and sanitation.
- 1.3 Collect information on the ongoing and proposed interventions in the Upazila in water and other relevant sectors.

### 2. Inventory survey and Participatory Rural Appraisal (PRA)

- 2.1 Carry out the inventory survey of existing infrastructure related to water resources, along with their status and location maps.
- 2.2 Select potential areas for SSWRD.
- 2.3 Undertake PRA at representative unions and Upazilas that includes the potential area and assess the following: (a) development status, needs and priorities; (b) water-related problems, their causes and proposed solutions; (c) stakeholders' views on the ongoing and proposed initiatives; and (d) stakeholders' willingness to contribute to the construction, operation and maintenance (O&M).

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### 3. Preparation of Master Plan for SSWRD

- 3.1 Strategies and priority programs which could include flood management, irrigation and drainage, agriculture and fishery extension, rural water supply, arsenic mitigation, and institutional strengthening
- 3.2 Guidelines for project assessment
- 3.3 Prioritized list of sub-projects
- 3.4 Action plan

### 4. Consultation

Submit the proposed draft Master Plan for SSWRD to the Upazila Development Coordination Committee (UDCC) for discussion and further participatory improvements. The UDCC meeting discussing the proposed draft Master Plan shall be participated by all UP chairmen, Upazila level officials of the concerned ministries/departments including representative of BWDB. After the UDCC meeting and necessary follow-up updating, the final draft Master Plan will be presented to the District Small-scale Water Resources Committee (DSWRC), which is chaired by the Deputy Commissioner with District level officials of the Bangladesh Water Development Board (BWDB), Department of Agricultural Extension (DAE), Department of Cooperatives (DOC), Department of Forests (DOF), Department of Fisheries (DoF), Department of Women Affairs and other relevant Departments/Agencies as members of the committee for review. The Executive Engineer of LGED is the member secretary of the committee. The final draft Master Plan will then be presented at a national level workshop participated by various agencies involved in water sector development activities including representatives of Donors.

## V. STUDY SCHEDULE

The Study shall be carried out in accordance with the Tentative Work Schedule attached as Annex I.

## VI. REPORTS

JICA shall prepare and submit the following reports, written in English, to GOB:

Inception Report: Twenty (20) copies at the commencement of the Study

Interim Report: Twenty (20) copies in the middle of the Study

Draft Final Report: Twenty (20) copies at the end of the Study

GOB shall submit written comments on the Draft Final Report to JICA within one (1) month after receipt of the report.

Final Report: Forty (40) copies within two (2) months after the receipt of comments on the Draft Final Report from GOB

## VII. UNDERTAKINGS OF GOB

1. To facilitate smooth conduct of the Study, GOB shall undertake the following necessary measures:
  - (1) Secure safety of the Study Team,
  - (2) Permit the members of the Study Team to enter, leave and sojourn in Bangladesh for the duration of their assignment therein, and exempt them from alien registration requirements and consular fees,
  - (3) Exempt the members of the Study Team from taxes, duties and other charges on equipment, machinery and other materials to be brought into and out of Bangladesh for the conduct of the Study,
  - (4) Exempt the members of the Study Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Study Team for their services in connection with the implementation of the Study,

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- (5) Provide necessary facilities to the Study Team for remittance as well as utilization of the funds introduced into Bangladesh from Japan in connection with the implementation of the Study,
  - (6) Secure permission for the Study Team to enter private properties or restricted areas for the conduct of the Study,
  - (7) Secure permission for the Study Team to take all data and documents, including photographs and maps, relevant to the Study out of Bangladesh to Japan, and
  - (8) Provide medical services as needed, expenses for which shall be chargeable to members of the Study Team.
2. GOB shall bear any claims that may arise against members of the Study Team resulting from, occurring during the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Study Team.
  3. The Local Government Engineering Department (hereinafter referred to as "LGED") shall act as the counterpart agency to the Study Team, and LGED / Local Government Division as the coordinating body in relations with other governmental, Local Governmental Institutions and non-governmental organizations for the smooth implementation of the Study.
  4. LGED shall, at its own expense and in cooperation with other organizations concerned, provide the Study Team with the following:
    - (1) Available data and information related to the Study,
    - (2) Counterpart personnel,
    - (3) Suitable office space and necessary equipment in Dhaka and the Study area, and
    - (4) Credentials or identification cards.

#### VIII. UNDERTAKINGS OF JICA

For the implementation of the study, JICA shall undertake the following measures:

- (1) Dispatch, at its own expense, study teams to Bangladesh, and
- (2) Transfer technology to the Bangladesh counterpart personnel during the course of the study.

#### IX. CONSULTATION

JICA and LGED shall maintain constant communication and consult with each other in respect of any matters that may arise from or in connection with the Study.

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TENTATIVE WORK SCHEDULE

.MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Work in Bangladesh																	
Work in Japan	<input type="checkbox"/>				<input type="checkbox"/>									<input type="checkbox"/>			
Reports	$\Delta$ Ic/R				$\Delta$ It/R									$\Delta$ Df/R	$\oplus$		$\Delta$ F/R

(Remarks)

Ic/R  
It/R  
Df/R  
F/R  
 $\oplus$

: Inception Report  
: Interim Report  
: Draft Final Report  
: Final Report  
: Comments on Df/R by GOB

**MINUTES OF MEETING  
ON  
THE INTERIM REPORT  
FOR  
THE MASTER PLAN STUDY  
ON  
SMALL SCALE WATER RESOURCES DEVELOPMENT  
FOR POVERTY ALLEVIATION  
THROUGH EFFECTIVE USE OF SURFACE WATER  
IN  
GREATER MYMENSINGH OF BANGLADESH  
AGREED UPON BETWEEN  
THE LOCAL GOVERNMENT ENGINEERING DEPARTMENT  
AND  
THE STUDY TEAM  
OF  
JAPAN INTERNATIONAL COOPERATION AGENCY**

**Dhaka, February 12, 2005**



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**Mr. Md. Nurul Islam  
Superintending Engineer  
Integrated Water Resources Management Unit,  
Local Government Engineering Department**



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**Mr. Keiji Matsumoto  
Leader  
JICA Study Team**

The Study Team organized by Japan International Cooperation Agency (hereinafter referred to as "The Study Team") for The Master Plan Study on Small Scale Water Resources Development for Poverty Alleviation through Effective Use of Surface Water in Greater Mymensingh of Bangladesh (hereinafter referred to as "the Study"), headed by Mr. Keiji Matsumoto presented the Interim Report for the Study to the Local Government Engineering Department, represented by Mr. Md. Nurul Islam, Superintending Engineer of the Integrated Water Resources Management Unit, the Local Government Engineering Department, the Peoples Republic of Bangladesh (hereinafter referred to as "LGED").

In accordance with the Scope of Works for the Study signed between the Economic Relations Division, Government of the People's Republic of Bangladesh and the Japan International Cooperation Agency on February 25, 2004, the Study Team officially submitted twenty (20) copies of the Interim Report to LGED on January 26, 2005.

In addition to the District level and Central level workshops on the Interim Report of the Study held on February 2 and 9 respectively, a wrap-up discussion was held between the Study Team and the LGED in which the contents of Interim Report was discussed. After detailed discussion both LGED and The Study Team have agreed upon the following:

1. The LGED agreed with the contents of the Interim Report which have been prepared in compliance mutatis mutandis with the conditions set forth in the Scope of Work for the Study, as agreed between the Government of Bangladesh and Japan International Cooperation Agency on February 25, 2004 subject to the comments made by LGED at the district and central level workshops on the Interim Report and in the wrap up meeting.
2. The Study Team agreed to conduct the Phase-II Study in due consideration of the comments expressed by LGED on the Interim Report and in workshops and discussions (Attachment II).
3. LGED noted that the Study Team has since conducted socio-economic survey including cursory inventory of water resources through questionnaire in all the Unions and will conduct sample but detailed Inventory Survey in approximately 210 Unions in the Study Area, including verification of Union Questionnaires and identification of potential Subprojects. Also both sides agreed that the Study Team will also conduct verification of Union Questionnaires and identify potential subprojects in the remaining 350 Unions of the Study Area.
4. Both sides understood that the Master Plan to be prepared under the Study will be prepared by collaborative efforts of both LGED and the Study Team, but such collaboration of LGED shall be limited to support services within the purview of the Scope of Works as agreed upon between the Government of Bangladesh and the JICA on 25 February, 2004.
5. The Study Team agreed with the desire of LGED to use this Master Plan Study as a model for replication in other areas of Bangladesh and assured that the Master Plan would be quite comprehensive and prepared without compromising the quality.



Attachment I  
LIST OF PARTICIPANTS

LGED

Mr. Md. Nurul Islam	Superintending Engineer(IWRM),
Mr. Bashir Uddin Ahmed	Project Director, SSWRDSP-2
Mr. Moshir Rahman	Executive Engineer, SSWRDSP-2
Mr. Md. Shahidul Hoque	Executive Engineer, SSWRDSP-2
Mr. Md. Habibur Rahman	Executive Engineer (Environment), IWRMU
Mr. Saleh Ahmed	Assistant Engineer (Environment), IWRMU
Mr. Md. Raziullah	Assistant Engineer (O&M), IWRMU
Ms. Shahana Akhter	Assistant Engineer (Planning & Design), IWRMU
Mr. M.Sultan Mahmud Khan	W M A Management Specialist, IWRMU
Mr. M.Eklimur Reza	Water Resource Planning Specialist, IWRMU
Mr. J. R. Rinfret	Team Leader, ADTA, SSWRDSP-2
Mr. GM Akram Hossain	Deputy Team Leader, ADTA, SSWRDSP-2
Mr. Tofail Ahmed	Sociologist, ADTA, SSWRDSP-2
Dr. Q. R. Islam	Agronomist, ADTA, SSWRDSP-2
Mr. M. S. Howlader	Aquaculture Specialist, ADTA, SSWRDSP-2
Mr. Ashfaqui Azam	O&M Specialist, ADTA, SSWRDSP-2

JICA Study Team

Mr. Keiji Matsumoto	Team Leader/ Development Planning
Mr. Sumitada Okamoto	Irrigation and Drainage Engineer/ Project Evaluation
Mr. Sabbir Hassan	Water Resources Engineer
Mr. Manabu Kawaguchi	Topography Survey/ Remote Censing Specialist
Mr. Naohito Watanabe	Environment and Social Consideration/ Coordinator



**Comment-3** Sec 5.1.2 (1): Basic Concept of SSWRD: Integrated Rural Development

**Observations:** It is true that water resources development, particularly small-scale water resources development, is principally for the development of rural areas like certain other rural development activities e.g roads and bridges/culverts, markets, etc. However, there is uniqueness in development and management of WRD projects and as such these should essentially be considered separately from other rural development projects.

Two such integrated rural development projects – Pabna Integrated Rural Development Project and Sirajganj Integrated Rural Development Project with major focus on water resources development were undertaken in the early 80s with BWDB as the lead implementing agency. But, the projects were not very successful from the view points of other rural development integration. They principally remained as WRD projects.

The SSWRDSP of LGED has developed necessary procedure for providing coordinated input from other government and non-government agencies for overall development of the subproject areas and the arrangements appear to be working relatively well.

**Suggestion :** *The section should be restated with clarity so that none may understand that the Study is recommending SSWRD activities to be brought under rural development sector.*

**Comment – 4** Sec 6.2.1 (2): **Suggestion :** *Check expression of last 3 sentences.*

**Comment – 5** Sec 6.2.2 (1): Union Questionnaire Survey

**3<sup>rd</sup> Para :** “..... the data obtained from the collected questionnaires will be analyzed and follow-up will be done for points regarded necessary .....”

**Observations:** The questionnaire provides some data/information that are available from nationally accepted secondary level sources. Data obtained from the questionnaire are not properly validated and some data may have been given based on ideas of the respondents. These may generate conflict later on.

**Suggestion :** *The data from the questionnaire that are available from secondary sources may not be analyzed further. This will save time and also cost which may be utilized in some other useful activities.*

**3<sup>rd</sup> Para :** “.....unanswered questions will be filled through interviews ..... in selected Union Parishad offices. These data will .....improve ..... precision and efficacy of the Master Plan.”



**Observations:** The ‘selected Unions’ are the 210 sample Unions which the Study Team will visit for the Inventory Survey. This is in disregard of what LGED has requested for improvement of quality of questionnaire responses from all the Unions, particularly the responses on problems and solutions relating to water resource (ref: section 6.2.1 (1): “..... clarify the submitted questionnaires ..... of all Unions, additional surveys will be required .....“ ).

**Suggestions :** *The plan of activities of the Study (referred as ‘Modification of Study Contents’ in Section 6.2) should be adjusted properly to incorporate LGED’s request of clarifying / improving questionnaire responses of all the Unions under the suggested additional survey (the ‘additional survey’ referred in LGED’s request letter means ‘additional’ in respect of the Consultant’s given plan of activities but not ‘additional’ in respect of the scope of works of the Study that speaks of collection of data and conducting of study without specific limitations ). The paragraph should be corrected accordingly.*

**Comment – 6** Sec 6.2.2 (2): Additional Work Items for Inventory Survey

**Observations:** The Consultant’s activity plan for conducting detail inventory of water resources systems, infrastructures and water bodies [activity b] in 210 Unions appears to be acceptable. The issue with activity for modification of Union questionnaire [activity a] has been discussed and commented above. The activity of Identification of Subprojects [activity c] has not been properly planned in accordance with the request made by LGED. If identification of potential subprojects of all the Unions is not done realistically, the usefulness of the study may be questioned as it might not be of immediate use by the implementation projects.

**Suggestions :** *Activities [a] and [c] in this section should explicitly incorporate the requirements requested by LGED which have been explained / clarified in the observations above.*

**Comment – 7** Sec 6.3.1 : Survey in Bangladesh (Phase II Study)

**Item 19:** Inventory Survey of Unions involving Subproject Applicants and its Surroundings <modified>

**Observations:** (a) The term ‘water bodies’ in this section needs more elaboration. As the issue is inventory for purposes related to small-scale water resources development, water bodies should include rivers and drainage khals, beels, baors, haors, etc but not ponds, both private and



public. Also, 'infrastructures' should be clarified to mean water resource development infrastructures and will include flood protection embankments, permanent and temporary dams, weirs, regulators, sluices, water retention structures and other types of water management structures.

(b) We observe that all water bodies and existing infrastructures in the Union need to be surveyed with all detail data / information including physical conditions, special features and possibilities, etc.

(c) 'Identification of potential subprojects' should include delineation of purposes and basic features of the subprojects.

(d) The ledger as shown for use in the inventory survey is designed for structures only. There should be additional columns for water body data in the proposed ledger or a separate form may be used for water bodies.

**Suggestions :** *Necessary corrections as indicated in above observations should be incorporated in proper places.*

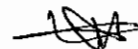
**New Item:** ..... (to be named) .....

**Observation :** Item 19 defines works that will be undertaken for 'Inventory Survey' of the 210 Unions (as per original plan). But, as LGED has requested to undertake clarification / updating of questionnaires of all the Unions and identification of potential subprojects of all Unions and for which reasons have been explained in Comment - 5, these works involved for the remaining 350 Unions, being different from the inventory works, need to be defined and described properly.

**Suggestions:** *A new work item or a sub-item under Item-19 should be included to define and describe works of finalizing / updating questionnaires and identification of potential subprojects of the remaining 350 Unions.*

**Item-20:** Selection of Potential Areas for SSWRD Subprojects

**Suggestion :** *(a) In the sub-heading, 'potential areas for SSWRD Subprojects' should be replaced by 'potential SSWRD Subprojects'.*





*(b) The list of prioritized potential subprojects should be made Upazila wise.*

**Item – 21:** PRAs in representative Unions and Upazila ..... Etc.

**Observation:** In the Target Area paragraph, when it is said that PRA at only one subproject area will be done in one district, it looks quite curious.

**Suggestion:** *The logic should be clearly explained in the section.*


**Item-24:** Consultation Workshops at various Government Levels for the Draft Master Plan <modified>

**Suggestion:** *As the basic concept of the Master Plan and the prioritized list of potential subprojects from all Unions of the Upazila will be discussed with UDCC (ref: Item 22), workshop on the draft Master Plan at the UDCC may not be required. The workshops on the draft Master Plan may only be held at the districts and national levels.*



**Minutes of Meeting  
on  
The Draft Final Report  
for  
The Master Plan Study  
on Small Scale Water Resources Development for Poverty Alleviation  
through Effective Use of Surface Water in Greater Mymensingh of Bangladesh  
agreed upon between  
Government of Bangladesh  
and  
Japan International Cooperation Agency**

**Dhaka, October 5, 2005**



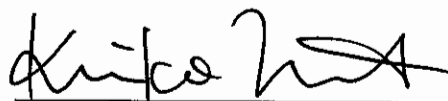
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Md. Emdadul Haque  
Deputy Secretary  
Economic Relations Division,  
Ministry of Finance and Planning  
Government of Bangladesh



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Keiji Matsumoto  
Leader of the JICA Study Team



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Kumiko Murata  
JICA Monitoring Team

The Study Team organized by Japan International Cooperation Agency (hereinafter referred to as "The Study Team") for The Master Plan Study on Small Scale Water Resources Development for Poverty Alleviation through Effective Use of Surface Water in Greater Mymensingh of Bangladesh (hereinafter referred to as "the Study"), headed by Mr. Keiji Matsumoto presented the Draft Final Report of the Study to the Government of Bangladesh represented by Mr. Md. Nurul Islam, Superintending Engineer of the Integrated Water Resources Management Unit, the Local Government Engineering Department, the People's Republic of Bangladesh (hereinafter referred to as "LGED").

In accordance with the Scope of Works for the Study signed between the Economic Relations Division, Government of the People's Republic of Bangladesh and the Japan International Cooperation Agency on February 25, 2004, the Study Team officially submitted twenty (20) copies of the Draft Final Report to LGED on September 15, 2005.

In addition to the District level and Central level workshops on the Draft Final Report of the Study held between September 15 and October 3, 2005, a wrap-up discussion was held on October 3, 2005 between the Study Team and the LGED in which the contents of Draft Final Report was discussed. After detailed discussion both LGED and the Study Team have agreed upon the followings:

1. The LGED agreed in principle with the contents of the Draft Final Report which have been prepared in compliance mutatis mutandis with the conditions set forth in the Scope of Work for the Study, as agreed between the Government of Bangladesh and Japan International Cooperation Agency on February 25, 2004.
2. The LGED agreed to review the Draft Final Report upon receipt of all information within next seven days and send the written final comments on the Draft Final Report to the Study Team through the administrative Ministry by October 30, 2005 for incorporation in /modification of the Report as appropriate.
3. The LGED requested equipment that was purchased and used by the Study Team for the Study to transfer to the LGED for further similar studies by the LGED. The Study Team and the LGED agreed to prepare the required documents for the equipment transfer in accordance with the JICA regulations set forth.



## LIST OF PARTICIPANTS

LGED

Mr. Saroj Kumar Saker	Additional Chief Engineer
Md. Nurul Islam	Superintending Engineer (IWRMU),
Mr. Bashir Uddin Ahmed	Project Director, SSWRDSP-2
Mr. Moshir Rahman	Executive Engineer, SSWRDSP-2
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Mr. Md. Habibur Rahman	Executive Engineer (Environment), IWRMU
Ms. Shahana Akhter	Assistant Engineer (Planning & Design), IWRMU
Mr. M.Sultan Mahmud Khan	W M A Management Specialist, IWRMU
Mr. M.Eklimur Reza	Water Resource Planning Specialist, IWRMU
Mr. GM Akram Hossain	Deputy Team Leader, ADTA, SSWRDSP-2
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JICA Monitoring Team

Ms. Kumiko Murata	JICA Monitoring Team
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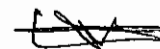
JICA Study Team

Mr. Keiji Matsumoto	Team Leader/ Development Planning
Mr. Sumitada Okamoto	Irrigation and Drainage Engineer/ Project Evaluation
Mr. M. Sabbir Hassan	Water Resources Engineer
Mr. Naohito Watanabe	Environment and Social Consideration/ Coordinator

JICA Expert to LGED

Mr. Susumu Sugatani	Advisor to LGED
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## Attachment II

### Comments on the Interim Report (October 2004) of Master Plan Study for Poverty Alleviation Through Effective Use of Surface Water in Greater Mymensingh in Bangladesh

#### I. GENERAL COMMENTS

1. The Study Team should consider; 1) the appropriate form of beneficiary participation in subproject identification, 2) methodology for using the union questionnaires in identifying potential subprojects, 3) identification of potential subprojects by combining multiple subproject proposals when found necessary, and 4) the methodology of integrating top-down approach and bottom-up approach in preparing the Master Plan.
2. The concept of basin level water resources analysis shall be taken into regard in preparation of the Master Plan.
3. The description in the Interim Report concerning WMCA should be revised in consultation with Project Management Office.
4. The process of subproject appraisal in SSWRDSP-2 and its relation with the identification of subprojects in the Study should be examined.
5. Coordination of the Study Team with the District Water Resources Assessment Project is necessary.

#### II. SPECIFIC COMMENTS

The following Comments relate to the sections and text of the Interim Report. The comments apply for corresponding sections, paragraphs and statements in the Summary also.

**Comment-1** Sec 3.8.5 (2): Zoning of Water Resources Development in Study Area

**Suggestion:** *Names of Upazilas (defining specific parts, if necessary) falling under the zones should be added in the Table.*

**Comment-2** Sec 4.1.3 : Summary of Problem Analysis Workshops

**Observations:** The field level Problem Analysis Workshops were to identify problems related to livelihoods and water resources development (ref: sec 4.1). But they resulted in “agricultural production is low” as the direct cause of “villagers income is low” in the first place and “difficult to find work” as the direct cause in the second place. It appears therefore that the relation of water resource development problems to the poverty issue is not clearly stated.

**Suggestion :** *This should be properly addressed in the Study reports.*

**JICA MASTER PLAN STUDY ON SMALL SCALE WATER RESOURCES DEVELOPMENT (SSWRDP)  
FOR POVERTY ALLEVIATION THROUGH EFFECTIVE USE OF SURFACE WATER  
IN GREATER MYMENSINGH OF BANGLADESH**

**JICA STUDY TEAM MEMBERS AND BANGLADESH COUNTERPARTS**

As of July 2004

Assignment	Name	
	JICA Expert	Bangladesh Counterpart, LGED
Team Leader / Development Planning	MATSUMOTO Keiji	Md. Nurul Islam
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Topo. Survey / Remote Sensing Specialist	KAWAGUCHI Manabu	Md. Jamal Uddin Niranjana Das

Notes: At district level, Executive Engineers and Assistant Engineers of District's LGED are the Bangladesh counterparts  
At sub-district (Upazila) level, Upazila Engineers are Bangladesh Counterparts.