

**ANNEX 14**

**MASTER PLAN ON SSWRD IN NETRAKONA DISTRICT**

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)  
MINISTRY OF LOCAL GOVERNMENT,  
RURAL DEVELOPMENT AND COOPERATIVES (MLGRD&C)  
LOCAL GOVERNMENT ENGINEERING DEPARTMENT (LGED)

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

**MASTER PLAN  
ON  
SMALL SCALE WATER RESOURCES DEVELOPMENT  
IN  
NETRAKONA DISTRICT**

**NOVEMBER 2005**

**PACIFIC CONSULTANTS INTERNATIONAL (PCI), JAPAN**

# NETROKONA DISTRICT DHAKA DIVISION

## LEGEND

### Administrative Boundary

- International Boundary
- District Boundary
- Upazila Boundary
- Union Boundary
- Moredad Boundary

### Administrative HQs

- District HQ
- Upazila HQ
- Union HQ

### Socio-economic Infrastructures

- Govt. Centre
- Small Industrial
- Police Station
- Upazila Health Complex
- College
- High School
- University

### Physical Infrastructures

- National Highways
- Regional Highways
- Zila Road
- Upazila Road/Panar
- Upazila Road/Satka
- Union Road/Panar
- Union Road/Satka
- Highway/Bakark
- Embankment

### Natural Features

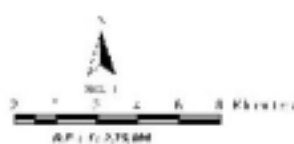
- Water Flow
- Water Flow
- Clear Area

### Agricultural Infrastructures

- Embankment
- Road Embankment

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Map of Netrakona District

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### **Abbreviations**

ADB	Asian Development Bank
BADC	Bangladesh Agricultural Development Corporation
BBS	Bangladesh Bureau of Statistics
BMD	Bangladesh Meteorological Department
BRDB	Bangladesh Rural Development Board
BWDB	Bangladesh Water Development Board
CAD	Command Area Development
DAE	Department of Agricultural Extension
DFID	Department for International Development of UK
DI	Drainage Improvement
DIWC	Drainage Improvement and Water Conservation
DOC	Department of Cooperatives
DOE	Department of Environment
DoF	Department of Fisheries
DPHE	Department of Public Health Engineering
DTW	Deep Tubewell
EIRR	Economic Internal Rate of Return
FAP	Flood Action Plan
FCD	Flood Control and Drainage
FCDI	Flood Control, Drainage and Irrigation
FD	Forestry Department
FM	Flood Management
FMDI	Flood Management and Drainage Improvement

GDP	Gross Domestic Product
GIS	Geographical Information System
HQ	Headquarter
HTW	Hand Tubewell
HYV	High Yield Variety
IEE	Initial Environmental Examination
IFAD	International Fund for Agricultural Development
IMCC	Inter-ministerial Coordination Committee set under the TAPP
JICA	Japan International Cooperation Agency
LCS	Labour Contracting Society
LGED	Local Government Engineering Department
LGI	Local Government Institutions
LLP	Low Lift Pump
M&E	Monitoring and Evaluation
MIS	Management Information System
MLGRD&C	Ministry of Local Government, Rural Development and Co-operatives
MoA	Ministry of Agriculture
MoEF	Ministry of Environment and Forest
MoFL	Ministry of Fisheries and Livestock
MoL	Ministry of Land
MoWR	Ministry of Water Resources
NGO	Non-Governmental Organization
NWMP	National Water Management Plan
NWPo	National Water Policy
NWRD	National Water Resources Database
O&M	Operation and Maintenance
PMO	Project Management Office
PRA	Participatory Rural Appraisal
PWD	Public Works Datum (0.0 m PWD = 0.457 m of SOB datum)
SOB datum	Survey of Bangladesh datum (identifiable with mean sea level)
SP	Subproject
SSWRDSP	Small-Scale Water Resources Development Sector Project
STW	Shallow Tubewell
TIP	Thana Irrigation Program
TK.	Taka, US\$ 1.00= Tk 57.4 as of October 2004
UDCC	Upazila Development Coordination Committee
UP	Union <i>Parishad</i> (Council)
UE	Upazila Engineer
WARPO	Water Resources Planning Organization
WC	Water Conservation
WMA(WMCA)	Water Management (Cooperative) Association

## Chapter 1 Outline of the Master Plan Study

### 1.1 Background

The provisions of the National Water Policy (NWPo) of 1999 states that the local government and relevant agencies are responsible for planning and execution of water management based on the National Water Management Plan (NWMP) approved by the National Water Resources Council (NWRC) on 31<sup>st</sup> March 2004, and in regard to the regional features of local water resources<sup>1</sup>.

The Government of Bangladesh (hereinafter referred to as “GOB”), with the support from ADB, IFAD and the Government of the Netherlands, has carried out the Small Scale Water Resources Development Sector Project (SSWRDSP-1) aiming at the rehabilitation and improvement of small-scale water resource management systems. The project was carried out from 1995 covering 37 districts of the western part of Bangladesh. Following the same concept, the second phase of this project (SSWRDSP-2), covering 61 districts throughout the country commenced in 2003 with the planned period of 7 years. However, from lessons learned from SSWRDSP-1, the preparation of district level small scale water resources development plans are recognized to have significant importance for further implementation of SSWRDSP.

Under such circumstances, the GOB requested the Government of Japan (hereinafter referred to as “GOJ”) for technical assistance regarding the preparation of district level plans for small scale water resources development (SSWRD), which will be considered as the basic development plans at district levels. In response to the GOB’s request, the GOJ dispatched a Preparatory Study Team from February to March, 2004, and signed the Scope of Work for *the Master Study on Small Scale Water Resources Development for Poverty Alleviation through Effective Use of Surface Water in Greater Mymensingh of Bangladesh* (hereafter referred as “the Study”) on February 25, 2004.

Based on the Scope of Works, the JICA Study Team, carried out the Study in Bangladesh from July 18, 2004 to July 23, 2005.

### 1.2 Objectives and Scope of the Study

#### (1) Objectives

The overall goal of the Study is **to secure safe and sustainable water resources management and to increase farmers’ income**, and objectives of the Study are;

- 1) to formulate Plan for SSWRD in Greater Mymensingh comprising program of 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 the SSWRD Plan

#### (2) Scope of the Study

The Study is conducted in the following 2 phases:

- Phase I: Field Survey in wet season, Identification of problems on SSWRD in the Study Area (July 2004 to November 2004)
- Phase II: Field survey and Formulation of Small Scale Water Resources Development Plans (January 2005 to July 2005)

The Study will consist of the following study items.

#### 1) Data Collection and Analysis

- (a) Collect and review the existing data and information on physical, socio-economical 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.

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<sup>1</sup> Outline of the NWPo (1999) is shown in Table 1.1.

- (b) 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.
  - (c) 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)
- (a) Carry out the inventory survey of existing infrastructure related to water resources, along with their status and location maps
  - (b) Select potential areas for SSWRD
  - (c) Undertake PRA at representative Unions and Upazilas that includes the potential area and assess the following: i) development status, needs and priorities; ii) water-related problems, their causes and proposed solutions; iii) stakeholders' views on the ongoing and proposed initiatives; and iv) stakeholders' willingness to contribute to the construction, operation and maintenance (O&M).
- 3) Preparation of Master Plan for SSWRD with the Target Year of 2015
- (a) Strategies and priority programs which could include flood management, irrigation and drainage, agriculture and fishery extension, rural water supply, arsenic mitigation, and institutional strengthening.
  - (b) Preparing guidelines for project assessment
  - (c) Preparing prioritized list of sub-projects
  - (d) Preparing Action Plans
- 4) Technology transfer to counterpart personnel
- (a) On-the-job training in the process of preparing the Master Plan
  - (b) Conduct workshops

### **1.3 The Study Area**

The Study Area, as indicated in the location map, covers the six districts (Mymensingh, Tangail, Sherpur, Jamalpur, Netrakona and Kishoreganj) of the Greater Mymensingh area. The Study Area is located in the north-central part of the country bordered by the Meghna River in the east, Gazipur District and Dhaka City in the south, the Jamuna River in the west, and the Indian state of Meghalaya in the north. The Old Brahmaputra River runs through the Area flowing from the northwest to the southeast. In the southern part of the Study Area, the Madhupur terrace with an elevation of about 15 m lies in the 3 m-lowlands. The Study Area occupies 11.3 % of the country with a land area of 16,672 km<sup>2</sup>, and has a population of 12.6 % (15.5 million people) of the total population (BBS, 2001). The local administration in the Study Area comprises of 6 Districts, 58 Upazilas (sub-districts) and 562 Unions.

### **1.4 Counterparts of the Study**

As stated in S/W, the GOB counterpart institution is Integrated Water Resources Management Units (IWRMU) of Local Government Engineering Department (LGED) under the Ministry of Local Government, Rural Development and Cooperatives (MLGRD&C).

The counterparts of the Study are consisting of the staff of LGED headquarters and Executive Engineers and Upazila Engineers at the local government institution in the Study Area.



## 1.5 Surveys and Workshops conducted in the Study

The Study designed as participatory plan formulation with several workshops and meetings, and several surveys at each level of the administration. They are summarized as follows:

Stages	Workshops/Surveys	IMCC	National	District	Upazila	Union	Community
Phase I: Problem Identification	W/S on the Inception Report and PCM Problem Analysis						
	Socio-economic Interview Survey						
	Farm Household Interview Survey						
	Union Questionnaire Survey(UQS)						
	W/S on Phase I Survey Results						
	W/S on Interim Report						
Phase II: Development Potential and Master Plan Formulation	W/S on Planned Field Survey & Questionnaire Survey to Upazila Engineers						
	Participatory Workshops (PRA)						
	Inventory Survey						
	UQS Verification Survey						
	CM of UDCC/DSSWRDC on Master Plan Concepts and verification of potential subproject						
	Explanation on Master Plan Concepts and verified of Potential Subproject						
	W/S on Draft Master Plan Explanation and Discussion						

Notes: W/S= Workshop(s), PCM=Project Cycle Management, UQS= Union Questionnaire Survey, PRA= Participatory Rural Appraisal, CM= Consultation Meeting(s), UDCC= Upazila Development Coordination Committee(s), DSSWRDC= District Small Scale Water Resources Development Committee, IMCC= Inter-ministerial Coordination Committee, = main targeted group, =secondary targeted group

## Chapter 2 Netrakona District

### 2.1 General Conditions

Netrakona District (the District) with an area of 2,810.40 km<sup>2</sup>, is bounded by Garo Hills of Meghalaya (India) on the north, Kishoreganj district on the south, Sunamganj district on the east and Mymensingh district on the west.

Netrakona subdivision was established in 1882 and was turned into a district in 1984. The district consists of 10 upazilas, 4 municipalities with 36 wards, 102 mahallas, 85 union parishads and 2,281 villages. The name and areas of upazilas are shown in the following table.

Upazila-wise Area in km<sup>2</sup>

Name of Upazila	Effective area	River Area	Forest Area	Total Area	% over District
<b>District Total</b>	<b>2,768.65</b>	<b>32.58</b>	<b>9.17</b>	<b>2,810.40</b>	<b>100.00</b>
Atpara	195.13	-	-	195.13	6.94
Barhatta	219.92	1.58	-	221.50	7.88
Durgapur	275.24	9.01	9.17	293.42	10.44
Khaliajuri	288.08	9.56	-	297.64	10.59
Kalmakanda	376.22	1.19	-	377.41	13.43
Kendua	303.60	-	-	303.60	10.80
Madan	225.85	-	-	225.85	8.04
Mohanganj	242.66	0.54	-	243.20	8.65
Netrakona sadar	332.94	7.41	-	340.35	12.11
Purbadhala	309.01	3.29	-	312.30	11.11

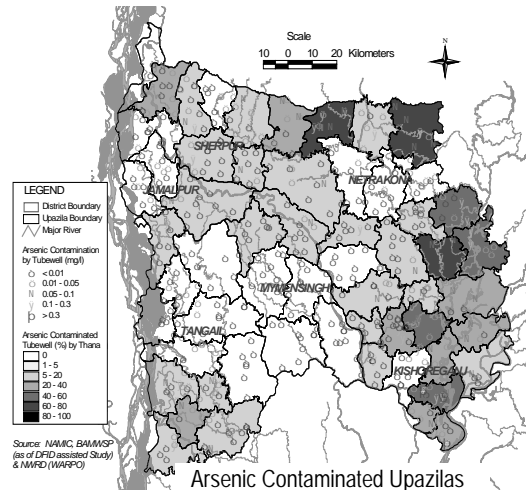
Source: Census of Agriculture 1996

### 2.2 Natural Conditions

Annual average temperature ranges the maximum 33.3 °C and the minimum 12 °C. Annual average rainfall at BWDB Netrakona station is 3,242 mm. The District belongs to the Northwester part of Northeastern Hydrological Zone. There are a large number of rivers, rivulets and haors flowing through the District (Fig. 2.2). Among them the Mogra, the Kangsa, the Someswari, the Saiduli, the Barun, the Bathail, the Patkura, the Surma and the Bhanu are important. The river Bhanu, generally known as Ghorautra, is a tributary of the Meghna and is navigable throughout the year. The river Kangsa which originated from the Garo hills passes through the District. These rivers are navigable by country boats mostly in the rainy seasons and they are none tidal. Total area cover by rivers in the District is about 32.58 km<sup>2</sup> (BANGLAPEDIA).

The soil of the District is mainly formed in combination with the old Brahmaputra floodplain ridges and piedmont basin. Northern part of the District contains the poorly drained silty clay of the younger piedmont basin. The western part consists of grey of the loam of the old Brahmaputra floodplain. The central part is mainly dominated by soil of the mixed dark and grey heavy clay. The soil along the Someswary river channels is sandy and is loamy at roof hills and on high ridges.

Arsenic contamination of groundwater in the district is rather high ratio compare with other districts in the Study Area. According to the DFID survey, 60 to 80% of wells in Kalimakanda and Madan upazilas are higher contamination. And Bangladesh arsenic mitigation water supply project (BAMWSP) is expected to be implemented in Kendua upazila listed in Phase 2, Mohanganj, Khaliajuri, Madan and Atpara upazilas are listed in Phase 3.



## 2.3 Socio-economic Conditions

Population of the district is 2.08 million; of which male 50.71%, female 49.29%; Muslim 83%, Hindu 14% and others 3%. Main occupations are; Agriculture 52.05%, fishing 1.87%, agricultural laborer 21.97%, wage laborer 3.09%, commerce 7.61%, service 2.94% and others 10.47%.

Average literacy of the district is 26%, male 31.2% and female 20.4%. Educational institutions: in the district are; government college 2, non-government college 17, government high school 5, non-government high school 106, junior high school 44, madrasa 77, government primary school 634, non-government primary school 478, primary teacher's training institute 2, law college 1, nursing institute 1, Sanskrit college 1, homeopathy college 1, technical institute 1, music school 2.

GDP of the District at current prices in 1999-2000 is estimated at Tk. 32,020 million with growth rate at 4.99 %, and per capita GDP is US\$ 306 (Tk. 15,410) which ranked the 30<sup>th</sup> among 64 districts in Bangladesh. Sectorial shares of GDP are 23 % by crops & horticulture, 11.5 % by Fishing, 11.4 % by wholesale & retail trade(1999-2000).

Population ratio below the lower poverty line in the District is mostly very high at 37% to 55%, and Netrakona Sadar upazila shows smallest at 25 to 31%. Percentage of population with calories intake lower than 1,805 Kcal/capita/day is high to moderate (10-30%), of which in Kalimakanda upazila show the highest (more than 30%).

## 2.4 Agriculture in the District

Total cultivable land is 207,608 ha; fallow land 15,702 ha; single crop 29.5%, double crop 55% and triple crop land 15.5%; land under irrigation 55%.

The land holding, operation and cropping pattern and area under different land types of the District is as follows:

Land holding and use	No. of holding		Operated area	
	No.	%	ha	%
Total	337,079	100	195,412	100
Non farm holding	125,925	37	3,881	2
Small holding	152,900	72	60,914	32
Medium holding	48,419	23	81,023	42
Large holding	9,835	5	49,594	26

Source: Census of Agriculture, 1996

Cropping pattern	Area (ha)	Share of Total Area
Single cropped area	148,200	21.83
Double cropped area	417,430	61.49
Triple cropped area	113,250	16.68
Net cropped area	678,880	-
Cropping Intensity %	194.85	

Source: 2000-2001 Annual Report of DAE

As shown the above table, 72% of the numbers of farm house holdings belong to the small farm holdings with an area of less than 1 ha. The medium and the large farm holdings were 23% and 5% respectively in the District. In the Study Area 84.1% of the farm holdings belong to the small farm holdings. Comparison of the 1983-84 of holdings with the 1996 indicates that the non-farm holdings increased by 1.68 times during this period. The farm holdings increased by 1.13 times, much smaller than the non-farm holdings. The small farm holdings increased by 1.30 times. On the other hand, the medium farm holdings decreased to 0.87, and the large farm holdings decreased to 0.68.

The area in the District under the cultivation of rice is slightly higher than that of the crop average of the total Study Area, while wheat and maize show considerably lower figures. Areas under cultivation of Jute and Sugarcane were also considerably high compared to the Study Area average. The gross cropped area and the percentage of distribution of crops in the study area is shown below:

Distribution of Crops in the District and Study Area (%)

District	Gross Cropped Area (1,000 acre)	Aus	Aman	Boro	Rice Total	Wheat / maize	Potato	Vegetables	Spices	Pulses	Oil Seeds	Jute	Sugar Cane
Netrakona	661	13.3	33.6	36.4	83.3	1.7	0.9	0.7	1.5	0.5	2.6	8.0	1.2
Study Area Average	-	12.9	31.7	32.6	77.3	4.2	1.4	1.2	2.5	1.3	5.4	5.5	0.8

Source: Census of Agriculture - 1996 (BBS)

Gross value-added of major crops in the Study Area is shown below. The District indicated high percentages in Fishing.

Gross Value-added of Agriculture by District at Constant Prices (2000/01)

(Unit: million Taka)

District	Crops	Animal farming	Forestry	Fishing	Total
Netrakona	6,584	1,154	894	3,255	11,887
Bangladesh	287,664	59,470	36,996	120,020	504,150
<Share in Agriculture (%)>					
Netrakona	55.4	9.7	7.5	27.4	100.0
Study Area Average	59.0	11.6	7.7	20.4	100.0
Bangladesh	57.1	11.8	7.3	23.8	100.0

Source: Statistical Yearbook of Bangladesh (2001)

## 2.5 Fisheries in the District

### (1) Production of Fishery in Greater Mymensingh Area

Inland water fisheries of Bangladesh are divided into two types. One is inland open-water (river & estuary, Sundarban, beel, Kaptai Lake, flood land), and the other is inland close-water (pond & ditch, Baor, shrimp (freshwater shrimp) & fish farm). However in Greater Mymensingh area, there is no estuary and baor.

In the rainy season, a lot of young and old men and women in rural areas catch fish in the floodplain, public canal, river etc. In addition, backyard pond culture using the hole that has been dug when soil is taken for the construction of house, road etc., becomes active every year. Freshwater fish is an important source of animal protein accounting for around 60% of the total animal protein intake. Moreover, freshwater fish, both caught in public water and cultured, is also an important source of cash income.

The table below shows annual fisheries production from inland waters in six districts in 2002. Pond and shrimp farm are culture fisheries and others are capture fisheries.

Total catch of inland water, 2002

(Unit: MT)

No.	District	River	Beel	Floodland	Pond	Shrimp farm	Total
1	Mymensingh	2,607	5,332	25,270	23,314		56,523
2	Kishoreganji	1,284	5,584	19,191	9,237	15.82	35,312
3	Netrakona	1,344	8,013	8,867	15,682		33,906
4	Tangail	1,032	1,456	9,341	5,605		17,434
5	Jamalpur	755	2,287	6,746	3,241		13,029
6	Sherpur	85	2,330	3,830	2,486		8,731
	Total	7,107	25,002	73,245	59,565	15.82	164,935

Source, Fisheries Statistical Yearbook of Bangladesh (2002), Department of Fisheries

The table below shows the area, total catch and catch/ha from Beel in 2002. Kishoreganj District and Netrakona District are most productive in Beel fisheries. So far it is not known whether the high productivity in those two districts is due to abundance of fisheries resources or intensive fishing effort.

Area and fisheries production of Beels, 2002

District	Area of Beels(ha)	Total Catch(MT)	Catch(kg)/ha
Jamalpur	3,360	2,287	680.7
Kishoreganji	6,837	5,584	816.7
Mymensingh	7,346	5,332	725.8
Netrakona	8,355	8,013	959.1
Sherpur	3,508	2,330	664.2
Tangail	2,333	1,456	624.1
Total	31,739	25,002	4,470.6

Source, Fisheries Statistical Yearbook of Bangladesh (2002), Department of Fisheries

## (2) Fisheries in Netrakona District

Since, Netrakona District has a haor land that covers the eastern part, its floodplain is wide and catching fisheries are active there. The proportions of fishery industry of District GDP is 14 %, which is highest in the Study Area.

The annual catches from various inland waters recovered in 2002 to the level in 1998 from the lowest level recorded in 2000. However, the catch from the floodland was still at a very low level in 2002 compared to that in 1998. Production from the pond (by fish culture) gradually increased. Catch from the river drastically decreased from 1999 to 2001, but recovered in 2002 to the level of 1/3 of the catch in 1998.

Annual Catches from Inland Waters in the Netrakona District (MT)

Location	1998	1999	2000	2001	2002
River	3,440	848	808	715	1,344
Beel <sup>1</sup>	n.a.	n.a.	n.a.	n.a.	8,013
Floodland	19,925	14,203	6,872	9,249	8,867
Pond	11,262	11,988	13,783	13,921	15,682
Shrimp farm					
Total	34,627	27,039	21,463	23,885	33,906

Note: <sup>1</sup> old statistic system from 1998 to 2001 of which district data shown as Old Mymensingh District and data of Netrakona district are not available.

Source: Fisheries Statistical Yearbook of Bangladesh, DoF

The number of subsistence fisheries households increased in 2002. The average catch per household dropped in 2000 to the level of about 1/3 of that in 1998. The decrease in average catch per household might be attributable to over-fishing.

## 2.6 Livestock in the District

Climatic and topographic conditions, especially the high temperature and high humidity and frequent flooding, are not suitable to domestic animals. Pasture lands are not abundantly available for cattle and goats. Recently water shortages and development of agricultural machinery have caused unfavorable conditions to water buffalos. Due to the low feed efficiency, it has been difficult to enhance livestock farming in Bangladesh under the low food self-sufficiency. From these reasons, livestock farming has not been a priority area in the past. However, livestock is necessary to be developed in the future as an important income source of farmers. Livestock can be a demand-driven product. As the national economy develops, consumption of livestock will be increased.

Number of livestock in the District and Study Area according the size of holdings is shown below.

Number of livestock in the District and Study Area (1996)

	Districts	Number in 1000s					
		Holdings		Farm Holdings			
		All	Non-farm	Total	Small	Medium	Large
Cattle	Netrakona	141	11	131	81	41	9
	Study Area Total	2,526	156	2,370	1,493	724	152
Goats	Netrakona	68	17	50	34	13	3
	Study Area Total	1,351	260	1,091	805	244	42
Fowls	Netrakona	214	57	157	109	40	8
	Study Area Total	10,346	2,070	8,311	6,088	1,896	328

Source: Census of Agriculture - 1996 (BBS)

Percentages of households which raise animals are generally high in all the size of farm holdings. It indicates that the farming is closely related with animal husbandry, and recycling and scavenging of livestock are well functioned. Difference in the number by district in the Study Area was not large in cattle. The high water level during rainy seasons is suitable for water animals and brings about high value. In the scavenging livestock, farming area of the farm lands has large effects on number of animals.

Land limitation causes a shortage of feed supply in Bangladesh. As observed in Kishoreganj large

haors effect on feed supply in rainy seasons. In dry seasons, competitions between animal feeds and vegetables are also severe. Various chars along large rivers such as the Jamuna river and the old Brahmaputra river are expected to be good pasturing areas. For that purpose, the water management of the rivers is important.

In Bangladesh, veterinary services are key issues for the development of livestock farming. According to the officers in Ministry of Livestock and Fisheries, the veterinary services in the Greater Mymensingh are not much different among the districts. Vaccination to poultry is already well organized. However, vaccination services to cattle and ducks are not well managed. Veterinary services in Kishoreganj and Netrakona, where duck farming is widely extended, need to be improved.

## 2.7 Zoning of the District

Based on the Agroecological Zone (AEZ) and inundation land type, upazilas in the District is mainly dominated by lowlands being classified as 1) lowlands and medium-lowlands of Old Brahmaputra Floodplains, 2) of Sylhet basin and 2) medium highlands of North-western Plains and Basins (Fig. 2.3). Shares of zones in the Upazila wise classifications are shown in the table below:

(unit in ha)

Upazila	Union	Young Brahmaputra and Jamuna (802)	Old Brahmaputra Floodplain (902, 903, 904)			Sylhet Basin (2104)	North-western Plains and Basins (2201)	Northern and Eastern Piedmont (2202)	Northern and Eastern Basins (2204)	Northern and Eastern Hills (2902)	Total
		F1	F1	F2	F3	F3	F1	F0	F3	F0	
Atpara	Total(ha)		1,598	17,259		708					19,565
	Share		8.17%	88.21%		3.62%					100.00%
Barhatta	Total(ha)		3,588	13,641		2,265		2,281			21,775
	Share		16.50%	62.60%		10.40%		10.50%			100.00%
Durgapur	Total(ha)		446				11,897	13,586		1,185	27,114
	Share		1.60%				43.90%	50.10%		4.40%	100.00%
Kalmkanda	Total(ha)		62			10,788	3,813	21,213	2,227	457	38,560
	Share		0.20%			28.00%	9.90%	55.00%	5.80%	1.20%	100.00%
Kendua	Total(ha)	155	1,832	20,068	8,959						31,014
	Share	0.50%	5.90%	64.70%	28.90%						100.00%
Khaliajuri	Total(ha)			59		27,668					27,727
	Share			0.20%		99.80%					100.00%
Madan	Total(ha)			9,907	352	12,885					23,144
	Share			42.80%	1.50%	55.70%					100.00%
Mohanganj	Total(ha)			10,705		13,473					24,178
	Share			44.30%		55.70%					100.00%
Netrokona Sadar	Total(ha)		25,968	4,530				2,499			32,997
	Share		78.70%	13.70%				7.60%			100.00%
Purbadhala	Total(ha)		28,631					2,979			31,610
	Share		90.60%					9.40%			100.00%
District Total (ha)		155	62,125	76,169	9,311	67,787	15,710	42,558	2,227	1,642	277,684
Share		0.06%	22.37%	27.43%	3.35%	24.41%	5.66%	15.33%	0.80%	0.59%	100.00%

F3 total 28.6%

## 2.8 Water Resources Development

### (1) Hydrological Region and NWMP

The District is under the North East Hydrological Zone. According to the National Water Resources Management Program (NWMP), there is no specific regional water resources program except national level program for the District.

The FAP study in relation to the District is FAP 6: North East Regional Water Management Project (NERWMP). The FAP 6 Study completed in 1994 with the study area at 24,200 km<sup>2</sup>, which is 17% of total Bangladesh area. The Study proposed 44 Initiatives under 8 Strategic Thrusts to manage water

resources. A list of the 8 Strategic Thrusts, is mentioned below.

- Urban and Infrastructure Protection
- Intensive Agriculture for Urban Consumption
- Enhanced Production Systems on Seasonally Flooded Areas
- Integrated Development of Deeply Flooded Areas
- Biodiversity Enhancement and Sustainable Management
- Improved Liveability of Rural Settlements
- Navigation Improvement
- Institutional Strengthening and Development

## (2) Large Scale Water Resources Development Projects

Among the large scale water resources development projects, major information in the District is as follows:

- 1) As a district adjacent to the Haor area, there are 2 Haor development projects (No. 34 & 35).
- 2) Nautana Khal Scheme (No. 40) is also located in the Haor area.
- 3) Thakurakona Sub-project (No.39), Kangsha River Sub-Project and Dampara Project (not listed) are ranged.
- 4) Khaliajuri Flood Control and Drainage Project (new project) is under implementation.

According to the NWRD of WARPO, there are eight (8) large-scale water resources development projects, which were constructed by BWDB as shown in Fig. 2.2. Its outline is summarized as follows:

Name of Project	Length of Embankment (km)	Length of canal (km)	No. of Regulator/Sluice Gate	New Type of System	Project Area (ha)	Irrigable Area (ha)	Starting Year	Completion Year	Status
Kangsha River Sub-Project	22.77	30.54	8	FCD1	11,620	11,200	1982	1991	Complete
Pagner Haor System	32.41	8.26	2	FCD	19,000	0	1990	1995	Complete
Chandra Sunarthal Haor System	55.50	1.73	3	FCDI	5,714	1,600	1974	1978	Complete
Haijda Embankment Sub-Project	28.34	129.60	13	FCDI	9,716	8,000	1982	1993	Complete
Mohadao Nadi Embankment	16.93	0.00	0	FC	2,800	0	1986		Complete
Balali - Padmasree Sub-Proj	14.10	6.50	2	FCDI	2,398	2,024	1984	1995	Complete
Thakurakona Sub-Project	13.15	0.00	3	FCDI	3,160	2,400	1989	1992	Complete
Nautana Khal Scheme	5.50	1.13	1	FCDI	3,120	2,000	1985	1989	Complete

Source: National Water Resources GIS Data Base (NWRDB)

## (3) Minor Irrigation Development

Minor irrigation equipment and irrigated area during Boro 2003 in the Upazila is show as follows:

Upazila	DTW		STW		LLP		Total Irrigated (ha)
	Numbers.	Area (ha)	Numbers.	Area (ha)	Numbers.	Area (ha)	
Netrakona	59	1,437	3,757	9,837	172	2,084	13,358
Purbodha	56	1,129	3,801	13,041	170	1,245	15,430
Durgapur	10	223	2,048	11,366	176	1,639	13,228
Kalmakanda	12	306	2,509	13,713	197	2,325	16,344
Brhatta	35	921	1,191	5,566	306	2,336	8,823
Mohongonj	32	803	510	2,526	350	5,040	8,369
Atpara	42	1,366	698	1,942	99	835	4,143
Modan	5	216	864	4,308	360	1,538	61,745
Kendua	40	972	4,523	14,650	42	572	16,194
Khaliajuri	0	0	3	12	432	3,291	3,303
Total	291	7,373	19,904	76,961	2,304	20,905	105,367
District Total	4,930	106,650	156,497	441,009	8,068	79,708	631,268

Sources: Survey Report on irrigation Equipment and irrigated Area 2003, BADC, Total irrigated area including the area irrigated by other traditional equipment

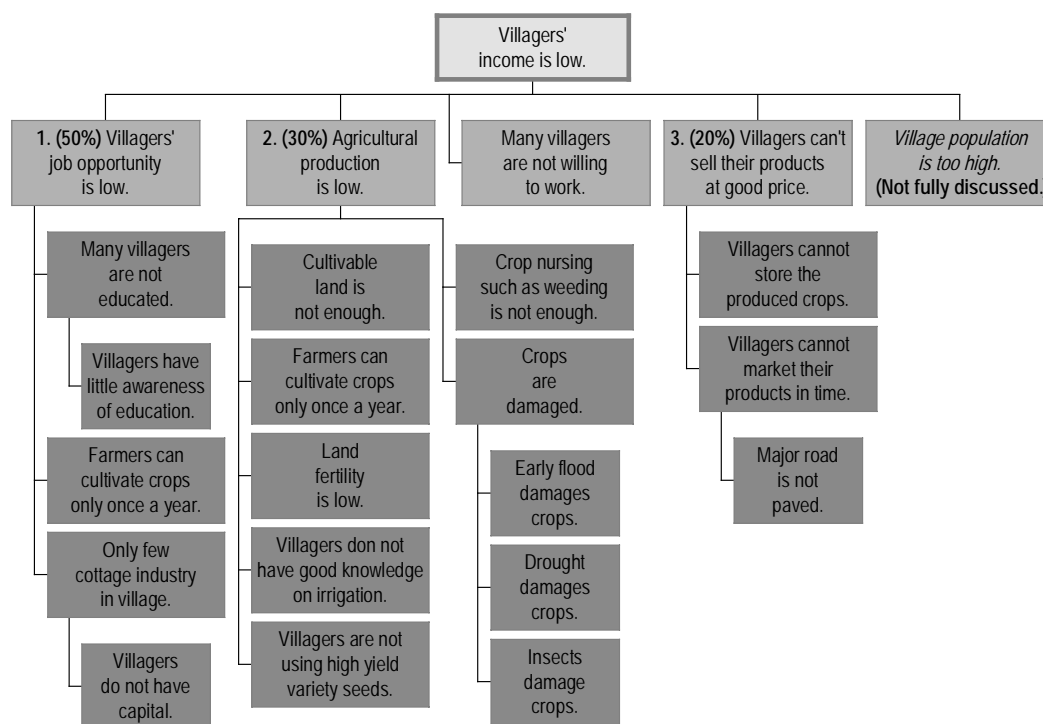
## Chapter 3 Problem Analysis and Participatory Workshops in the District

### 3.1 Problem Identified through Workshops in the District

To clarify the main issues concerning water resources management and livelihood in the Study, three (3) workshops were held at the District, Sinher Bangla and Sinher Bangla Unions in the District. Problem analyses were carried out in each workshop.

#### (1) Problem Identification Workshops of District Officials

Workshops targeting government officials were held at district levels. Participants were LGED officials/officers, government district agencies and representative of Union *Parishads*. Results are shown in the following problem trees.



#### (2) Problem Identification Workshops of Villagers in Subproject Areas

Workshops at Sinher Bangla and Sinher Bangla unions were held at 2 unions 4 and 19 Sep. 2004. Selection of the workshop sites was done based on the zoning of the Upazilas. Overall problem trees in the Study Area are shown in Fig. 3.1.

#### (3) Summary of the Problem Analysis Workshops

Problem analyses were undertaken at each workshop with the core problem defined as “villager’s income is low”. Direct causes in each workshop are shown below.

Name of District/Upazila/Union	Netrakona District	Sinher Bangla Union, Netrakona Sadar Upazila	Sinher Bangla Union, Sadar Upazila
Direct Cause 1.	1. No jobs / work	1,3 Low agricultural. Production	1. Low agri. Production
Direct Cause 2.	2. Low agricultural Production	3,1 No jobs / work	2. No jobs / work
Direct Cause 3.	3. Low products price	2,2 Expenditure is large	3. Expenditure is large
Direct Cause 4.	-	Low villagers' wage	Low fish production
Direct Cause 5.	-	Low price of products	Low price of products

The direct causes identified as the least common multiplier of all the problems identified together with workshops in the Study Area are: 1) Low agricultural production, 2) Limited work opportunity, 3) Low profit from products, 4) Low fish production, 5) Large family expenditure, and 6) Women cannot earn, low livestock production, etc. (Fig. 3.2).



### 3.2 Problems and Issues Identified

#### (1) Problems identified in the District

Problems for small scale water resources development identified in the District are summarized in the following table

Problems related to Natural conditions:		
- Flat low lying terrain	- Arsenic Contamination	
- Strong Seasonal Bias of Rainfall		
Problems related to Socio-economic Conditions:		
- Poverty/Vulnerability of Farmers	- Gender Issues	- Local Conflicts
- Illegal Land Occupation	- Fragmented Agricultural Area and Small Landholdings	
- Communication Gap between Local Government and Villagers		
Problems related to agriculture, livestock and fisheries:		
(Agriculture)		
- Land development	- Water Related Problems	- Rice Monoculture
- Problems of deficit farmers	- Seed Production and Supply	- Traditional Farming
(Fisheries)		
- Flood damages	- Shortage of water during dry season	
- Insufficient fishery extension services	- No management of indigenous fish and conservation area	
- Shortage of improved species/varieties, quality fingerling and fish feed		
(Livestock)		
- Feed shortages in dry seasons	- Veterinary services	
(Marketing)		
- Poor marketing environment		
Rural Infrastructure Conditions:		
- Damages to roads	- Rural Community Water Supply	- Poor road network

#### (2) Findings of Farm Household Interview Survey and Union Questionnaire Survey

The survey was conducted to understand/identify profitable farming style. According to the results of farmers' interview survey, farmers expressing their request to the Union Parishads are summarized in the table. As far as water resources concerned, irrigation and drainage problems are expressed by farmers.

Priority of Farmers Requests to Union.

Requests	Netrakona	Average
Transportation (Marketing)	1	1.2
Sanitary facilities	2	1.7
Irrigation	3	3.0
Seed supply	4	4.5
Drainage	4	4.8
Health services	4	5.2
Fertilizer supply	8	5.5
Training for new technologies	4	7.2
Credit services.	10	8.7
Information services	10	9.5
Cooporative services	9	9.8

Source: JICA Farm household survey (2004)

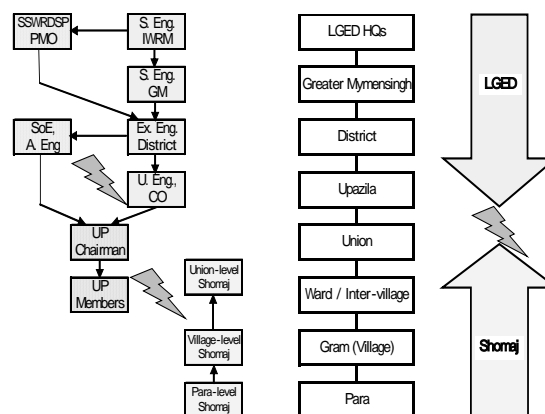
#### (3) Other Issues

##### 1) PRA used in SSWRDSP-2

The PRA used in SSWRDSP-2 is a step of a project appraisal process by SSWRDSP-2. Therefore, PRA starts from the proposed project, not from the needs of the villagers or their future image. However, PRA workshops become the venue to talk about the development of the area, to get better consensus among stakeholders and improve subproject design.

##### 2) Communication Gap

There found two major communication gaps in subproject planning, one between Union level and village/para level, and the other between project employee and LGED employee line. The former gap hinders getting the consensus of the people and establishing participation and ownership of the people. The latter gap hinders identifying and designing a



Communication Gap

good subproject. In this context, more participation of Upazila Engineer and Community Organizer to design- discussion meeting seems to be necessary. Also, consensus of *shomaj* elders at village-level and *para*-level should be reached before finalizing the proposal of subproject.

### **3.3 Participatory Workshop (PRA) for Sustainable Water Resources Management**

#### (1) Methodology

##### 1) Issues:

Two communication gaps; one between union level and *gram* (village)/*para* level, and the other between project employee and LGED employee line.

##### 2) Assumptions:

Organizing several participatory workshops (PRA) at *gram* level beside sub-project level, with active participation of villagers, local leaders, UEs, AEs (SP-2), SoEs (SP-2), SAEs (SP-2) and other local LGED staff, can conquer these communication gaps and promote better project design and better consensus among all the actors.

The Team requested AE (SP-2) and/or SoE (SP-2) of each district to choose one promising sub-project area to organize participatory workshops.

#### 1) Expected Outputs of the Study Team / LGED

To collect more grass-roots information especially on decision-making and collaboration in the community-base projects and activities.

To clarify the needs of the community

To verify a participatory planning and decision making process for small-scale water resources development including involvement of UEs, AEs (SP-2), SoEs (SP-2), SAEs (SP-2) and other local LGED Staff.

#### 2) Expected Outcomes for the local communities as a by-product

To share the ideas and opinions at intra-*gram*, inter-*gram* and sub-project levels.

To start some collaborative actions for consensus and for the future.

Capacity building of the individuals and the communities.

#### (2) Process of Participatory Workshops (PRAs)

##### 1) Arrangement of workshops with local leaders

Preparation of about four *gram* level workshops to strategically cover all the study area.

Preparation of one integrated workshop at sub-project level for summary and some consensus building.

Miking by UP Chairpersons, UP Members, *matabbors* and other local leaders for participation.

##### 2) Gram level interviews and workshops

Interviews focused on poor villagers.

Mapping, rich-poor profile and other RRA tools if necessary.

*Appreciative Inquiry* : a) Discovery Stage by sharing success stories of community- based projects and activities, b) Dream Stage by sharing the future image of individuals and the community where they can repeat more success stories, c) Design Stage by sharing what actions they can take today, tomorrow and next week.

##### 3) Integrated workshops

Presentation of the results of the *gram* level workshops.

Presentation of observation and analysis by the Team: identification of intra-*gram* / inter-*gram* issues, and sub-project / *upazila* / district level issues if any.

Discussion especially on inter-*gram* and sub-project level issues, and on immediate actions.

### Interviews and Participatory Workshops Schedule at Each Sub-project Area

<b>1<sup>st</sup> – 3<sup>rd</sup> day:</b>	Meeting with key persons and arrangement of workshops by the Study Team, transect of the study area and interviews of villagers by the PRA Contractor.
<b>4<sup>th</sup> – 7<sup>th</sup> day:</b>	Four <i>gram</i> level workshops (three <i>para</i> level workshops at the sub-project area in <i>Sherpur</i> District) using mapping, rich-poor profile and <i>Appreciative Inquiry</i> .
<b>8<sup>th</sup> day:</b>	An integrated workshop at sub-project level: <ul style="list-style-type: none"> <li>- Presentation of the results of the four <i>gram</i> level workshops by villagers</li> <li>- Presentation of the observation and analysis by the Study Team and the PRA Contractor</li> <li>- Technical issues of the proposed sub-project by UE and/or AE (SP-2) or SA (SP-2)</li> <li>- Social issues and WMCA by SoE (SP-2)</li> <li>- Question &amp; answer, and free discussion</li> </ul>
<b>9<sup>th</sup> – 10<sup>th</sup> day:</b>	Reporting by the PRA Contractor.

### (3) Records of Participatory Workshops (PRA) in Netrakona District

<b>Sub-project Name:</b> <i>Krishnakhal</i> & <i>Keronkhola</i> Canal Re-excavation & Construction of Regulator Sub-Project <i>Medni</i> union Netrakona Sadar, Netrakona District	<b>Grams:</b> 1) <i>Medni</i> , 2) <i>Krishnapur</i> , 3) <i>Rampur</i> , 4) <i>Digjan</i> , 5) <i>Vatlvita</i> , 6) <i>Baroari</i> , 7) <i>Shaljan</i> , 8) <i>Khoerbangla</i> , 9) <i>Dhorerbangla</i> , and 10) <i>Bangladaspara</i>	<b>Appraisal Status:</b> UDCC approved.
<b>Type / Project Area (Benefited Area):</b> Command area development and water conservation / 900 ha (750 ha).		
<b>Major Proposed Activities / Facilities:</b> <i>Karonkhola</i> canal re-excavation and construction of a regulator.		
<b>Necessary Modification:</b> Outlet canal and a <i>beel</i> need to be included in the sub-project.		
<p>The villagers who live near the river think they can pump up water from the river by the sub-project. The villagers who live at the center of the project area near the beel welcome the sub-project only if it benefits fish culture. The villagers who live near the outlet of the canal said they already suffer back flow. They are afraid that the sub-project might bring more back flow.</p> <p>A villager said re-excavation of the same khal was done five to seven times so far, but none was complete. So if the same thing happens, then it is useless to do it again.</p>		

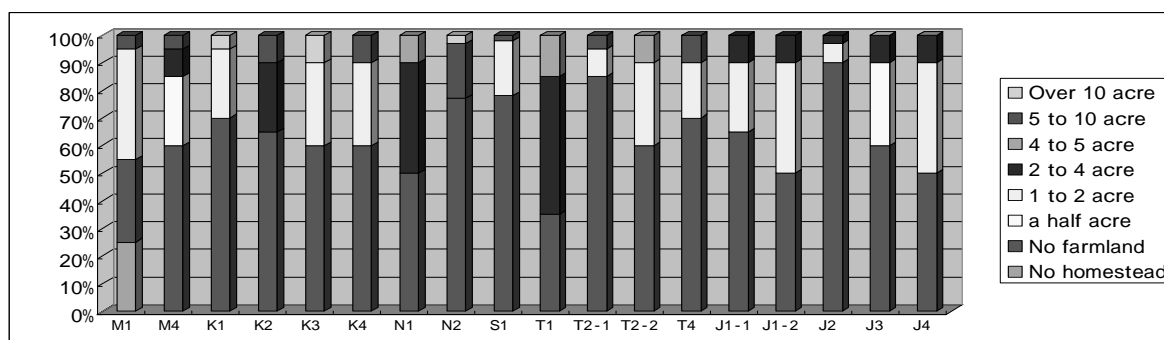
### (4) Some Cross Sectional Analysis

#### 1) Rich-poor profiles at the gram level workshop

18 Rich-poor profiles conducted at the *gram* level workshops show that villagers define landless farmers as poor and the ratio of the poor ranges from 50% to 85%

**Rich-Poor Profile at Gram Level Workshops**

	M1	M4	K1	K2	K3	K4	N1	N2	S1	T1	T2-1	T2-2	T4	J1-1	J1-2	J2	J3	J4
No homestead	25%																	
No farmland	30%	60%	70%	65%	60%	60%	50%	77%	78%	35%	85%	60%	70%	65%	50%	90%	60%	50%
a half acre		25%																
1 to 2 acre	40%		25%			30%			20%		10%	30%	20%	25%	40%	7%	30%	40%
2 to 4 acre		10%		25%			40%		50%	10%				10%	10%	3%	10%	10%
4 to 5 acre							10%		15%		5%		10%					
5 to 10 acre	5%	5%		10%		10%		20%	2%									
Over 10 acre			5%		10%			3%										



Note: Mymensingh (M1, M4), Kishoreganj (K1 to 4), Netrakona (N1, N2), Sherpur (S1), Tangail (T1, T2-1, T2-2, T4), Jamalpur (J1-1, J1-2, J2 to 4)

2) Cash income of relatively poor villagers

The PRA Consultant Team made 92 interviews in total, 15 or 16 interviews at each sub-project site. They did a purposeful sampling of interviewees by visiting rather small and shabby huts. 26 out of 92 interviewees or 28.3% are women, and strikingly, 14 out of 26 or 53.8% of the women are single (13 widows and one divorcee). At the sub-project area in *Kishoreganj*, all the four women interviewed are widows.

8 out of 26 female interviewees or 30.8% said they are doing maid and earn something like three meals and Tk. 30/day or 0.5 kg of rice per day to 1 mond (40 kg) per month. 6 out of 26 or 23.1% are day laborer earning Tk. 30 to 100 and they are all in *Sherpur*. 5 out of 26, or 19.2% said they are hawkers of fishes, vegetables and household goods, and earn Tk. 25 to 60/day. Also another 5 said they are housewives.

32 out of 92 interviewees or 34.8% said their major income source is day labor and the daily wages range from Tk. 30 to 100/day. At the sub-project area in *Sherpur*, 14 out of 15 interviewees or 93.3% are engaged in day labor of farming, forestry and earthen work etc. One villager said he is a farmer with 50 decimal (0.5 acre) of farmland.

The daily wages and availability of farming labor vary from month to month. For example in *Jamalpur*, the wage is about Tk. 50/day in July-September, about Tk. 60/day in January-March, about Tk. 80/day in November-December, and about Tk. 100 in April-June. Usually one meal and 0.5 kg of rice are provided by the landowners in planting and weeding seasons, and two meals and 1 kg of rice in harvesting season.

9 out of 92 interviewees or 9.8% said they are sharecroppers but their land sizes are something like one or two *bigha* (0.33 or 0.66 acre) and they do day labor substantially. 8 out of 92 interviewees or 8.7% are rickshaw/van pullers and earn Tk. 50 to 200/day. Some are working in Dhaka. 7 out of 92 interviewees or 7.6% are hawkers of fishes, vegetables, ice cream and household goods and earn Tk. 25 to 100 (Tk. 25 to 60 for women)/day.

In conclusion, options of day labor for women are less and wages are lower than men. Men can choose fishery or farm labor in high season, and rickshaw/van pullers, earthen work or hawkers in low season. Many of them can still make Tk. 50-70 per day all year round. Maximum wages women can make, however, is Tk. 60/day if earthen work is available. Only some women are lucky enough to find wood cutting/planting jobs or to be able to work in the field. Otherwise, to work as a maid might be the best regular occupation.

The majority of poor farmers (55 out of 92 interviewees or 59.8%, the cases with no interest are excluded) are borrowing money at very high interest (8% to 20% per month or 100% to 240% per year). 57.9% are the loans for food, agriculture, business etc. and the average amount is Tk. 1,873. 34.2% are for health problems and the average amount is Tk. 3,431. Others are for land and houses (Tk. 20,000 and Tk. 14,000 from NGOs), and for wedding (Tk. 7,800)

(5) Participatory Planning and Decision Making Process

COMMON ISSUES	POSSIBLE IMMEDIATE ACTION
<b>On Project Designing</b>	<b>For Project Designing</b>
1 All of the six sub-projects where the Team had workshops go beyond union borders. If the benefited area is close to 1,000 ha and the area of each union is something like 2,000-3,000 ha, the sub-project most likely is a multi-union project.	1 Assuming all the sub-projects are multi-union, UE, AE (SP-2), SoE (SP-2) and other local LGED Staff need to check all the sub-project proposals and rewrite them accordingly.
2 Negative impacts tend to occur near the border of the project area, especially beside the facilities such as embankment, sluice gates and culverts. They are not paid attention so that no mitigation measures can be taken, if appraisal teams only study inside of the project area.	2 The study area for the appraisal teams need to include potentially affected areas such as outside of embankment, outlets or inlets of sluice gates and culverts, and upstream of dams. The study area must be significantly wider than the project area.
3 Project purpose, major project facilities and activities are not so clear in the sub-project proposals, and they are being refined through "appraisal" process by the appraisal teams.	3 UEs, AEs (SP-2), SoE (SP-2) and other local LGED staff must refine the sub-project proposals so that the project purpose, major project facilities and activities are clear.
4 UEs, AEs (SP-2) and other local LGED staff are not involved in substantial project designing because it is considered as "appraisal" process.	4 Full and active participation of UEs, AEs (SP-2), SoE (SP-2) and other local LGED staff in project designing is a must. Participation does not only mean participation of the villagers, but of all the actors.
5 Phasing of the projects and priority in <i>upazila</i> / district development (plans) are not so clear.	5 UEs, AEs (SP-2) and other LGED staff at <i>Upazila</i> and District levels need to add comments to the sub-project proposals on phasing and priority in the <i>upazila</i> and the district.

On Consensus Building	For Consensus Building
1 Few districts or <i>upazilas</i> have full appraisal reports, so that local LGED staff cannot explain the results, either the proposals pass or fail, fully to UP Chairpersons and villagers.	1 For transparency and accountability to UP Chairpersons, UP members, local leaders and villagers, copies of all the appraisal reports must be sent to each district and the <i>upazila(s)</i> so that AEs (SP-2), SoE (SP-2), UEs and other local LGED staff can explain the results of appraisals to them.
2 Few UP Chairpersons consult <i>gram</i> level leaders, sometimes not even UP members, before submitting sub-project proposals.	2 Accountability to the villagers and consensus of <i>gram</i> level leaders such as <i>matabbors</i> need to be the pre-requisites for UP Chairpersons to submit sub-project proposals
3 One transect walk and one workshop in a sub-project area are not enough for consultation. Important negative impacts and social conflicts can be unrecognized by the appraisal teams, and many questions of the villagers will be unanswered.	3 Two-day interviews and three to five <i>gram</i> level workshops need to be conducted in addition to one transect walk and one workshop by the PRA team. A workshop for more than three <i>grams</i> usually cannot attract so many ordinary villagers from all the grams. A workshop for every one or two <i>grams</i> is recommended.
4 Neighboring villagers of a sub-project do not have opportunities to be consulted by the appraisal teams	4 The villagers of neighboring <i>grams</i> and unions must be included to the interviews and workshops by the PRA team. They could be affected negatively by the proposed sub-project. The primary purpose of impact assessment is not to show there are little negative impacts, but to show how many mitigation measures are identified and how much project design has improved from the original one.
5 Many villagers do not have opportunities to get information on WMCA so that they do not know what WMCA is even after they have agreed to join WMCA.	5 Full explanation to the villagers on major activities, pre-requisites and benefits of WMCA is necessary before asking about their promises to join WMCA.

## (6) WMA or WMCA

### 1) WMAs in SSWRDSP-1

There are 280 sub-projects in SSWRDSP-1 and the average members of WMA are 413, of which 100 or 24.2% in average are female members. The members are largest at 833 (an average of four WMAs) in Pabna District and smallest at 110 (an average of four WMAs) in Bogra District.

The target amount of beneficiary contribution is Tk. 128,417 in average per WMA. The amount is highest at Tk. 363,342 (an average of six WMCAs) in Chapai Nawabganj District and lowest at Tk. 27,259 (an average of seven WMAs) in Thakurgaon District.

The collected amount of beneficiary contribution is Tk. 290 per member in average. It is highest at Tk. 1,247 per member in Bogra District and lowest at Tk. 104 per member in Jhenaidah District.

### 2) Community-Based Projects

From the success stories of community-based projects, the Team has found that about 20 villagers invested for a gram level earthen dam project in *Sherpur* District about Tk. 240,000 every season for nine years. In case of a gram level DTW project in *Mymensingh*, 35 villagers invested Tk. 350,000. The amount is almost as much as the target amount of beneficiary contribution in *Chapai Nawabganj* District.

The water fee of the earthen dam project in *Sherpur* District is Tk. 800/acre, and that of the DTW project in *Mymensingh* District is Tk. 140/Katha (Tk. 1,750/acre). The investment, water fee, construction wages and who work as day laborer etc. were decided by *shomaj* of *matabbors* and villagers have had no serious problems of investment nor collecting water fees.

The interviews showed that more than 20% of the poorer households in the villages could be female-headed. Also more than half of the population is usually landless and poor. The figure could be as high as 90% in some grams.

Women have much less options and opportunities for cash income in the villages. If they are not lucky enough to be able to work in the forest or in the paddy field, the best they can do is to find temporary earthen work, work as a maid (usually 40 kg of rice per month plus three meals) or as a hawker (could be Tk. 30-40/day).

### 3) RECOMMENDATION

*It seems to be very difficult for poor families, especially female-headed families, to contribute Tk. 300, sometimes more than Tk.1,000 in cash to join WMCA. They might not be the direct beneficiaries of the sub-projects either if they are landless. On the other hand, it is not difficult for villagers to invest Tk. 300,000 at gram level if they are community-based projects, the decision was made through shomaj, and landowners, who are more likely the real direct beneficiaries of sub-projects, invest and pay the water fee. Therefore:*

To exempt poor landless farmers, especially female-headed households, from cash contribution to join WMCA.

To introduce progressive cash contribution system based on gram level decision.

To charge operation and maintenance fee solely on landowners' accounts.

To include community-based water resources development projects into WMCAs under SSWRDSP-2 even if they are not selected as sub-projects.

## Chapter 4 Small Scale Water Resources Development Potentials

### 4.1 Surface Water Resources in the District

#### (1) Perennial/seasonal Waterbodies

There are about 813 perennial waterbodies, with a total area of about 5,380 ha which cover 1.9% of the District (Fig. 2.2). Among them, beels are counted as 725, in NWRD of WARPO, with an area of 725 ha in the District as shown in the following table. There is no beel in a upazila and 39 unions; in other wards, only 54% of unions have beels in the Study Area.

District	Total Numbers		No. having Beel		No. of Beel*	Beel Total Area (ha)
	Upazila	Union	Upazila	Union		
Netrakona	10	85	9	46	117	725
Total	58	565	52	250	664	15,033

Source: NWRD, WARPO

Notes: \* because a beel locates in the several unions

In regard to the water scarcity in dry season, it may be said that all waterbodies especially beels with considerable scale have some potential for SSWRD. Installation of supplemental water retention facilities or dredging may improve its utilization.

#### (2) Haor Area

The eastern part of Netrakona and Kishoreganj districts are classified as Haor areas, as characterized by its low altitude and long inundation period. Inundation depth rises up to more than three meters, and continues for several months. The haor area has rich water resources development potential but careful attention shall be paid environmental impact.

#### (3) Flood Water

While floods including early floods and flash floods are the major constraints for livelihood in the District, it is also a fact that it is a source of water, and with an excessive amount. Retention and utilization of flood water for supplementary irrigation may enhance agricultural production particularly in areas with relatively high altitude.

### 4.2 Small Scale Water Resources Development in the District

#### (1) Previous SSWRD Program

There was not significant small scale water resources development project operated in the District except Thana Irrigation Program (TIP) in 1960s and Canal Digging Program (CDP) since 1979 up to 1996, Also the SSWRDSP, started 1995, was implemented in the western part of Bangladesh. Since July 2002, the SSWRDSP-2 has started covering the District.

#### (2) Progress of SSWRDSP-2

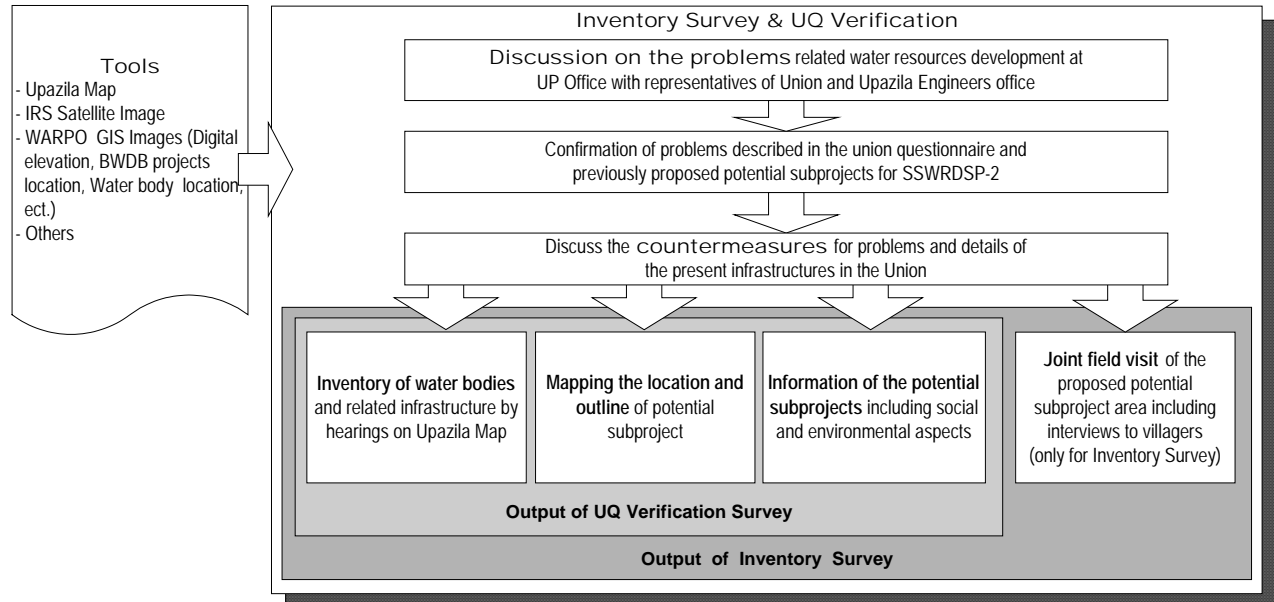
There are 73 subprojects proposed from 40 unions in 12 upazilas of the District as shown in as shown in Table 4.1. The subprojects proposals were screened by the following procedures: 1) prescreening at district level, 2) reconnaissance by PMO, 3) PRA/Pre-feasibility survey by local consultants, 4) Feasibility Study by consultant. Up to the reporting period, 14 subprojects were granted approval for implementation. Most of reasons for failure at prescreening stage are incomplete proposal format.

### 4.3 Identification of Potential Subprojects

#### (1) Methodology

Identification of potential SSWRD subproject was conducted by the inventory and union questionnaire verification surveys. Both surveys conducted firstly, discussion and clarification of the answer of union questionnaires on the water related problems in the Union among UP chairman and members, representative of villagers and staff of Upazila engineer's office at Union office. Then the locations,

necessary countermeasures for the problems faced by people in the Union were confirmed. These scopes of works for the potential subprojects not only the technical aspects but also environmental and social aspects were discussed and recorded by surveyor and enumerator of the Study Team. In case of the inventory survey, the proposed potential subprojects were visited to confirm the present conditions and conduct the preliminary technical assessment including interviewing the potential beneficiaries by members discussed in the Union office. Processes of both surveys are shown below:



### (3) Inventory Survey

#### 1) Objectives

To examine the situation of water resources related infrastructure, confirm the contents of the collected Union Questionnaires and to identify the potential subprojects for SSWRD in selected 41 Unions in the District

#### 2) Selection of Unions to be surveyed

Selection of unions to conduct the inventory survey was done based on the submission of subproject proposals for SSWRDSP-2. Unions, which were previously selected, based on the understanding that information on present water bodies and related infrastructure is required.

#### 3) Survey Procedures

The survey was conducted by dispatching consultants to each Union and by conducting interviews to relevant government officers, UP chairmen and members, village heads, Upazila Engineers and other local stakeholders and actual field survey to the water resources infrastructures and potential subproject sites. The survey process for each union was as follows:

- a) Explanation of survey to relevant officers at Union complex
- b) Identification of water bodies / infrastructure location and access route
- c) Survey on water bodies / infrastructure
- d) Verification of information indicated in the Union Questionnaires
- e) Discussion with relevant officers at Union complex for identification of potential subproject areas and possible intervention plans based on identified water bodies/ infrastructure

### (3) Union Questionnaire Verification Survey

#### 1) Objective

To verify the contents of the collected Union Questionnaires and to identify/collect information relevant to potential subprojects for SSWRD in the 44 unions of the District, which were not selected for the Inventory Survey.

## 2) Survey Procedures

The Survey was done through interviews to local stakeholders including UP chairmen, members, village heads, Upazila Engineers and other local representatives.

### (4) Identified Potential Subprojects

#### 1) Results of Potential Subproject Identification Survey

In preparation of the list of potential subprojects for SSWRD in the District, the results of field surveys were carefully examined and necessary modification were made. Accordingly, the Study Team identified 124 ungrouped potential subprojects in the District. The identified potential subprojects were categorized into four types; 1) Flood Management: FM, 2) Drainage Improvement: DI, 3) Command Area Development: CAD and 4) Surface Water Conservation: WC, accordingly to their contents. The type, scale of gross area and relation with BWDB projects in the District are summarized in the following tables, while the locations of these subprojects are indicated in Fig. 4.1. However, it must be clearly noted that these figures are of preliminary stage and not yet meant for indicating the number of subprojects for implementation. The preliminary list of potential subprojects has further been screened to clarify whether they should be implemented under small-scale water resources development schemes, and then has been prioritized in order to select those for further implementation arrangements.

Identified Potential Subprojects by type

District	FM	DI	CAD	WC	FM&DI	FM & WC	DI&WC	FM, WC&DI	Total
Netrakona	22	26	1	10	21	14	25	5	124
% within total	17.7	21.0	0.8	8.1	16.9	11.3	20.2	4.0	100
Study Area Total	118	145	2	67	83	25	185	69	694
% within total	17.0	20.9	0.3	9.7	12.0	3.6	26.7	9.9	100

Identified Potential Subprojects by Scale of Area

Upazila	Gross Subproject Area (ha)					BWDB Related
	1,000	1,000 < 1,500	1,500 < 2,000	> 2,000	Total	
Netrakona	75	10	1	38	124	45
Study Area Total	572	57	18	47	694	176

#### 2) Verification of Identified Potential Subprojects

After discussion in the UDCC, DSSWRC and IMCC, the identified subprojects were reviewed in the light of the comments received in these meetings. The hydrological features and contents of the identified subprojects were also examined to verify its adequacy as a single subproject. Consequently, a total of 124 potential subprojects were verified. About 10% of the potential subprojects were grouped in the District. This was mainly due to: 1) multiple upstream-downstream subprojects with contents of re-excavation continuously located on the same river/*khal* and 2) multiple subprojects with continuous contents of embankment rehabilitation/construction.

Verified Potential Subprojects by type

District	FM	DI	CAD	WC	FM&DI	FM & WC	DI&WC	FM, WC&DI	Total	Total before verification
<b>Netrakona</b>	<b>19</b>	<b>18</b>	<b>1</b>	<b>8</b>	<b>20</b>	<b>13</b>	<b>24</b>	<b>9</b>	<b>112</b>	<b>124</b>
Study Area Total	91	101	2	57	80	23	157	82	593	694
% within total	15.3	17.0	0.3	9.6	13.5	3.9	26.5	13.8	100.0	-

Verified Potential Subprojects by Scale of Area

District	Gross Subproject Area (ha)					BWDB Related
	1,000	1,000 < 1,500	1,500 < 2,000	> 2,000	Total	
<b>Netrakona</b>	<b>92</b>	<b>11</b>	<b>2</b>	<b>7</b>	<b>112</b>	<b>42</b>
Total	473	63	24	33	593	170



## 4.4 Prioritization of Potential Subprojects

### (1) Necessity of Prioritization

In order to effectively utilize limited inputs, development activities of the Master Plan should be implemented at the right place for the right purposes, contributing at the maximum extent to its overall goals. Prioritization of subprojects should be done with necessary criteria to select the most important interventions. Before prioritization, the verified subprojects which were obviously unqualified for SSWRDSP were screened out, and then the qualified potential subprojects were scored and categorized into four categories (A, B, C and D) depending on their scores and maturity in planning.

### (2) Method of Prioritization

Identification of potential subprojects was done by first identifying the needs of the local villagers and then by formulating a package of measures to cope with these problems. This was done so that the measures to cope with the most important problems were not forced to take the form of SSWRD, neglecting the possibilities of other forms such as medium and large-scale interventions, which may be more suitable in certain cases. In this context, the verified subprojects were not necessarily designed as SSWRD subprojects from the beginning.

Among prioritization, the verified potential subprojects were pre-screened to exclude subprojects that clearly do not fit into the SSWRD scheme. For this process, the gross area and location of the verified subprojects were applied, where medium and large-scale subprojects as well as small-scale subprojects lying in areas protected for the purpose of environmental conservation were excluded.

After pre-screening, the qualified subprojects were scored by applying a method for multi-criteria analysis. The criteria and weight of the scores were carefully examined based on available information, and each qualified subproject was scored accordingly. The main items regarded in the criteria were:

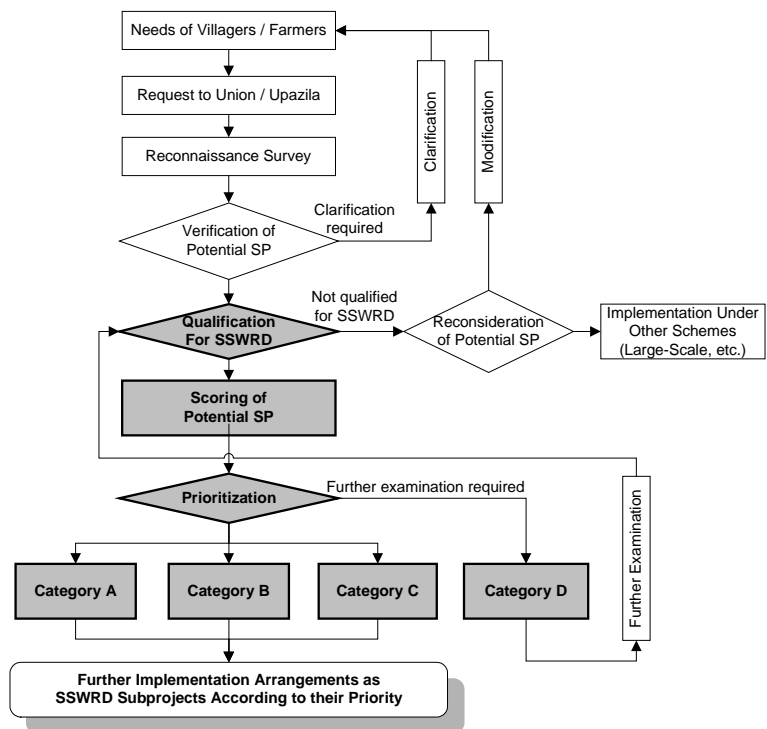
- Impact on Poverty Alleviation
- Significance of Benefit
- Hydrological and Environmental Considerations, and
- Easiness of Implementation of the Subproject and O&M by Local Beneficiaries in the Subproject Area

Subsequently, the maturities of the qualified subprojects were checked based on the criteria developed under the SSWRDSP-2, which is the current scheme for implementation of SSWRD subprojects. Those found to require further examination for implementation as SSWRD subprojects were categorized as Priority D, while others were categorized into A, B and C according to their scores.

### (3) Qualification of Verified Subprojects

#### 1) Criteria for Qualification of Verified Subprojects

Under the NWPo, water resources development interventions with the benefiting are of 1,000 ha or less are categorized as “Small-Scale”. In this regard, all such interventions can be referred to as potential SSWRD subprojects. However, LGED has developed a set of selection criteria under the SSWRDSP-1 and 2 to qualify subprojects that are expected to be effective and efficient. This criterion



Flow of Prioritization

covers a wide range of issues from economic viability / technical feasibility to social acceptability and environmental soundness.

In regard that the potential subprojects that are identified and prioritized under this study are to be implemented by LGED, and that the SSWRDSP-2 following its first phase is currently the only scheme under LGED to implement SSWRD subprojects, these criteria (or modified according to future needs) would be most appropriate in qualifying such potential subprojects.

However, in order to give concrete decisions on whether the potential subproject is fully qualified or not, analysis must be done in detail for each individual criteria. In regard that the Master Plan Study has not stepped in to the very details of the individual subprojects, but rather concentrated in collecting general but overall information to provide the directionality for SSWRD, it is not favorable to completely judge the potential subprojects at this stage, where those judged unqualified will be excluded from further examinations. In this regard, two fundamental criteria were applied for qualification (pre-screening) of the verified potential subprojects, while the remaining selection-criteria were considered later on for the prioritization of qualified subprojects.

The criteria applied were:

a) Gross subproject area

Based on the definition of SSWRD subprojects, the benefiting area of each subproject must be 1,000 ha or less. At this stage, detailed analysis of topography and hydrology is not done for individual subprojects, therefore, accurate figures of benefiting areas are not presented. Taking into regard that based on GIS analysis of the layout of verified subprojects, some 20% of the subprojects area is expected to be settlements, roads etc., qualification of the subprojects were done by adding 20% margin to the current frame. Also taking into regard that the range of benefiting area as defined in SSWRDSP-2 is 50 to 1,000 ha, verified subprojects with the gross area falling outside of the range of 60 to 1,200 ha were excluded.

b) Overlapping with protected areas

In order to prevent obvious negative impact on the environment, implementation of subprojects in protected areas should be avoided. In this regard, verified subprojects located in Madhupur National Park and its buffer zone as defined by the Department of Forestry was excluded.

2) Qualified potential subprojects

Through the process of pre-screening in regard to the criteria set above, some 18% of the verified subprojects were considered to be of large scale, while 1 was located within Madhupur National Park. As a result, 496 subprojects out of the 593 verified subprojects were found qualified. These qualified subprojects will be prioritized for further implementation arrangements. The average area of a single qualified subproject is 538 ha in the District.

District-wise Number and Area of Qualified Subprojects

District	Number of verified subprojects	Number of qualified subprojects	Total gross area of subprojects (ha)	Average gross area of subprojects (ha)	Total area of district (ha)	% of Total gross area within the district
<b>Netrakona</b>	<b>112</b>	<b>97</b>	<b>51,825</b>	<b>534.3</b>	<b>281,000</b>	<b>18.4</b>
Total	593	496	266,743	537.8	1,667,200	16.0

Type-wise Number of Qualifies Subprojects

District	FM	DI	CAD	WC	FMDI	FMWC	DIWC	FMDI & WC	District Total
<b>Netrakona</b>	<b>17</b>	<b>18</b>	<b>1</b>	<b>6</b>	<b>18</b>	<b>12</b>	<b>20</b>	<b>5</b>	<b>97</b>
Total by Type	81	89	2	52	70	21	118	63	496

(4) Prioritization of Qualified Potential Subprojects

1) Prioritization Method

After qualification, the potential subprojects were prioritized and categorized into four categories (A,

B, C and D) according to their priority. This was done by two approaches. One to screen out and lower the priority of potential subprojects that are qualified but yet require additional information to confirm if they satisfy certain criteria for SSWRDSP-2. The other is to score the qualified subprojects by using a multi-criteria analysis method, and selecting those with higher priority based on a set of criteria. The potential subprojects selected in the former process was categorized into category D, while the remaining were categorized in to A, B, and C.

a) Screening of Category D Subprojects

Out of the set of selection criteria developed under SSWRDSP-2, two were applied in the process of qualifying the potential subprojects. The remaining criteria were not applied in consideration that the potential subprojects should not be completely screened at Master Plan level. However, based on the information collected in the study, preliminary judgment for the criteria concerning subproject construction cost can be made, where potential subprojects not satisfying the criteria at this point should be bound for further examination. In regard that such examination will require more time and resources, they should have lower priority among implementation. The potential subprojects not satisfying the criteria were categorized into “Category D”, which require further examination to clarify whether they can (with or without modification) satisfy the set of selected criteria.

SSWRDSP-2 Selection Criteria and its Application for Screening “D Category” Subprojects

SSWRDSP-2 Selection Criteria	Application	Reason
The SP must be in line with district strategies and guidelines for SSWR and approved by DIAPEC	Applied for qualification	The Master Plan itself is positioned as the district strategy for SSWRD. Approval of DIAPEC will be done at the stage of implementation
More than 40 % of the SP benefited area will be operated by landless share croppers, marginal farmers	Not applied	Examination should be done based on reliable information obtained at the stage of feasibility study
No more than 30 % of the households depend on subsistence capture fisheries.	Not applied	Examination should be done based on reliable information obtained at the stage of feasibility study
Each SP will entail rehabilitation / upgrading of an existing water control system	Not applied	Examination will be done at field reconnaissance
SP cost must not exceed US\$ 1000/ha for CAD and US\$ 500 for other schemes without ADB's prior approval.	Applied	Examination will be done by checking the contents of the potential SPs
Benefited area served by the SP must be more than 50 ha and not exceed 1000 ha.	Applied for qualification	Already applied for qualification of verified subprojects
Each subproject must be technically feasible; economically viable (EIRR > 12 %)	Not applied	Detailed study should be examined at the stage of feasibility study.
Capacity of beneficiaries in ensuring the sustainability of submersible embankments must be shown for Interventions in the deeply flooded part of the Northeast Region	Not applied	Detailed study should be examined at the stage of feasibility study
The SP shall be environmentally sound and IEE/EIA study has to be undertaken and appropriately approved after consulting the beneficiaries and project affected people	Partially applied for qualification	SP areas in environmentally sensitive areas have been taken into consideration
The SP shall be socially sound and require no or minimal displacement of people and land acquisition, and not involving sensitive areas	Not applied	Detailed study should be examined at the stage of PRA
Enrollment of 70 % of the direct beneficiary households as member of the WMA.	Not applied	Detailed study should be examined at the stage of PRA – WMA formulation
Recurrent cost of subproject O&M shall be covered by beneficiaries through formulated WMA	Not applied	Detailed study should be examined at the stage of PRA – WMA formulation

b) Scoring Method of Qualified Subprojects

Scoring of subprojects was done by applying *Analytical Hierarchy Process* (AHP) method, which is a tool for decision making with various parameters (multi-criteria analysis). During the last three decades, especially when the social or administrative and environmental or hydrological impacts have been emphasized in decision making process, traditional methodologies such as Cost-Benefit Analysis (CBA) or Cost-Utility Analysis (CUA) have been gradually replaced or complemented by Multi-Criteria Decision Methods (MCDM), with prominence for AHP. The main concept is to examine relative importance of various factors for decision-making using a matrix chart called a "decision-tree". Comparison of importance is examined by hierarchy by examining relations of two items and then

integrating the relations into one matrix.

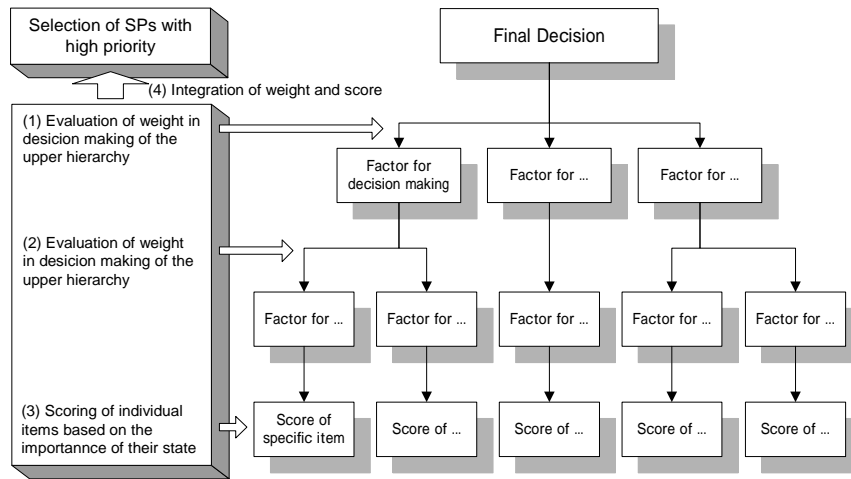
Relative importance of items/decision factor called “natural states” regarded for categorization of SPs was considered and weights for scoring of these items were examined. The main procedure consists of four steps.

- Examining weight of importance of each category
- Examining weight of importance of each item in the same category
- Scoring of individual items in consideration of each state
- Integration of individual scores and weight to prioritize potential subprojects

**Pair wise Comparison Scale**

Relative Preference / Importance	Numerical Rating
Extremely preferred/important	9
Very strong to extremely	8
Very strongly preferred/important	7
Strongly to very strongly	6
Strongly preferred/important	5
Moderate to strongly	4
Moderately preferred/important	3
Equally to Moderately	2
Equally preferred/important	1

In scoring individual items, a pair-wise comparison matrix is formed reflecting relative importance of the items based on a nine-point Relative Importance Scale as shown below.



**Process of Subprojects Prioritization**

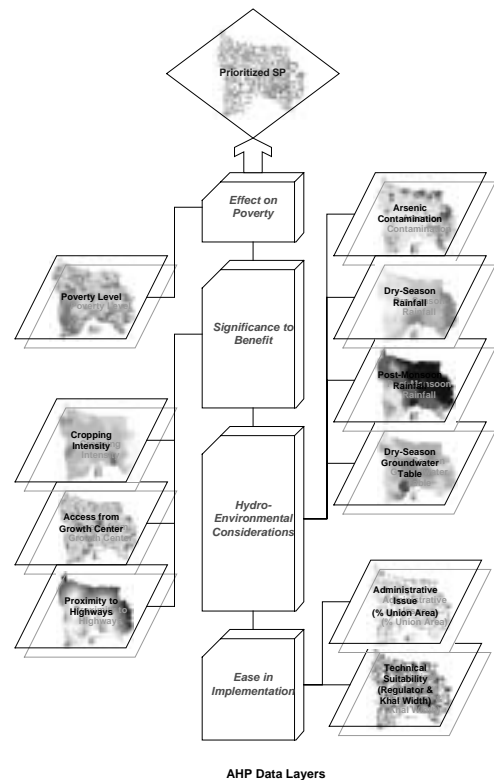
**c) Criteria for Scoring**

Among implementation, the basic requirements for SSWRD subprojects will be covered by applying the selection criteria of SSWRDSP-2. In this regard, scoring for prioritization of potential subprojects shall concentrate on selecting subprojects that may have more positive effect than the others. The items for considering the scoring of the subprojects are 1) Effect on Poverty by the Subproject (applicable to all types of subprojects), 2) Significance of Benefit, 3) Hydrological and Environmental Considerations, 4) Easiness in Implementation of the Subproject and O&M by Local Beneficiaries

**d) Weighting of Scoring Criteria**

The basic idea of calculating evaluation weight of categories/items and scoring of individual items are shown in the table below. Importance of each factor is calculated so that the total of each category / item will sum up to a total of one (1). The method and weight of each criterion for prioritization are indicated in the following table.

In applying the AHP method, overlaying subproject with



various data collected, updated and developed by the study team and converted them to buffers and grids, has been carried out under GIS environment. The figure on the right gives an image of the GIS data layers used in prioritization.

Sensitivity Analysis has been carried out to check the effect of weight of particular criteria on overall scores of the sub-projects. This eliminates skewness in subproject priority such that a single criterion doesn't play a sharp role in overall priority and smoothes out the effect of different criteria. Through such sensitivity analysis, the final weights of the criteria have been decided. The table in the next page shows the final criteria and weight.

Weight of Multi-Level Criteria for Subproject Prioritization

Primary Criteria (Level 1)	Weight	Secondary-Criteria (Level 2)	Weight	Tertiary Criteria (Level 3)	Weight		
Effect on Poverty by the Subproject (Applicable to all types of SPs)	0.61*	Very High Poverty Area	0.59	-	-		
		High Poverty Area	0.22	-	-		
		Moderate Poverty Area	0.12	-	-		
		Low Poverty Area	0.07	-	-		
Significance of Benefit (applicable to all types of SPs)	0.13*	Cropping Intensity	0.75	Low having Inundation Land Type F3 & F4	0.76		
				Medium having Inundation Land Type F2	0.16		
				High having Inundation Land Type F0 & F1	0.08		
		Access to and from Growth Center	0.18	Proximity to National and Regional Highways	0.07	Easy	0.68
						Moderate	0.22
						Difficult	0.10
		Proximity to National and Regional Highways	0.07	0.07	Close	0.68	
					Moderate	0.22	
					Far	0.10	
Hydrological and Environmental Considerations (depends on types of SP)	0.10*	Arsenic Contamination (applicable to WC type only)	0.64*	High Contaminated Area	0.69		
				Medium Contaminated Area	0.23		
				Low Contaminated Area	0.08		
		Dry Season Rainfall: Nov. ~ Mar. (applicable to WC type only)	0.14*	0.14*	Low Rainfall	0.65	
					Moderate Rainfall	0.23	
					High Rainfall	0.12	
		Post-Monsoon Rainfall: Sep. ~ Oct. (applicable to DI type only)	0.14*	0.14*	High Rainfall	0.65	
					Moderate Rainfall	0.23	
					Low Rainfall	0.12	
		Dry Season Ground Water Table: Nov. ~ Mar. (applicable to WC/ CAD type only)	0.08*	0.08*	Deep Groundwater Table	0.65	
Medium Groundwater Table	0.23						
Shallow Groundwater Table	0.12						
Easiness in Implementation of the SP and O&M by Local Beneficiaries in the SP Area (applicable to all types of SPs)	0.16*	Administrative Issue	0.75	Single Union	0.83		
				Multiple Unions	0.17		
		Technical Suitability	0.25	0.25	Structures are of adequate scale	0.90	
					Structures exceed adequate scale	0.10	

\* Different weight applied depending on type of SPs. For detailed figure, refer to Annex-7.

## 2) Prioritization of Potential Subprojects

### a) Screening of D Category Subprojects

Screening for Category D subprojects were done based on the costs of individual subprojects estimated from their components. In the District, out of the 97 qualified subprojects, 31 subprojects were determined to have costs exceeding US\$ 500/ha (US\$ 1,000/ha for CAD type subprojects). In addition to this, one CAD type subproject was screened into Category D in regard that necessity of medium scale low-lift pumps should be further examined. The numbers of such subprojects in the District are indicated below.

### Screening of Category D Subprojects

District	Number of qualified subprojects	Number of category D subprojects	Number of category A- C subprojects	Gross area of category A-C subprojects (ha)	Average gross area of category A-C subprojects (ha)	Total area of district (ha)	% of gross area of category A-C subprojects within the district
Netrakona	97	31	66	36,580	554.2	281,000	13.0
Total	496	146	350	200,942	574.1	1,667,200	12.1

### Type-wise Number of Category D Subprojects

	FM	DI	CAD	WC	FMDI	FMWC	DIWC	FMDI & WC	Total
Netrakona	7	0	1	3	3	2	12	3	31
Total by type	32	3	2	22	25	7	32	23	146

#### b) Prioritization of Qualified Subprojects

After screening of Category D subprojects, each of the remaining subprojects are marked with a score indicating its relative importance in the light of the set criteria. The scores varied from 0.18 to 0.98 with the average of 0.45. However, it should be noted that because of the characteristics of the AHP method, the scores do not indicate the value of actual importance of the subprojects, but represent relative importance between the subprojects.

Prioritization of the scored subprojects was done upazila-wise in regard of the capacity of the Upazila Engineer office in implementation. One subproject with the highest score was selected in each upazila for implementation under the short-term activities of the Master Plan. Such subprojects were categorized as Priority A. Furthermore, some 30% were selected from the remaining 56 subprojects for categorization in Priority B. This counted up to 17 subprojects. Finally, the remaining 39 subprojects were categorized into Priority C, which will be implemented under the long-term activities of the Master Plan. The prioritized subprojects have been checked upazila-wise and then district-wise so that implementations of the prioritized subprojects become distributed among the upazilas and districts. Lists of prioritized subproject in each district are shown in Table 4.2. The following table summarizes the number of subprojects in each category. The distribution of prioritized subprojects is indicated in Fig. 4.3.

### Prioritized Verified Potential Subprojects by Type

Netrakona	FM	DI	CAD	WC	FMDI	FMWC	DIWC	FMDI & WC	Total	BWDB related
Category A	2	5	0	1	0	0	1	1	10	5
Category B	2	1	0	2	8	2	2	0	17	6
Category C	6	12	0	0	7	8	5	1	39	12
Category D	7	0	1	3	3	2	12	3	31	10
All categories	17	18	1	6	18	12	20	5	97	33
Study Area Total	81	89	2	52	70	21	115	59	496	136

## Chapter 5 Master Plan on Small Scale Water Resources Development

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

#### (1) Objectives

The National Water Policy (NWPo) has been formulated to provide direction to all agencies working with the water sector, and institutions that relate to the water sector, for achievement of specified objectives. Under this policy, the sector agencies of Government and local bodies will prepare sub-regional and local water-management plans in conformance with the NWMP and approved Government project appraisal guidelines. In regard of the above, the Master Plan of District Water Resources Development has been started by LGED including the Study covering 6 districts in Greater Mymensingh as one of the pioneers. The overall goal of the Study is to secure safe and sustainable water resources management and to increase farmers' income. The Master Plan is prepared comprising of strategies, prioritized subproject list, priority programs, and the scope for the follow-on investment project which include effective use of surface water.

#### (2) Basic Concepts of the Small Scale Water Resources Development

Integrated Rural Development: Improvement plan of agriculture, livestock, and fisheries including extension credit, system, post harvesting, marketing, etc., shall be conducted in the subprojects.

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.

Flood management in Small Scale Water Resources Development: Human life shall be protected from all the conceivable floods. In reality, complete flood management conditions cannot be realized, and flood management would be improved only in steps both in areal extent and increase level of protection.

Participatory Development Process: At all stages of the subproject, local stakeholders shall be involved or participated in order to formulate the ownership of the subproject for the sustainable O&M.

Income Generation for Weak through the Project Implementation: Specific measures shall be taken to ensure the poor, marginal/small farmers and destitute women benefit from the subprojects.

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

### 5.2 Small Scale Water Resources Development Plan

#### (1) Target Year and Phasing of the Implementation

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 some construction of priority A category subprojects
- Mid Term: by 2010 to implement the priority B category subprojects along with or within the SSWRDSP-3 as much as possible
- Long Term: by 2015 to implement the priority C category subprojects and complete the permissive subprojects proposed

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

Basically the implementation of Master Plan will follow the on the line of SSWRDSP-2 after modification of its procedures.

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:

Highland: The Madhupur Tract area is a typical area of the highland zone. Strategy of SSWRD shall be based on water retentions of the monsoon flood water and rainfall for irrigation during the dry season. The development potential of the pond at the depression of the hill shall be examined.

Medium highland: The medium highland spreads outside of the highland zone in the old Brahmaputra flood plain. Strategy of the SSWRD of the zone shall be based on flood management to reduce damage of *aman* at the beginning of flood season and to drain submerged water for the early re-trans planting *aman* paddy.

Medium lowland: The medium lowland spread outside of the lowland and the young Brahmaputra and Jamuna rivers. The strategy of SSWRD shall be based on flood management to delay the submergence of grown *aman*, and drainage after flooding. Embankment height will be reasonably set.

Lowland: The lowland with inundation depth between 180 and 300 cm spread outside of the Haor area. Because of the inundation depth, flood proofing in this zone is rather difficult without major river flood management, and strategy of SSWRD shall be concentrated mainly on drainage after flood season.

Very lowland (Haor Area): The very lowland zone is the *Haor* area of the old Meghna estuarine flood plain. The strategy of the small scale water resources development shall be mainly concentrated to the drainage acceleration before *boro* cultivation and flood management of early flood.

Paurshavas: In this Master Plan Study, paurshavas areas are excluded from the Study Area.

### (3) Upazila-wise hydrological condition and Development Strategy of SSWRD

#### 1) Atpara Upazila

The Upazila locates at the western border of the haor area, but most of the land classified as medium lowland of Old Brahmaputra Floodplain. Main rivers are the Mogar, Banari, Dhali, Ghora Utra. Tushai and Nurundi rivers, they are mostly silted up. Noted depressions are; Nagara, Ganesh, Kamrail and Dhaliban, and noted beels are; Atashi, Gama, Elsi and Kafanga beels. The annual average rainfall at the nearest BWDB project office at Kendua recorded at 3,230 mm of which 70 % of rainfall concentrates in monsoon season. Most of the land in the Upazila is at the elevation between 5 m to 10 m (PWD).

The SSWRD strategy of small scale water resources development shall be flood management to delay the inundation of grown Aus paddy, and drainage to drain the inundation rapidly for T-aman paddy after flooding. Embankment height of polder will be reasonably set along the border of benefited area.

#### 2) Brhatta Upazila

Main rivers are Dhalai and Kangsha; noted canals are Nalhathi and Aothitpur; noted depressions Kalahogla Beel, Magura Beel, Lungi Beel, Urha Beel, Makra Beel and Naldugi Beel. Most of the land in the Upazila is at the elevation between 1 to 10 m (PWD).

The Upazila locates in 1) haor area (low land) and 2) Old Brahmaputra medium low land flood plain.

The strategy of SSWRD in medium low land in the western part of the Upazila shall be flood management to delay the flooding of grown aus paddy, and drainage to drain the inundation water rapidly after flooding for the aman and boro cultivation. Embankment height of polder will be reasonably set along the border of beneficiary area.

#### 3) Durgapur Upazila

The Garo hills and valleys are on the northern part of the upazila. Main rivers are Someshwari, Kangsa, Old Someshwari. The Upazila is located at the foot of Meghalaya Mountains. The annual average rainfall at the BWDB project office recorded at 3,566 mm of which 73 % of rainfall concentrates in monsoon season. Most of the land in the Upazila is at the elevation between 4 m to 15 m (PWD).



The Upazila locates in the hilly area with 1) Northwestern plains and basins of medium highland and 2) Northern and eastern piedmont of highland. SSWRD strategies in these areas will be as follows:

There are 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. Because of the heavy rain in Indian mountains and rather flat topography causes the flash 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. Also the flush flood management along the rivers is to be considered.

#### 4) Kalmakanda Upazila

The Upazila is mostly covered piedmont area but southeaster corner of the Upazila covered by haor area. The elevation of land varies from 1 m to 15 m (PWD). Main rivers are Someshwari, Gunai; Pakata and Urdha; Bahar Beel is notable

The Upazila locates in 1) hilly area and 2) haor area (low land). SSWRD strategies in these areas will be as follows:

At the hilly area, there are 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. Because of the heavy rain in Indian mountains and rather flat topography causes the 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. Also the fresh flood management along the rivers is to be considered.

On the other hand, the haor area is submerged deeply during monsoon seasons, and dry season become the rice basket with water retained by soils and sometimes by supplemental irrigation. Therefore SSWRD strategies will be fishery and aqua-animals development during monsoon season, and drainage acceleration before Boro paddy cultivation and flood management of the early flood damage mitigation. It will need the combination with the rehabilitation of existing large scale flood control projects. Also appropriate countermeasures shall be considered on the siltation by flood and water logging in the khals and canals which require high cost as a recurrent cost.

#### 5) Kendua Upazila

The Upazila locates at the western border of the haor area extended the Trail haor area, but most of the land classified as medium lowland of Old Brahmaputra Floodplain. Main rivers are the Bauri and Patkura rivers. The annual average rainfall at the BWDB project office at Kendua recorded at 3,230 mm of which 70 % of rainfall concentrates in monsoon season. Most of the land in the Upazila is at the elevation between 3 m to 10 m (PWD).

The Upazila locates in the medium lowland of Old Brahmaputra Floodplain. SSWRD strategies in the medium lowland of Old Brahmaputra Floodplain is as stated in Brhatta Upazil.

#### 6) Khaliajuri Upazila

The Upazila is covered by haor area. Major water bodies in the Upazila are; the Dhanu, Surma, Piyain, Chinai. Pagla, Dharaj, Ruksi, Keuria and Gorail Beels are noted. The annual average rainfall at the BWDB project office recorded at 3,902 mm of which 68% of rainfall concentrates in monsoon season. Most of the land in the Upazila is at the elevation below 5 m (PWD).

The Upazila locates in 1) haor area (low land) and 2) Old Brahmaputra medium low land flood plain. SSWRD strategies in these areas will be as follows:

SSWRD strategies for Haor area is as same as described in Kalmakanda Upazila. Also SSWRD strategies in the medium lowland of Old Brahmaputra Floodplain is as stated in Brhatta Upazil.

Most of the potential subproject area locates inter unions or upazila, consensus formulation among stakeholders shall be carefully arranged by upazila engineers and UDCC. Also the careful coordination with existing BWDB projects on engineering, planning aspects shall be prepared, in case of the potential subproject is within or adjacent to the BWDB projects.

#### 7) Madan Upazila

The Upazila locates at the western border of the haor area extended from Kaliajuri haor area, and western part of the Upazila is classified as medium lowland of Old Brahmaputra Floodplain. Main rivers are the Dhanu, Dhalai, Baruni rivers. The annual average rainfall at the nearest BWDB project office at Kaliajuri is recorded at 3,902 mm of which 68 % of rainfall concentrates in monsoon season. The land in the Upazila is at the elevation between 0.15 m to 10 m (PWD).

The Upazila locates in the medium lowland of Old Brahmaputra Floodplain and haor areas.

SSWRD strategies for Haor area is as same as described in Kalmakanda Upazila.

SSWRD strategies in the medium lowland of Old Brahmaputra Floodplain is as stated in Brhatta Upazil..

#### 8) Mohongonj Upazila

Eastern part of the Upazila is covered by haor area. Major water bodies in the Upazila are; the Nawa, Kangsa, Dhalai Mogra and Cjjela rivers, many beels in haor area such as Makra, Nettle, Bamkumara Bndha, Mathabanga beels. The annual average rainfall at the BWDB project office recorded at 3,356 mm of which 73% of rainfall concentrates in monsoon season. Most of the land in the Upazila is at the elevation below 5 m (PWD).

The Upazila locates in 1) haor area (low land) and 2) Old Brahmaputra medium low land flood plain. SSWRD strategies in these areas will be as follows:

SSWRD strategies for Haor area is as same as described in Kalmakanda Upazila.

SSWRD strategies in the medium lowland of Old Brahmaputra Floodplain is as stated in Brhatta Upazil.

Most of the potential subproject area locates inter unions or upazila, consensus formulation among stakeholders shall be carefully arranged by upazila engineers and UDCC. Also the careful coordination with existing BWDB projects on engineering, planning aspects shall be prepared, in case of the potential subproject is within or adjacent to the BWDB projects.

#### 9) Netrakona Sadar Upazila

The Upazila locates at the western border of the haor area extended from Kaliajuri haor area, and western part of the Upazila is classified as medium highland of Old Brahmaputra River Floodplain. Main rivers are the Kangsha, Dhala, Magra, Teorkhali rivers. The annual average rainfall at the BWDB office at Netrakona is recorded at 3,242 mm of which 70 % of rainfall concentrates in monsoon season. The land in the Upazila is at the elevation between 5 m to 15 m (PWD).

The most of Upazila locates in the medium highland of Old Brahmaputra Floodplain. The silt, clay loam of the zone shows 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 monsoon season and to drain the submerged water rapidly for the early re-trans planting aman paddy after flood season.

#### 10) Purbodha Upazila

The Upazila locates at the western border of the District, and most part of the Upazila is classified as medium highland of Old Brahmaputra Floodplain. Main rivers are the Kangsha, Dhala, Magra, Teorkhali rivers. The annual average rainfall at the nearest BWDB office in Netrakona is recorded at 3,242 mm of which 70 % of rainfall concentrates in monsoon season. The land in the Upazila is at the elevation between 7 m to 15 m (PWD).

The most of Upazila locates in the medium highland of Old Brahmaputra Floodplain. The silt, clay loam of the zone shows 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 logged water rapidly for the early transplanting of aman paddy after monsoon season.

### **5.3 Relevant Sectors' Development Strategies and Plan**

As the nature of SSWRD other sector activities can not involve in the project like those in integrated rural development. It is considered that beneficiary sector activities will be implemented by the other financial resources. However, beneficiary sector development shall be implemented together with small scale water resources development in order to achieve the targets of the Master Plan.

#### **(1) Agricultural Development**

- Improve human nutrition by diversified agriculture
- Focus on profitable farming through higher productivity
- Upgrade of general agricultural technology–Technical packages other than water management will not be obstacle to agricultural production
- Collaborate with other agricultural projects
- Develop Value Added Agriculture
- Develop community-based activities to fulfill basic regional needs for the rural human security
- Develop wide-area based water management: Ex. Multiple function of paddy fields
- Human Resources Development

#### **(2) Fishery Development**

- Encouragement of integrated fish culture
- Introduction of tilapia culture
- Introduction of freshwater prawn culture
- Introduction of freshwater ornamental fish culture
- Conservation of indigenous/natural fish in Beel, Khal, River and Haor
- Propagation of indigenous/natural fish by fish culture

#### **(3) Livestock Development**

- Stability of feed supply
- Development of animal health
- Processing/ slaughtering of animals

#### **(4) Suggestions to Future Development in Agriculture and Livestock**

- Rice Terrace Cultivation in. Haor Area
- Rural Industrial Complex
- Development of vaccination system in rural areas.
- Efficient Irrigation Technology in Highland Area.
- Small Scale Mechanization
- Field Training for Seed Production and Processing for Farmers Own Use.
- Development of Rural Recycling in Farming System
- Integrated forestry-livestock farming
- Development of market information system for fish and fresh vegetables
- Human Resources Development

### **5.4 Priority Programs**

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

#### **(1) Collaboration and Coordination among Stakeholders**

Collaboration works with relevant government agencies are strongly expected to the implementation of SSWRD Project. National, district and Upazila level government agencies coordination committees should be maintained to achieve multiplication effects of the Project.

#### **(2) Strengthening of Local Government Engineering Department**

In order to support smooth implementation of daily works of the Project office equipment and facilities will be improved at District and Upazila level offices. This includes transportation vehicles,

computer and peripherals/software, photocopy machines, etc.

### (3) Capacity Building of the Local Government Level Technical Officers

There are not enough water resources development planners/engineers in LGED, especially at district and upazila level. Technical training program shall be considered to strengthen the capacity of local government level officials of LGED for planning and implementation of SSWRD.

### (4) Water Management Associations

In order to maintain the sustainability of SSWRDP sub-projects, capacity building of WMA members is indispensable. In parallel with training of WMA members, national level association of WMAs will be formulated to exchange experiences and information among individual WMAs for better activities of WMAs.

### (5) GIS and IT

At present, the GIS coordination system between WARPO and LGED is deferent. Standardization is required for exchanging information of GIS. Inventory of water bodies and existing projects under the NWRD is no completed yet. It needs to formulate nation wide inventory survey of water resources among stakeholders under the coordination of WARPO.

## **5.5 Implementation Plan (Action Plan)**

### (1) Project Implementation

The Project aims to achieve the sustainable agriculture and improve the farmers' living conditions through increase of agricultural production and resources mobilization in the Project Area. The Project consists of two major components; 1) SSWRD Subprojects and 2) Priory programs. Considering the similarity of interventions, implementation arrangement of SSWRDSP-2 will be applied for the Project with improvement, if appropriate. The Project is basically assumed to be implemented by the Bangladesh Government budget with external financial support.

### (2) Executing Agencies

The LGED will be the executing agency of the Project. The project management office (PMO) will be established at LGED headquarters. The major functions of the PMO are: i) coordination of agencies concerned, ii) preparation of overall implementation plan, annual project work plans and budget, 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, 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.

Under close guidance and supervision of the PMO, LGED district offices will be responsible for the day-to-day implementation at the subproject level with assistance from the upazila offices. The LGED district Executive Engineer will act as Subproject Manager and 1) prepare individual subproject implementation with stakeholder participation, 2) coordinate with other agencies and organizations, 3) support organization of WMAs, 4) carry out field surveys, 5) supervise construction activities and make payments to contractors, and 6) monitor and report subproject development to the PMO.

At National Level, Inter-ministerial Coordination Committee (IMCC) shall coordinate the agencies for smooth implementation of the Project. District-level Small-scale Water Resources Development Committees (DSSWRDCS) will meet when required to coordinate the activities of the district level Government agencies. MOLGRDC will issue an order requiring the Upazalial Development Coordination Committee (UDCC), composed of the union chairpersons and upazila-level officials, to put the review of subproject progress on the agenda of all 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.

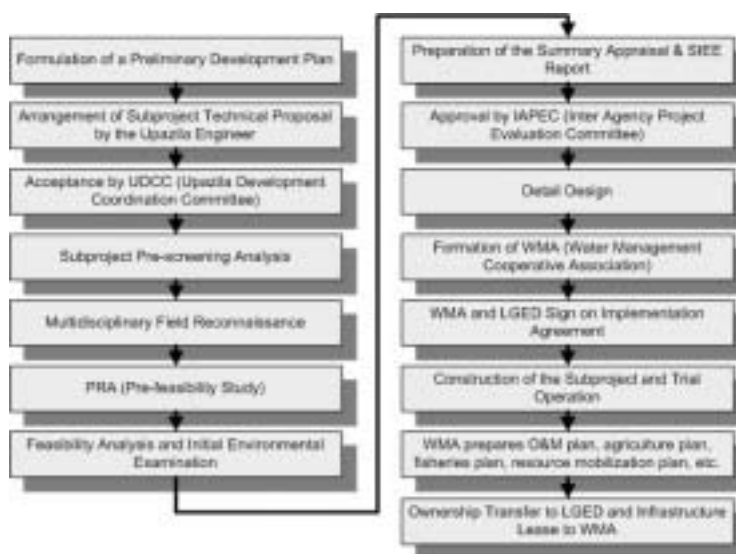
### (3) Implementation Plan

#### 1) Implementation Procedures

Identification and appraisal process for an individual sub-project on SSWRDSP-2 set by the LGED are as indicated in the diagram.

#### 2) Subproject Implementation

The high priority subprojects, after prioritization, 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 priority, some upazila has no subproject and some upazila concentrate more than 3 subprojects. To avoid these cases, SPs were selected based on higher prioritized subprojects in the upazila.



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

- Short term* (2 years): 10 Category A subprojects of the highest in each upazila
- Medium term* (3 years): 17 Category B subprojects of the secondary highest in each upazila
- Long term* (5/4 years): 39 Category C subprojects of the thirdly highest in each upazila

Civil works of subproject will be contracted with local contractors under local competitive bidding (LCB) under the standard LGED procurement procedures. Small scale earthwork contracts with labour contracting societies (LCSs).

After completion of the sub-project construction, WMA conduct O&M and management under guidance of Upazila Engineer office for one year. After one year, O&M committee of WMA takes responsibility of subproject O&M. WMA bare the O&M expenses by collecting fees, based on the investment cost of subproject, from WMA members.

Implementation schedule of the whole Project component are indicated in the following chart.

Phase	Short Term		Medum Term			Long Term					Total
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
<b>Small Scale Water Resources Development (No. of Subproject)</b>											
Netrokona	4	6	5	6	6	9	11	11	8		66
Study Area Total	25	33	29	33	37	45	49	51	48	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											

### 3) Subproject Investment Costs

Subproject investment cost of 66 subprojects in the District is estimated at Tk. 656.2 million, based on the unit rates of SSWRDSP-2. Their breakdowns by the short, medium and long term periods are summarized as follows:

Terms	Total Number of SP	Total Gross Area (ha)	Average Gross Area (ha/SP)	Investment Costs in Tk. '000'				
				Earthworks	Structures	Total Construction	Land Acquisition	Total Investment
Short Term	10	4,932	493	29,297	53,400	82,697	2,560	85,257
Medium Term	17	5,287	311	57,586	69,772	127,358	21,536	148,894
Long Term	39	17,608	451	143,555	237,200	380,755	41,270	422,025
Total	66	27,827	422	230,438	360,372	590,810	65,366	656,176

Notes: \*direct investment costs only, not including engineering service, contingencies, price escalations etc.

## Chapter 6 Further Activities Required at Upazila Level

Potential subprojects identified and prioritized through surveys under the Study are only at the initial stage of the whole procedure. The Upazila Engineers are required to take necessary measures to mature the technical proposals of these subprojects. In this process, emphasis should be put on potential subprojects with higher priority. At the actual proposal preparation stage, some of them will be selected and requested as subprojects for SSWRDSP-2.

### 6.1 Union Level

The potential subproject appeared through the discussion with UP members and representatives of villagers. It is necessary to discuss among the potential stakeholders at union level to confirm the needs and get the consensus among stakeholders to the potential subproject. It is recommended to conduct the PRA among stakeholders as the JICA Study team demonstrated in Medni Unions of Netrakona Sadar Upazila in the District. During the formulation of consensus of the potential subproject, technical assistance will be required from the upazila engineer's staff. The proposal will be discussed and authorized at UP meeting for submission to Upazila Engineer.

### 6.2 Upazila Level

After the approval of the prioritized potential subproject list, the upazila engineers are expected to start the technical support for the stakeholders' discussions/workshops in the union level for the preparation of the technical proposal to submit to District LGED executive engineers.

**Table 1.1 Outline of National Water Policy (NWPo)**

Issues	Description
<i>River Basin Management</i>	The government will work with co-riparian countries to establish a system for exchange of information and data on relevant aspects of hydrology, morphology, water pollution, ecology, changing watershed characteristics, cyclone, drought, flood warning, etc., and to help each other understand the current and emerging problems in the management of the shared water sources.
<i>Planning and Management of Water Resources</i>	<ul style="list-style-type: none"> <li>• WARPO will prepare, and periodically update, a NWMP addressing the overall resource management issues in each region and the whole of Bangladesh.</li> <li>• Sector agencies of the government and local bodies will prepare and implement sub-regional and local water-management plans in conformance with the NWMP and approved government project appraisal guidelines. The Executive Committee of the National Water Resources Council (ECNWRC) will resolve any interagency conflict in this regard.</li> <li>• BWDB will implement all major surface water development projects and other FCDI projects with command area above 1,000 hectares. <b>The Local Government will implement FCDI projects having a command area of 1,000 hectares or less after identification and appraisal through an interagency Project Appraisal Committee.</b> Any interagency dispute will be resolved by means prescribed by the government</li> </ul>
<i>Water Rights and Allocation</i>	<ul style="list-style-type: none"> <li>• In general, the priority for allocating water during critical periods in the water shortage zones will be in the following order: domestic and municipal uses, non-consumptive uses (e.g. navigation, fisheries and wild-life), sustenance of the river regime, and other consumptive and non-consumptive uses such as irrigation, industry, environment, salinity management, and recreation. The above order of priority could however be changed on specific socio-economic criteria of an area by local bodies through local consensus.</li> <li>• The government may empower the local government or any local body it deems fit, to exercise its right to allocate water in scarcity zones during periods of severe drought, and it will monitor the water regime and enforcement of the regulations through specifically designed mechanisms.</li> </ul>
<i>Public and Private Involvement</i>	<ul style="list-style-type: none"> <li>• The management of public water schemes, barring municipal schemes, with command area up to 5,000 ha will be gradually made over to local and community organizations and their O&amp;M will be financed through local resources.</li> <li>• Public water schemes, barring municipal schemes, with command area of over 5,000 ha will be gradually placed under private management, through leasing, concession, or management contract under open competitive bidding procedures, or jointly managed by the project implementing agency along with local government and community organizations.</li> <li>• <b>Ownership of FCD and FCDI projects with command area of 1,000 ha or less will gradually be transferred to the local governments,</b> beginning with the ones that are being satisfactorily managed and operated by the beneficiary/ community organizations.</li> </ul>
<i>Public Water Investment</i>	<ul style="list-style-type: none"> <li>• Planning and feasibility studies of all projects will follow the <b>Guidelines for Project Assessment (GPA)</b>, the <b>Guidelines for People's Participation (GPP)</b>, the Guidelines for Environmental Impact Assessment (EIA), and all other instructions that may be issued from time to time by the government.</li> <li>• <b>Interests of low-income water users, and that of women, are adequately protected in water resource management.</b></li> </ul>
<i>Water Supply and Sanitation</i>	<ul style="list-style-type: none"> <li>• <b>Preserve natural depressions and water bodies in major urban areas for recharge of underground aquifers and rainwater management.</b></li> <li>• Mandate local governments to create awareness among the people in checking water pollution and wastage.</li> </ul>
<i>Water and Agriculture</i>	<ul style="list-style-type: none"> <li>• <b>Improve efficiency of resource utilization through conjunctive use of all forms of surface water and groundwater for irrigation and urban water supply.</b></li> <li>• Strengthen crop diversification programs for efficient water utilization.</li> </ul>
<i>Water and Industry</i>	Standards of effluent disposal into common watercourses will be set by WARPO in consultation with DOE
<i>Water and Fisheries and Wildlife</i>	<ul style="list-style-type: none"> <li>• <b>Water bodies like baors, haors, beels, roadside borrow pits, etc. will, as far as possible, be reserved for fish production</b> and development. Perennial links of these water bodies with the rivers will also be properly maintained.</li> <li>• Water development plans will not interrupt fish movement and will make adequate provisions in control structures for allowing fish migration and breeding.</li> </ul>
<i>Water and Navigation</i>	<ul style="list-style-type: none"> <li>• Water development projects should cause minimal disruption to navigation and, where necessary, adequate mitigation measures should be taken.</li> <li>• Minimum stream-flows in designated rivers and streams will be maintained for navigation after diversion of water for drinking and municipal purposes.</li> </ul>
<i>Water for Hydropower and Recreation</i>	Recreational activities at or around water bodies will be allowed provided it is not damaging to the environment.
<i>Water for the Environment</i>	<ul style="list-style-type: none"> <li>• Give full consideration to environmental protection, restoration and enhancement measures consistent with the National Environmental Management Action Plan (NEMAP) and the NWMP.</li> <li>• Adhere to a formal environmental impact assessment (EIA) process, as set out in EIA guidelines and manuals for water sector projects, in each water resources development project or rehabilitation program of size and scope specified by the Government from time to time.</li> <li>• Protect against degradation and resuscitate natural water-bodies such as lakes, ponds, beels, khals, tanks, etc. affected by man-made interventions or other causes.</li> </ul>
<i>Preservation of Haors, Baors, and Beels</i>	<ul style="list-style-type: none"> <li>• Haors that naturally dry up during the winter will <b>be developed for dry season agriculture.</b></li> <li>• Take up integrated projects in those <b>water bodies for increasing fish production.</b></li> </ul>
<i>Economic and Financial Management</i>	<ul style="list-style-type: none"> <li>• <b>Water charges realized from beneficiaries for O&amp;M in a project would be retained locally for the provision of services</b> within that project.</li> <li>• <b>Effective beneficiary participation and commitment to pay for O&amp;M will be realized at the project identification and planning stages by respective public agencies.</b></li> </ul>
<i>Research and Information Management</i>	Develop a central database and management information system (MIS) consolidating information from various data collection and research agencies on the existing hydrological systems, supply and use of national water resources, water quality, and the eco-system.
<i>Stakeholder Participation</i>	<ul style="list-style-type: none"> <li>• The "<b>Guidelines for People's Participation (GPP) in Water Development Projects</b>" be adhered to as part of project planning by all institutions and agencies involved in public sector management of water resources.</li> <li>• Guidelines for formation of water user groups (WUG) and similar community organizations will be formulated.</li> <li>• <b>Generally 25 % of the earthwork of any public water project will be offered to specific target groups or beneficiaries.</b></li> <li>• New projects proposed by a community or local institution will be considered for implementation on a priority basis only when the beneficiaries have mobilized a certain percentage of the total cost as their contribution to the project.</li> </ul>

Table 4.1 Subprojects Proposed to SSWRDSP-2 in Netrakona District

Upazila	Union	No. of SP	Proposed Subproject Name	Pre-screen	Reconnaisance	FRA	Approval	Upazila	Union	No. of SP	Proposed Subproject Name	Pre-screen	Reconnaisance	FRA	Approval		
Dangapar	Baska	5	Const. of Bundh from Kaniol to Khatsipara	X				Kaniol	Arlapa	2	Re-exon Baghi-Jalira Khal from Baghi Beel	X					
			Const. Bundh in Barua, W/1 Baniapara-Chatabi	X							Baghi Khal Subproject	Passed	X				
			Const. Emb. from Ho Daku Roy W/1 Sokolpur-Chatabi	X							Chirang-Rajkhal DR Subproject	X					
			Khanigang W/1 Bonga to Patahkhali DR & WC	Passed	Fail						Re-exon of Barla Khal	X					
			Nakar Khal (Bhulgua) DR & WC Subproject	X							Re-exon of Bidla Khal	X					
	Bucklegat	1	Mokujara Khal Subproject	Passed	Passed	Passed	?		Chirang	7	Re-exon of Cutli Mara Beel	X					
	Chondighar	5	Const. of Bundh upto Santoshi Khal Regulator	X							RE-exon of Kaniol Chaura Khal	X					
			Const. Bundh from Siddi Khat's Land to Abaholpar	X							Re-exon of Kurigha Khal	X					
			Const. Bundh from Baniapara A/O to Madrasa-Teligara	X							Re-exon of Mirra Beel Khal	X					
			Nalakhali Khal-Ghuggur FMD Subproject	X							Palashree River Subproject	Passed	X				
Kullagara	3	Satohi River-Nikhil Khal FMD	X				Mojibapur	8	Adula Beel DR Subproject	X							
		Const. Bundh from Ho Haran Ali to Maggara Beel	X						Banagali Ghoghhal DR Subproject	X							
		Re-exon ho Nahi Hassan-Chata Beel & a Regulator	X						Const. Emb. from Ganagali Nodi to Majidapur	X							
Kishnapur	5	<b>Bipangon-Chinabul Beel Subproject</b>	Passed	Passed	Passed	Passed			Ranganab-Madharia DR Subproject	X							
		Const. Emb. along Sarma B. Zidpur to Baniapara	X						Mojibapur-Dhala Subproject	Passed	X						
		Const. Emb. from Shyamgar to Ubbishali	X				Re-exon of Khal from Koyra Beel to Borna River	X									
		Const. Emb. from UP Office to Daulatpur	X				Re-exon of Khal from Anubula Beel to Sub River	X									
		Hogly, Jurket and Chaitanya Beel FMD	X				Re-exon of Rajkhal from Chaitanya to Raj River	X									
Kulapur	Mendipur	8	Kuluar Khal Subproject	Passed	Passed	Passed	In Process	Roaibari	1	Re-exon Manjal Beel Khal	X						
			Ardahbeel & Patisa Beel FMD Subproject	X						Jahangpur	2	Bakhal Subproject	?				
			Const. Emb. from Bakujan Beel to Borna Beel	X								Changara Subproject	?				
			Const. of Emb. from Bishari to Thalapara	X								Fahapur	1	Rubber Dam on Magra River	X		
	Const. of Mendipur Saker Jungle Embankment	X				Katal	1	Digha Beel Subproject	Passed	X							
	Const. of Modakbar Bundh	X						Madan	4	Bala Ferry Ghat Bribankarab Subproject	Passed	X					
	Const. of Selgona Jargokanama Embankment	X				Chhaytura-Kulid Subproject	Passed			Passed	Passed	In-process					
	Jhalakhal Khal Subproject	Passed	Passed	Passed	In Process	Gangaganar CAD Subproject	Passed			Passed	?						
Kalnia Beel (Hajpur) DR Subproject	X				Kapatala CAD Subproject	Passed	Passed			?							
Nagi	8	Const. of Embankment Acangur Khal	X				Meharajpur	Baralancha	2	Madhura Khal Subproject	X						
		Const. of Embankment Utappur Bazar to Dheper Khara	X							Mota Beel & Rajkhal Subproject	X						
		Const. of Embankment Khushalpur to Chingur	X					Katal Bank	1	Dabkhila River Subproject	Passed	X					
		Const. of Bundh over Sheikh Khal	X							Gajapur	1	Jalapur Manabadi Subproject	X				
		Const. of Chela Nodi Embankment	X					Shikhal	3	Dubkhila Subproject	Passed	X					
		Const. of Emb. from Changur to Madhan	X							Hemantpur FMD Subproject	Passed	X					
		Const. of Emb. from Hajipur to Khusaipur	X							Kanapa Subproject	?						
		Const. of Pasa Barchaner Embankment	X					Suar	1	Dhala River Subproject	Passed	Fail					
Jaharabidhala-Gondola DR Subproject	X				Testaha	2	Downaja River Subproject			Passed	Passed	Passed	Passed				
Reka Bazar-Gobidapur FMD Subproject	?								Kat Beel Subproject (WC)	Passed	Passed	Passed	In Process				
Kamarkanda	8	Chaitanya Manabadi DR Subproject	X				Meharajpur	Arlapa	9	Baghi Khal WC Subproject	X						
		Const. Emb. from Borna Bazar to Barla	X							Gagra and Sagartha Beel FMD Subproject	X						
		Const. Emb. from Borna Bazar to Bhoga River	X							Jagar Khal (Kambaj Beel) WC Subproject	X						
		Const. Emb. from Kallhala School to Kalmakanda	?							Fakara Haru DR Subproject	X						
		Const. Emb. from Nagpara to Nagpara	X							Katalbhal Khal (Goga Beel) WC Subproject	X						
		Gama Beel FMD Subproject	X							Katalbhal Khal (Goga Beel) DR Subproject	X						
		Nagpara Nodi DR Subproject	X							Rangada Khal Subproject	Passed	X					
		Shalider, Kachra, Ahameek Khal, Falban FMD	X							Napthal Khal DR & WC Subproject	X						
	Khamsi	2	Bamangara Barchaner FMD Subproject	?					Re-const. Emb. Baniapara-Gorakhar (Sagartha Beel)	X							
			Kachyana-Mangalshree FMD Subproject	X					Beel Gazabag WC Subproject	X							
	Kotli	14	Const. of Bundh from Harigali Khal to Bano Nodi	X					Katal	3	Duhali Beel DR Subproject	X					
			Const. of Bundh of Baniapara W/1 Abdul Ali-Kamal Mia	X							Furaj Beel FMD Subproject	X					
			Const. of Bundh from Pagla Ferry Ghat to Nowgana	X							Baleshree Nodi DR & WC Subproject	X					
			Const. of Bundh W/1 Syed Maman-Chaitanya Bazar	X					Kalia	8	Const. Muktajana Bazar-Gambha Emb.-cum-Road	X					
Const. Dulai Beel Bundh from Pokuia to Kaniolpara			X				Dulai Beel, Madhonia Baniapara Beel Khal DR & WC	X									
Const. Emb. at Borna Village			X				Kamakhal, Kamsakhal & Gama Khal WC Subproject	X									
Kannabandi	Langara	Const. Emb. at Samara Ghat	X				Meharajpur	Kalia	Gobragati	3	Kamakhal Khal & Gama Khondra DR & WC	X					
		Const. Emb. No Suthul Baba to Midly Road	X								Maha & Hogly Beel DR Subproject	X					
		Const. Emb. from Baniapara to Agona	X								Saha Khal WC Subproject	X					
		Const. Emb. from Kaniolpara to Pabai Shalim Road	X								Dornahala Bazar to Kanespur Khal DR & WC	X					
		Const. Emb. from Kotli Bazar to Pagla Ph. School	X								Madanpur	3	Dhanakhal Beel DR Subproject	X			
		Const. Emb. from Pokuia to Bhoga River	?										Kaya Beel DR Subproject	X			
		Construction of Deba Beel Bundh	X								Medri	1	Khana Khal DR & WC Subproject	Passed	Passed	Passed	Passed
		Rukhsh-Besuna Nodi DR Subproject	X										Maugli	8	Krishakhal & Kirokhal Subproject	Passed	Passed
		Langara-Gonshree FMD Subproject	X								Chal Beel DR Subproject	X					
		Danis River FMD Subproject	X								Dhala Nodi & Khal DR & WC Subproject	X					
		Kama Parbachi Beel FMD Subproject	X								Dupkhali Nodi & Khal (Chal Beel) DR Subproject	X					
		Kandapara-Kajra FMD Subproject	X								Magara Beel DR Subproject	X					
		Ranspur-Kantapur FMD Subproject	X								Moga Beel DR Subproject	X					
		Const. Emb. from Amban Bazar to Puljara	X								Nowgana Khal (Kawa) DR Subproject	X					
Const. Emb. from Gonia Bazar to Majjanga	X				Singer	7	Chingra Beel DR & WC Subproject	X									
Const. Emb. Rangajen Ferryghat to Chaula Bazar	X						Ghaghra Khal DR & WC Subproject	Passed	X								
Const. Emb. from Subpaker W/1 to Chaula Bazar	X						Hankhal Khal, Jal Ghaghra Beel DR & WC	X									
Const. Emb. Rangajen Ferryghat to Box Beel	X						Kaduka Khal DR & WC Subproject	X									
Pagla	7	Dhala Khal at Puljara DR Subproject	X				Singer	7	Krishakhal, Jal Ghaghra Beel, Rangra Beel DR & WC	X							
		Kuljanga Khal-Nara Beel DR Subproject	X						Pulbhata Khal, Jal Ghaghra Beel DR & WC Subproject	X							
Nangali	2	Re-exon of Jhanjhan Khal	X				Suth	Bhola	8	<b>Fazer Ali Khal Subproject</b>	Passed	Passed	Passed	Passed			
		Re-exon of Mahela Khal	X							Aly Beel WC Subproject	Passed	X					
Kaniol	5	Const. of Gopalnagar Embankment	X				Suth	Bhola	8	Const. of Gopalnagar Embankment	X						
		Hobukha Beel WC Subproject	X							Hobukha Beel WC Subproject	X						
		Bopara Beel DR Subproject	X							Bopara Beel DR Subproject	X						
		<b>Owli Beel Subproject</b>	Passed	Passed	Passed	Passed											
3	16	75															



**Table 4.2 Qualified Potential Subprojects with Prioritization in Netrakona District (1/4)**

Upazila	Union Proposed	SP_ID	Title	Type	Gross Area (ha)	BWDB Project	Implementation as SP for SSWRD	
							Pri- o- rity	Remarks
Alpara	Sarmaisa	37204010	Pagla Beel SP	FMDI WC	532	None	A	
	Sonai	37204020	Monsurpur Embankment SP	FMDI	211	None	B	
	Sonai	37204030	Kawakhali Embankment SP	FMDI	365	None	B	
	Loneswar	37204040	Loneswar Embankment SP	FMDI WC	455	Not Functioning	C	
	Sukhari	37204070	Karimkhali Khal and Tarachapur-Gajra Embankment SP	FMDI	362	None	C	
	Baniajan	37204080	Baniajan Embankment SP	FM	388	None	C	
	Duaz	37204050	Ichamoti - Nurundi Khal SP	FMDI WC	919	None	D	Further examination to be required
	Duaz	37204060	Nasir Khali Khal SP	FMDI WC	289	None	D	Further examination to be required
Barhatta	Asma	37209090	Asma - Bagmara - Ujangaon - Rauha Beel SP	DI	690	Suigar Bundh Beel	A	
	Bausi	37209030	Dauki beel - Noa beel - Hara beel SP	DI	912	Suigar Bundh Beel	C	
	Roypur	37209010	Fakirabazar - Tegharia Bazar Embankment SP	FM	1,112	None	D	Further examination to be required
	Bausi	37209020	Kewrasi - Chandpur SP	FM	304	Suigar Bundh Beel	D	Further examination to be required
	Shahata	37209060	Gopalpur - Machihala SP	CAD	421	None	D	Further examination to be required for low lift pump O&M by beneficiaries
	Singdha	37209081	Singdha chowrasta bazar - Chandrapur, Alokdia - Dharan Bridge, Singdha primary school - Bhatipara bridge Embankment SP	FM	590	None	D	Further examination to be required
	Chhiram	37209050	Gangajuri - Shengram - Raoha beel - Chiram bazar khal - Kaunai river - Dubakhali - Chengram - Moshkali Haor Area SP	DIW C	1,285	Suigar Bundh Beel	L	Benefited area more than 1,000 ha
	Barhatta	37209070	Please Refer to SP 37263010 of Mohanganj/Netrakona					
Durgapur	Gaokandia	37218050	Someswani river embankment SP	FM	743	None	A	
	Durgapur Sadar.	37218021	Chandiaghona Mayanagar - Minkifande amol - Farangpara SP	WC	785	None	B	
	Kakaigara	37218070	Balach River (Bayra-Ura to Dakshin Lakshmipur) and Kolorja - Dewtokon via Gondaber Embankment SP	FMW C	781	River protection by BWDB	C	
	Kullagora	37218010	Bongal Khal SP	FM	630	None	C	
	Birishre	37218030	Nalia Khal- Kharogaon River SP	DIW C	512	Someswari Bank Protection	D	Further examination to be required
	Bakaljora & Birishre	37218060	Norikhali - Khabor, Lahirhi khal SP	DIW C	2,189	Someswari Bank Protection	L	Benefited area more than 1,000 ha
	Chandigarh	37218023	Kamarkhali river embankment SP	FM	1,254	None	L	Benefited area more than 1,000 ha
	Durgapur & Kamalanda	Chandigarh & Lengura	37218022	Atraikhali, Kowbari river embankment SP	FM	3,124	None	L
Khaliajuri		Chakua	37238010	Surania-Dalimati (Chowtara) embankment SP	FM	289	Submersible embankment constructed by WDB & LGED	A
	Mendipur	37238020	Dulni-Ziakora Khal SP	DIW C	706	BWDB embankment to the northwest of the project area	B	
	Mendipur	37238030	Dhopundha Khal SP	DIW C	468	None	C	
	Mendipur	37238040	Ramchandra Ghonar Khal SP	DIW C	339	None	C	

**Table 4.2 Qualified Potential Subprojects with Prioritization in Netrakona District (2/4)**

Upazila	Union Proposed	SP_ID	Title	Type	Gross Area (ha)	BWDB Project	Implementation as SP for SSWRD	
							Prio rity	Remarks
Khaliajuri	Mendipur	37238051	Purba Jagannathpur SP	FM	79	BWDB embankment to the southwest of the project area	D	Further examination to be required
	Mendipur	37238052	Birbillah Bandh SP	FM	72	None	D	Further examination to be required
	Khaliajuri	37238060	Pangasia-Lakkipasha SP	DIWC	619	Proposed sluice gate but not yet approved.	D	Further examination to be required
	Khaliajuri	37238070	Baolai Khal SP	DIWC	529	Embankment, Regulator	D	Further examination to be required
	Khaliajuri	37238080	Chinamara-Bijoypur SP	DIWC	517	None	D	Further examination to be required
	Krishnapur	37238091	Ghorabhanga beel, Chapta Beel, Chandrakuna beel , Digha beel, Chatal beel, Gangia beel SP	DIWC	568	FC embankment outside the north boundary of the project area along the right bank of Surma River	D	Further examination to be required
	Krishnapur	37238092	Sonkatir Beel, Gatua Beel, Gangabadar Beel, Kura Beel, Khatua Beel, Gangni Beel, Hason Bhanga Beel, Ugli Beel, Chatla Beel SP	DIWC	678	FC embankment outside the north boundary of the project area along the right bank of Surma River	D	Further examination to be required
	Krishnapur	37238093	Jupa Beel, Jagaddair Beel, Chatla Beel SP	DIWC	585	FC embankment outside the north boundary of the project area along the left bank of Surma River	D	Further examination to be required
	Nagar	37238102	Chala River, Kunna Beel, Lamba Beel, Gautta Beel, Koia Beel SP	DIWC	708	None	D	Further examination to be required
	Nagar	37238103	Koia Beel, Kamaira Beel, Bora Beel, Upa Beel, Kadirpur Beel, Putia Beel SP	DIWC	851	None	D	Further examination to be required
	Nagar	37238104	Sibpur Beel, Boro Beel SP	DIWC	430	None	D	Further examination to be required
	Gazipur	37238110	Panch Hat Embankment SP	FMDIWC	662	None	D	Further examination to be required
	Nagar	37238101	Chala River, Ginari Beel, Mior Beel, Ujan Beel SP	DIWC	1,237	2 km long FC Embankment along the left bank of ChalaRiver	L	Benefited area more than 1,000 ha
Kalmakanda	Nazirpur	37240050	Bakla - Ulukanda-Koir River SP	DI	949	None	A	
	Kailati	37240090	Pukuria-Shampur khal SP	FMWC	805	Someswari Embankment	B	
	Kalmakanda Sadar	37240070	Kalihala river embankment SP	FMWC	766	Kalihala Right Embankment	C	
	Kailati	37240100	Bhogai river excavation SP	FMWC	962	None	C	
	Bara Kharpan	37240110	Jatrabari khal -Jangia beel closure subproject	FMWC	853	None	C	
	Bara Kharpan	37240120	Rica bazar - Bariundha bazar embankment subproject	FM	546	BWDB Regulator	C	
	Pogla	37240131	Gumai - Sholi River, Bakla - Ubdakhale River Embankment SP	FMWC	1,112	None	C	
	Lengura	37240020	Ganeshware river embankment SP	FMWC	690	None	D	Further examination to be required
	Kharnai	37240030	Mongolshwari - Galachara embankment SP	FM	405	None	D	Further examination to be required
	Rangchhati	37240040	Teratopa - Jhorjhira Embankment and Mehadeu River-Kalihala River - Dayer Bazar North Embankment SP	FMWC	358	Mahadeo River Embankment BWDB Regulator	D	Further examination to be required
	Nazirpur	37240060	Ulukanda River - Ulakanda - Panchakatha Dead River - Ulakanda - Shibnagar Khal SP	DIWC	555	None	D	Further examination to be required
	Kalmakanda Sadar	37240080	Roghurampur - Bishorpasha embankment SP	FMWC	1,311	Kalihala Right Embankment	L	Benefited area more than 1,000 ha
	Lengura	37240010	Please Refer to SP37218022 of Durgapur/Netrakona					

**Table 4.2 Qualified Potential Subprojects with Prioritization in Netrakona District (3/4)**

Upazila	Union Proposed	SP_ID	Title	Type	Gross Area (ha)	BWDB Project	Implementation as SP for SSWRD	
							Priority	Remarks
Kendua	Noapara	37247231	Bahrail Beel SP	DI	165	None	A	
	Garadoba	37247110	Sutikhali & Dhayel Khal SP	DIWC	332	None	B	
	Balaishimul	37247160	Jawla, Shouljan & Kichuria Beel SP	FMDI	199	None	B	
	Chirang	37247190	Gorkai Khal SP	DI	703	None	B	
	Muzafferpur	37247210	Sunui Haor Embankment SP	FMDI	361	Sukhajuri-Be tai SP	B	
	Roailbari	37247060	Masuil Beel SP	DI	176	None	C	
	Roailbari	37247070	Chapar Khal and Koch-Koicha Beel SP	DI	342	None	C	
	Paikura	37247080	Shariya, Balia & Shingroil Beel SP	FMDI	720	None	C	
	Noapara	37247232	Baora Beel SP	DI	97	None	C	
	Mashka & Roaibari	37247100	Shuchia Beel & Kaithkirmar Khal, Nuneswari Beel SP	FMDI	1,119	None	C	
	Asujia	37247140	Chatal Beel SP	FM	387	None	C	
	Balaishimul	37247150	Chowka & Jugni Beel SP	DI	456	None	C	
	Kandiura	37247180	Amasheya Beel SP	FMDI	718	None	C	
	Muzafferpur	37247200	Jaliar Haor Embankment SP	FMDI	950	Sukhajuri-Be tai SP	C	
	Noapara	37247170	Ghokra Khal - Dhalibandh Khal SP	FMDI	359	None	D	Further examination to be required
Ganda & Sandikona	37247040	Birandrapuri, Bahi & Balki Beel, Khela beel, Batya Mora River SP	FMDI	1,431	None	L	Benefited area more than 1,000 ha	
Kendua & Gauripur	Asujia & Balaishimul & Dalpa & Ganda & Garadoba & Maoha	37247130	Bhugiar Beel, Guddiar Beel, Pateswari River, Nopai Beel, Nopai & Chowpa Beel, Kojani-Sorishati Khal SP	FMDIWC	4,386	None	L	Benefited area more than 1,000 ha
Medan	Madan	37256090	Ganganagar and Kapashatia Khal SP	DIWC	492	FC embankment to the south of the project area along the right bank of Bali River	A	
	Changaon	37256040	Shahpur Chowrabari Changaon SP	FM	394	One regulator at Ratnapur +4 pipe sluice.	B	
	Nayekpur	37256020	Bashuri Molajan SP	FMWC	288	None	B	
	Nayekpur	37256030	Nargilla-Magoria SP	FMWC	569	None	C	
	Kaitail	37256010	Dhiga Beel SP	DIWC	249	One regulator at Boro khal.	C	
	Madan	37256100	Bali-Chelai River SP / Bali Ferry Ghat to Bribarikandi SP	FMDI	744	FC embankment to the south of the project area along the right bank of Bali River	C	
	Gobindasri	37256110	Bauch Kanda SP	FMWC	423	None	C	
	Madan	37256120	Boalia Bora Beel SP	FM	499	None	C	
	Changaon	37256050	Kha Beel SP	WC	382	None	D	Further examination to be required
	Tiasree	37256060	Chikni Beel SP	FM	221	None	D	Further examination to be required
	Tiasree	37256070	Badruli Duliujan SP	FMDI	184	None	D	Further examination to be required
	Fatehpur	37256080	Fatehpur Rubber Dam SP	WC	845	None	D	Further examination to be required

**Table 4.2 Qualified Potential Subprojects with Prioritization in Netrakona District (4/4)**

Upazila	Union Proposed	SP_ID	Title	Type	Gross Area (ha)	BWDB Project	Implementation as SP for SSWRD	
							Priority	Remarks
Mohonganj	Gaglajore	37263060	Katchador Khal SP	WC	780	Hajda Embankment Sub-Project.	A	
	Tentulia	37263070	Kur Beel SP	WC	191	Hajda Embankment Sub-Project.	B	
	Barokashia Birampur	37263030	Madhupur Khal SP	DI	309	Hajda Embankment Sub-Project	C	
	Suair	37263080	Maida Beel SP	DI	230	None	C	
	Suair & Samaj Sahildeo	37263020	Rajkhali - Dhalai River SP	FMDIWC	3,463	None	L	Benefited area more than 1,000 ha
	Baratali Banihari	37263040	Dattakhila River SP	WC	1,775	Hajda Embankment Sub-Project	L	Benefited area more than 1,000 ha
	Gaglajore & Tentulia	37263050	Bethai - Mora Kangsa River SP	WC	2,613	Hajda Embankment Sub-Project.	L	Benefited area more than 1,000 ha
Mohonganj & Barhatta	Barokashia Birampur & Barhatta	37263010	Orai Khal - Shatia Beel - Ghoraugra River, Tunra beel - Swalpa Dauladpur - Bori, Nayapara, Goraund SP	DIWC	3,474	Hajda Embankment Sub-Project Chandrapur Embankment	L	Benefited area more than 1,000 ha
Netrakona Sedar	Maugati	37274020	Kaisnar beel - Bawal Beel SP	DI	239	Kangsha River SP	A	
	Kailati	37274070	Alongir Khal and Embankment SP	FMDI	385	None	B	
	Lakshmiganj	37274120	Ghagra Khali Khal and Embankment SP	FMDI	591	None	B	
	Madanpur	37274130	Saiduly River Embankment SP	FM	251	None	B	
	Rauha	37274030	Mana, Gudia, Digha, Kanta Beel SP	FM	584	None	C	
	Challisha	37274040	Guingajuri Khal and Embankment SP	DIWC	1,022	None	C	
	Dakshin Bishura	37274050	Aily Beel SP	FMDI	701	None	C	
	Kailati	37274060	Kairkhali Khal SP	DI	359	None	C	
	Kaliara Gabragati	37274010	Bolosh - Satia Khal SP	DIWC	938	None	C	
	Medni	37274100	Krisnakhali - Keronkhola Khal SP	FMWC	817	Kangsha River SP (ADP) and Dupikhali Khal Re-excavation (FFW)	C	
	Thakurakona	37274110	Shishuala Beel, Swair Beel SP	DI	1,061	BWDB Embankment along Kangsha River	C	
Amtala & Singher Bangla	37274090	Rangadair Khal and Beri Beel, Putiakhali Khal - Horikhali Khal SP	FMDIWC	1,635	None	L	Benefited area more than 1,000 ha	
Purbadhala	Bairati	37283100	Chitrong Beel SP	DI	545	None	A	
	Purbadhala	37283070	Holida Beel SP	FMDI	492	None	B	
	Dhalamalgaon	37283120	Dhalamalgaon SP	FMDI	505	Kangsa River Flood Control Project	B	
	Khalishaur	37283080	Rawha beel-Shakunia Beel SP	DI	386	None	C	
	Gohalakan da	37283090	Bhander Beel SP	DI	764	None	C	
	Narandia	37283110	Dullah Khal SP	DI	298	Saralia Sluice Gate	C	
	Ghagra	37283030	Gozza Khal SP	DIWC	138	Dampara Water Management Project	D	Further examination to be required
	Jaria	37283060	Pakla Beel SP	WC	281	None	D	Further examination to be required
	Bishkakuni a	37283130	Kakuria Khal SP	FMDI	382	None	D	Further examination to be required
	Agia & Ghagra	37283050	Balia Sayttati, Balia River SP	FMDIWC	2,067	Dampara Water Management Project	L	Benefited area more than 1,000 ha
	Hogla	37283012	East Bhikunia-Shilaigati SP	FMDI	1,315	Dampara-Jaria Embankment Project	L	Benefited area more than 1,000 ha

**Table 5.1 Potential Subprojects of Small Scale Water Development Project 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 (Tk.'000)
								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 (Start: 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 (One regulator at Ujakhali Bridge and one regulator at Pagla beel).	None	8,287
2	Barhatta	Asma	A	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	15,548
3	Durgapur	Gaokandia	A	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
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
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
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
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	7,911
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.	7,579
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
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	13,690
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
12	Atpara	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	4,236
13	Durgapur	Durgapur Sadar.	B	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	13,510

**Table 5.1 Potential Subprojects of Small Scale Water Development Project 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 (Tk.'000)
								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	9,076
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
16	Kendua	Garadoba	B	37247110	Sutikhali & Dhayel Khal SP	DIWC	332	Re-excavation of Sutikhali khal: L=4km, W=4m, D=1.3m Re-excavation of Dhayel khal: L=2km, W=4m, D=1.3m	None	None	4,585
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	6,350
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	2,678
19		Muzafferpur	B	37247210	Sunui Haor Embankment SP	FMDI	361	Re-excavation of Fuleswari khal and Kalian 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
20		Madan	Nayekpur	B	37256020	Bashuri Molajan SP	FMWC	288	None	1 regulator	None
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
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
23	Netrakona Sadar	Kailati	B	37274070	Alongir Khal and Embankment SP	FMDI	385	Re-excavation of Alongir 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	10,110
24		Lakshmiganj	B	37274120	Ghagra Khali Khal and Embankment SP	FMDI	591	Re-excavation of Ghagra khali 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	18,089
25		Madanpur	B	37274130	Saiduly River Embankment SP	FM	251	New construction of embankment: L=4km, W=2.44m, H=1.5m	None	None	7,619

**Table 5.1 Potential Subprojects of Small Scale Water Development Project 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 (Tk.'000)
								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
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
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
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	9,851
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	5,613
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
32	Durgapur	Kullagora	C	37218010	Bongal Khal SP	FM	630	None	One water retention structure	None	7,200
32		Kakairgara	C	37218070	Balach River (Bayra-Ura to Dakshin Lakshmipur) and Kolonja - Dewtokon via Gondaber Embankment SP	FMWC	781	Reexcavation of River: L=5km, W=10-15 m, D=1.5-2.5 m Start: Lakshmipur, End: Bayra-Ura Rehabilitation/reconstruction of embankment: L=8 km, W=2.5m, H=1.5 m	One water retention structure (at Bayra-Ura).	River protection by BWDB	14,609
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
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	4,581
36	Kalmakanda	Kalmakanda Sadar	C	37240070	Kalihala river embankment SP	FMWC	766	New construction of Embankment: L=7.5km, W=4m, H=2.5 m Start: Kalihala School, End: Chandual. Beel : Ajjana	One regulator at Chakpara	Kalihala Right Embankment	18,989
37		Kailati	C	37240100	Bhogai river excavation SP	FMWC	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
38		Bara Kharpan	C	37240110	Jatrabari khal -Jangia beel closure subproject	FMWC	853	New construction of embankment: L=4 km, W=4m, H=2.5m	None	None	17,087
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
40	Pogla	C	37240131	Gumai - Sholi River, Ubdakhale Embankment SP	Bakla River FMWC	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	29,455	

**Table 5.1 Potential Subprojects of Small Scale Water Development Project 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 (Tk.'000)
								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
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	1,671
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
44		Mashka & Roailbari	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	6,341
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
46		Balaishimul	C	37247150	Chowka & Jugni Beel SP	DI	456	Re-excavation of Choitali khal: L=3km, W=4m, D=1.3m	None	None	493
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	19,652
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
49		Noapara	C	37247232	Baora Beel SP	DI	97	Re-excavation of Bhora khal: L=2km, W=5m, D=0.9m	None	None	207
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



**Table 5.1 Potential Subprojects of Small Scale Water Development Project 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 (Tk.'000)
								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=2.25 km, 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=5.5 km, 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
53		Gobindasri	C	37256110	Bauch Kanda SP	FMWC	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	13,384
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	7,767
55	Mohonganj	Barokashia Birampur	C	37263030	Madhupur Khal SP	DI	309	Re-excavation of Madhupur khal: L=5km, W=3m, D=1m	None	Hajjda Embankment Sub-Project	4,074
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
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 one regulator at mouth of Satia khal	None	15,975
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
59		Challisha	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
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	10,664
61		Kailati	C	37274060	Kairkhali Khal SP	DI	359	Re-excavation of Kairkhali khal: L=4 km, W=6m, D=1.5m	None	None	711
62		Medni	C	37274100	Krisnakhali - Keronkhola Khal SP	FMWC	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)	12,772
63	Thakurakona	C	37274110	Shishuala Beel, Swair Beel SP	DI	1,061	Re-excavation of khal from Shishuala beel to Kangsha river: L=3.5 km, 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	
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	5,945
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
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

**Table 5.2 Major Development Possibilities of Agroecological Zones in Netrakona District**

No	Region	Major Development Possibilities						
		Agriculture	Fishery	Livestock	Water resources	Infrastructure	Socio economy	Forestry/ Environment
1	Hilly Areas (AEZ-22: Northern and eastern piedmont and AEZ-29 Northern and eastern hills)	Integrated agriculture on cereals, horticultural (especially pineapple, jack fruit, banana), green manure crops.	Open water and closed water fisheries	Dairy farm. Aqua animal mainly duck.	Surface water storage by dyking hill streams.	Development of road communication, settlements market places.	Improvement of social amenities.	Protection of the environment.
3a	Floodplain Areas (AEZ-9: Old Brahmaputra & Jamuna river)	Rice based agriculture is the main economic output of the area and increased production is caused by inadequate pre-monsoon and post-monsoon drainage. On-going sediment deposition in the drainage system will result in increasing crop losses in dry season.	Open water and closed water fisheries	Aqua animal (Duck in T.Aman field).	Planned expansion and efficient use of tube-well irrigation Multipurpose development of surface water.	Improvement of road communication, housing and settlements, commercial, administrative and educational centers.	Planned population settlement. Backyard poultry and kitchen, gardening to improve family income. Village banking to promote saving habit.	Protection against water and air pollution. Strict compliance of land use policy. Expansion of trees through annual programs.
3b	Deeply Flooded Areas	Flooded Areas. This areas are flooded for five to six months each year. The cropping pattern of this area could be Boro - fishery - T.Aman.	The area has a comparative advantage of fishery production in Open water.	Aqua animal (Duck in T.Aman field).	Expansion of dry season pump irrigation, fishery development and navigation.	Development or road and river communication. Improvement of housing and settlements, administrative, marketing and educational centers.	Planned population settlement. Development of skilled man power. Creation of alternative employment Village banking facilities and social amenities.	Protection against water pollution incentives for homesteads forestry. Development of compact village.
5	Haor Areas (AEZ-16: Middle Meghna River Flood Plain, AEZ-19: Old Meghna Estuarine Flood plain, and AEZ-21: Shlet Basin Haor Areas	Intensive irrigated boro cultivation. Also the profitable cropping pattern could be boro-fishery - T.Aman. Adaptive research for short duration boro (<140 days HYV boro) -Fishery-Late T.Aman (Aug-Dec duration).	Increasing fisheries productivity through Boro-fishery-T.Aman system	Increasing production of livestock. under Boro+Duck+T .Aman system	Expansion of dry season power pump irrigation. Fishery development.	Improvement of river communication. Development of housing, administrative, commercial and educational centers.	Planned population distribution. Improvement of marketing facilities. Improvement of social amenities, Creation alternative employment.	Development of cluster villages. Development of homestead forestry and horticulture.

**Table 5.3 Promising Farming in Various Areas in Netrakona District**

Zone	Characteristics	Promising Farming System
<u>Haor area</u>	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)
<u>Lowland</u>	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 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.

**Table 5.4 Potential of Development Fish Production by Agroecological Zone in Netrakona**

No	Region	Potential of development fish production in SSWRD
3a	Floodplain Areas 8AEZ-9: Old Brahmaputra & Jamina 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 <ul style="list-style-type: none"> <li>◦ Tilapia with <i>Pangas</i> poly culture,</li> <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>◦ Poly fish culture</li> <li>◦ Indigenous/natural fish (fish naturally enters the pond due to a flood) and stocking fish culture</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>◦ Fresh water shrimp poly culture (shrimp with fish, except carnivorous fish)</li> <li>◦ Fresh water ornamental fish poly culture (golden fish, fancy carp etc.,)</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 <i>Pangas</i> or 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</li> <li>◦ Kuas in beel, khal (like small hole, pool, it becomes fish shelter in low level water) by some structure) and Kuas</li> </ul> </li> </ul>
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>◦ Poly fish culture</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>
5	Haor Areas (AEZ-16: Middle Meghna River Flood Plain, AEZ-19: Old Meghna Estuarine Flood Plain, and AEZ-21: Shlet 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>◦ Poly fish culture</li> </ul> </li> </ul> <p>When an initial investment for fish culture is possible:</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>

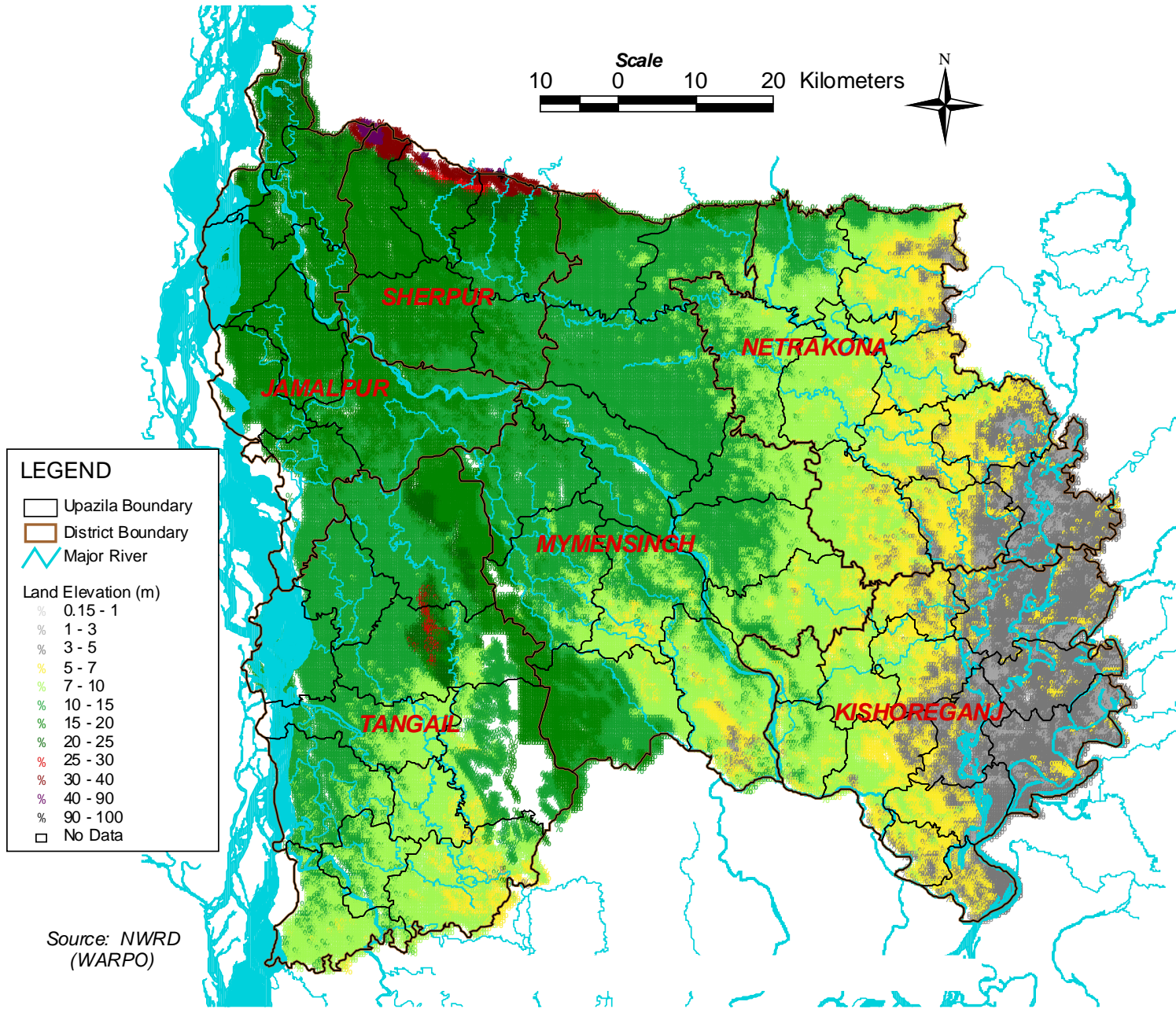


Fig. 2.1 Topographic Map of Netrakona District and Study Area



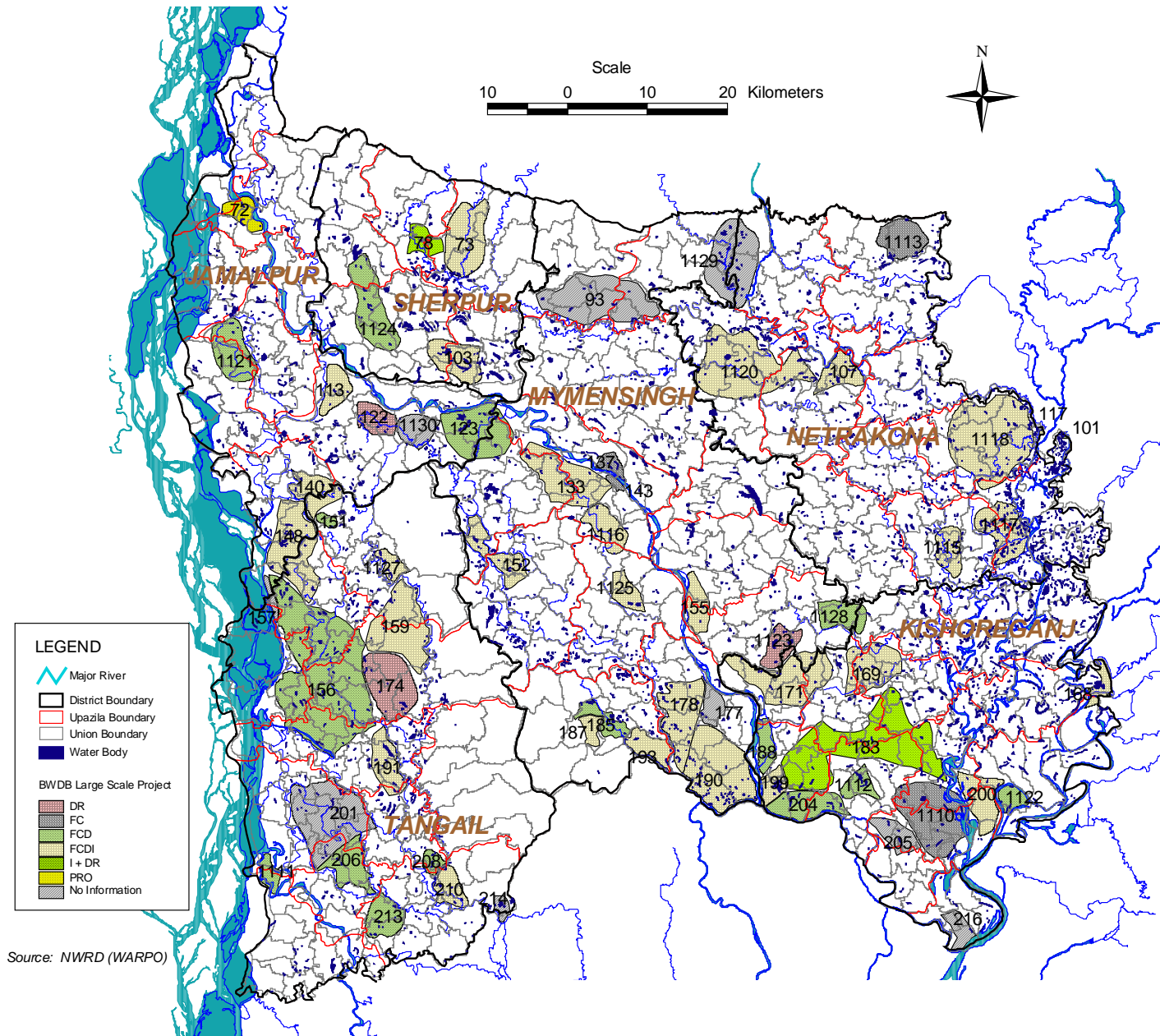


Fig. 2.2 Perennial Water Bodies and Large Scale Water Resources Development Projects in the Study Area

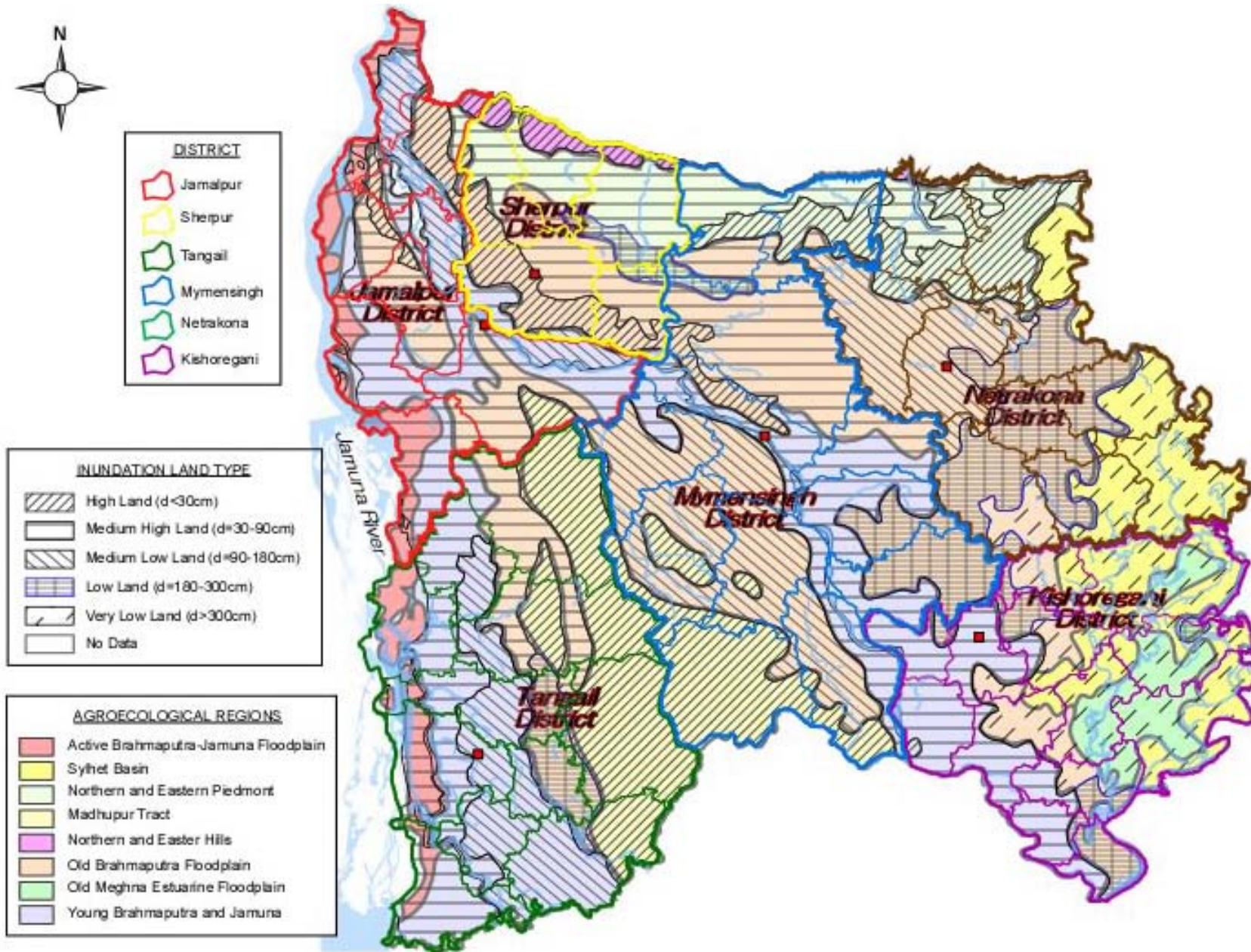
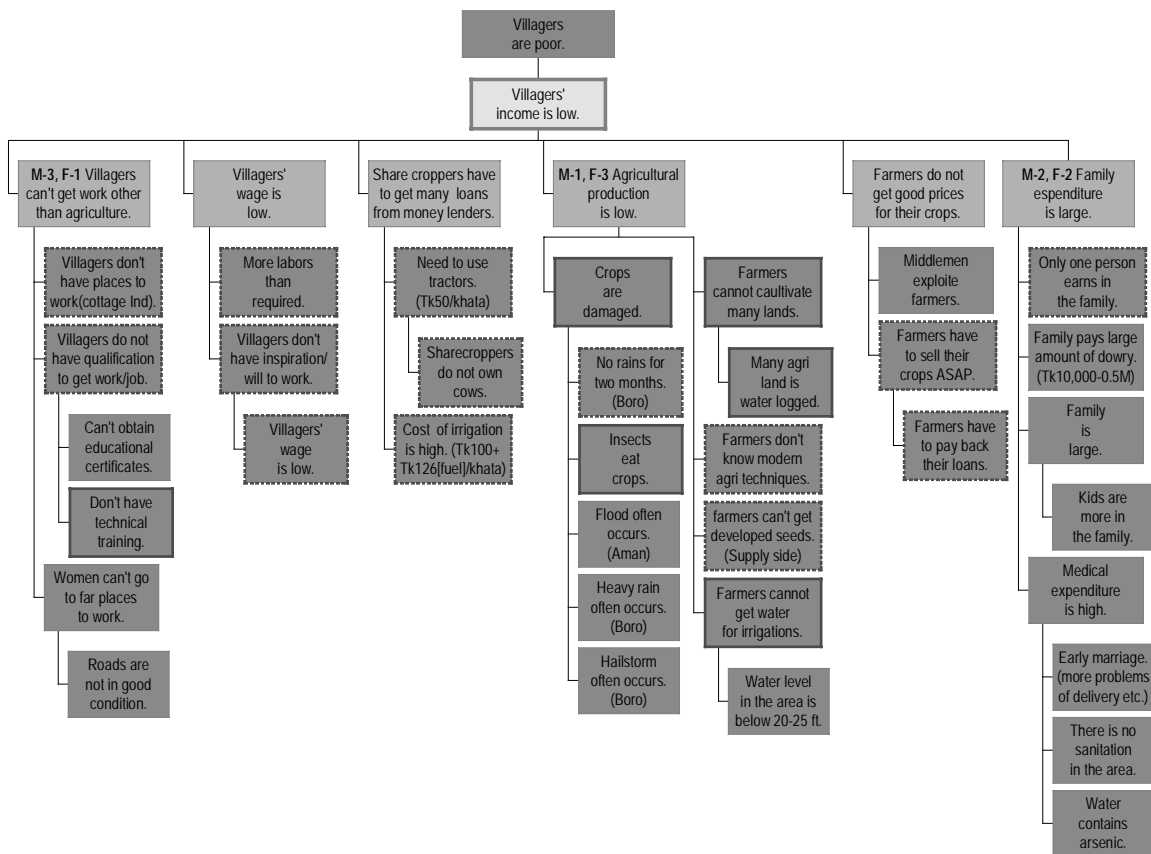
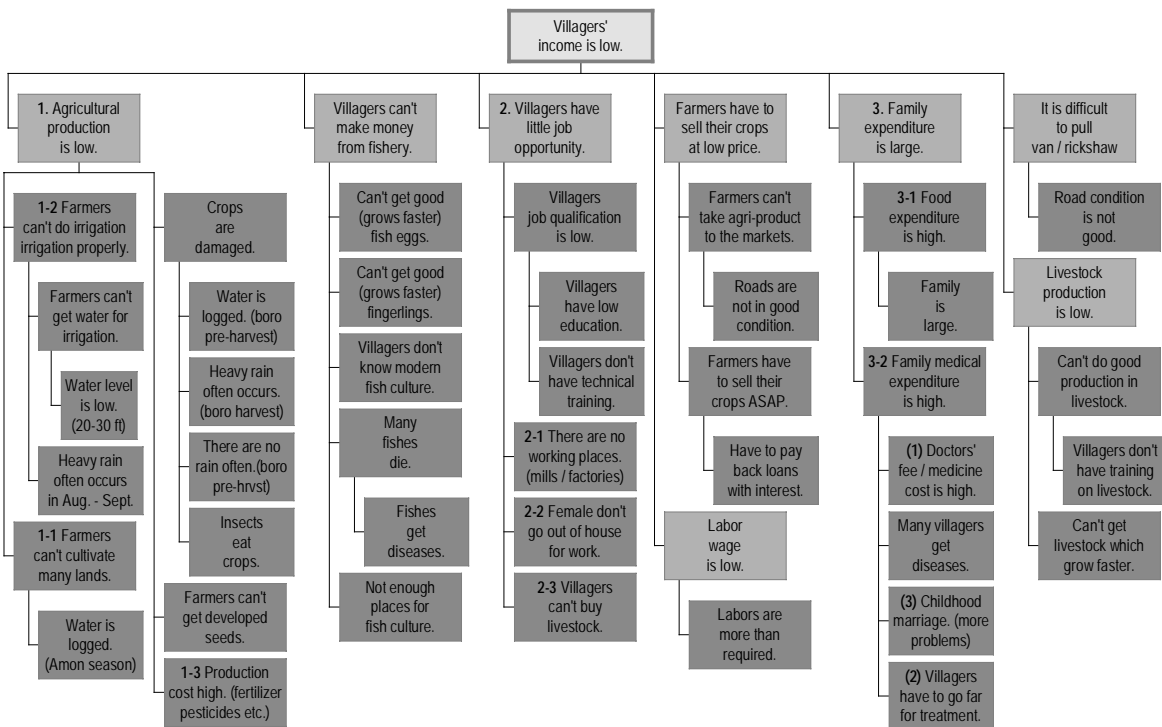


Fig. 2.3 Zoning of Netrakona District and the Study Area



**A. Sinher Bangla Union, Sadar Upazila, Netrakona District ( 23 September 2004)**



**Note:** No fishermen were present at the workshop.

**B. Sinher Bangla Union, Sadar Upazila, Netrakona District ( 24 September 2004)**

**Fig. 3.1 Problem Trees of Union Level Workshops in Netrakona District**



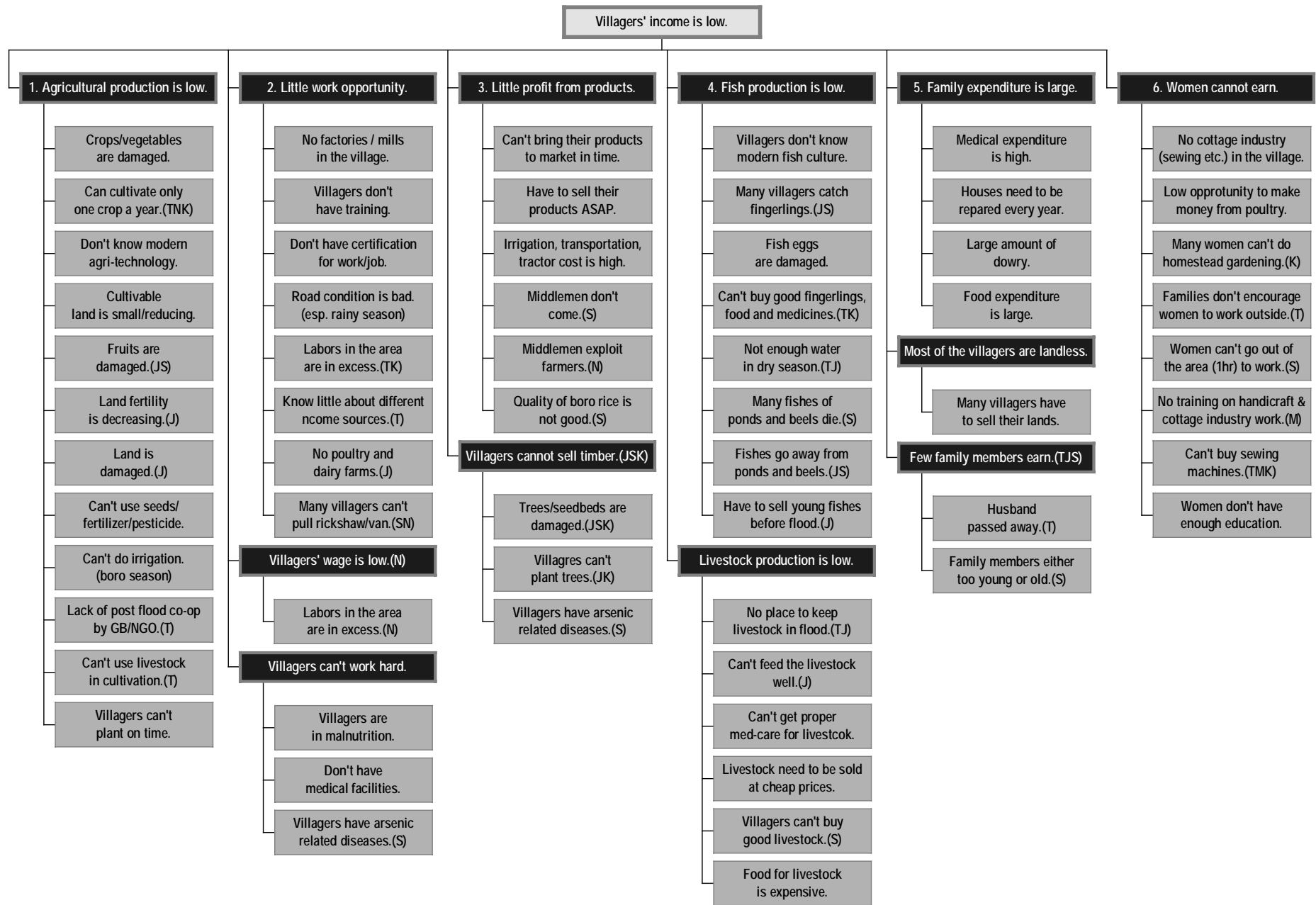


Fig. 3.2 Problem Trees after Problem Analysis in the Study Area