Government of the People's Republic of Bangladesh

Ministry of Local Government, Rural Development and Cooperatives

Local Government Division

Local Government Engineering Department

Guidelines for

Small Scale Water Resources Development Project

G2 Identification of Subproject

November 2017

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Document Architecture of the New Sets of Guidelines for SSWRD Project

[Small Scale Water Resources Development (SSWRD) means, from physical points of view, implementing appropriate water management subprojects of small sizes, not exceeding 1000 hectare benefited area by the current definition, to resolve existing water management constraints to agriculture that in turn enhance rural employment leading to reduction of rural poverty. Implementation of SSWR subprojects involve long process from proposal of a subproject from Local Government institutions (Union Parishad and Upazila Parishad) to its final selection, study of feasibility from different considerations (social, environmental, technical, economical), preparing detailed design and costing, constructing required physical works to standard quality and finally its operation and maintenance by its beneficiaries. The process has multiple facets too. It needs to be comprehensively beneficiaries' and other stakeholders' participatory, acceptable to people of widely varying social and socio-economic conditions, friendly to the surrounding environment, etc. Thus, Guidelines for SSWR Development is, of necessity, complex.

The long and complex process has been divided into major distinguishable steps and separate Guidelines for works and activities involved in those major steps have been developed. Environmental study applies to the subproject as whole and is of different nature. So, Guidelines for Environmental Assessment is made a separate document. Following this principle, the Ten (10) Guidelines with Alpha-numeric ID Numbers and Names as below constitute the Documentation of Guidelines for SSWR Development.

This list will appear in all the individual Guideline Documents with highlight of the current Document name for the user to refer when necessary]

The List of New Sets of Guidelines for SSWRD Project

G1	Policy and Development Process
G2	Identification of Subprojects
G3	Participatory Rural Appraisal of Subprojects
G4	Feasibility Study of Subprojects
G5	Environmental Assessment of Subprojects
G6	Detail Design of Subproject Structures
G7	Construction of Subproject Structures
G8	Operation and Maintenance
G9	Monitoring and Evaluation
G10	Integrated Rural Development Plan between SSWR and Rural Road/Market

AMENDMENT AND UPGRADATION RECORDS

This document "**Guidelines for SSWR Development: G2 Identification and Selection of Subprojects**" has been issued following amendments and upgradations as outlined below:

Revision	Description	Date
	A "Small Scale Water Resources Subproject Planning and Design Guidelines" was initially developed and used for ADB-supported SSW-1 and SSW-2 Projects. This document included sections on Identification, pre-screening and reconnaissance of subproject proposals that defined the procedure for selection of subprojects.	April 1999 March 2006
A	The Small Scale Water Resources Subproject Planning and Design Guidelines (March 2006) was detailed, upgraded and adopted for use in JICA-supported SSW-3 Project and a similar version was used in the ADB-supported SSW-4 Project.	May 2009
B	The "SSWR Development Strategy, Processes and Support (draft)" prepared under JICA-1 Project introduced variations to development process for three categories of subprojects: (i) without water flow regulation; (ii) with water flow regulation; and (iii) performance enhancement.	December 2013
C	The "SSWR Development Strategy, Processes and Support (draft)" document was revised and upgraded following consultation with relevant professional specialists and the Detailed Subproject Development Processes contained in it was firmed up through a series of meetings in IWRM Unit Chaired by Addl CE (IWRM), LGED in Nov-Dec, 2014.	January 2015
D	This "**Guidelines for SSWR Development: G2 Identification and Selection of Subprojects**" is the ***second*** Document of a series of Guidelines for SSWR Development finalized and approved by a Working Group of LGED Professionals with proven experience in SSWR development with assistance from Specialist WRD Consultants under a JICA-LGED Technical Co-operation Project. The Document builds on the procedures of identification and selection of potential SSWR subprojects given by "Subproject Planning and Design Guidelines (May 2009)" and "SSWR Development Strategy, Processes and Support (revised draft, January 2015)" along with incorporation of improved methods and techniques and lessons learned over the time.	August 2017

GLOSSARY

Aman	Rice grown during the wet season (Kharif), and harvested late (Nov-December). Yields: (i) Broadcast, deep water 1.5t/ha; (ii) Transplanted, local variety 2.2t/ha; (iii) Transplanted, high yielding variety, 3.25t/ha
Aus	Rice grown during the wet season (Kharif), and harvested early (July-August). Yields: (i) Broadcast 1.25t/ha; (ii) Transplanted, high yielding variety, 2.5t/ha
Beel	Saucer shaped low-lying area with pond of static water as opposed to moving water in rivers and canals.
Boro	Irrigated rice grown in the early dry season (Rabi). Transplanted in December-January and harvested in April-May. Yield: Transplanted, high yielding variety, 4.25t/ha
District	Second administrative unit of the government comprising 6-9 Upazilas. There are 64 districts in Bangladesh.
Haor	Haor is a wetland ecosystem in the north eastern part of Bangladesh. Physically a bowl or saucer shaped shallow depression, also known as a back-swamp
Integrated Water Resources Management Unit	Unit comprising two sections: (i) planning & design, and (ii) operation & maintenance, with a mandate to guide LGED's activities in the water sector with specific responsibility to assist in enunciation of policies, formulation of strategies and plans, preparation of new projects, inter-agency coordination and with external agencies, undertake studies and to provide long term support to the completed projects
Khal	Natural or man-made water channel (canal)
Kharif	Wet (monsoon) season
Local Stakeholder	Local Stakeholders are inhabitants of an area directly or indirectly affected by water management, be it as beneficiaries or as "project affected people".
Project Affected People	People negatively impacted by investment in water management projects and / or subprojects or by the manner in which water regulating infrastructure is managed.
Project Consultants	Project implementation consultants working with the PMO
Project Management Office	A unit comprising LGED staff appointed to manage implementation of a Project
Rabi	Dry / winter cropping season (November to March)
Stakeholder Groups	Stakeholder groups are collections of individuals who have similar interests concerning water. Among others, such stakeholder groups are men and women, farmers (low, medium low, medium high and high land farmers), fishers, boatmen, landless, elected representatives, LGED employees, BWDB employees, employees of other government departments, contractors, consultants, and development partners.
Union	Subdivision of Upazila and the lowest governance institution in the country.
Union Parishad	Local government institution at Union level. The Union Parishad consists of an elected council & chairman, and is the oldest government institution in Bangladesh
Upazila	Administrative unit, sub-division of District and lowest administrative tier of the government.
Upazila Parishad	2nd tier of local government institution at Upazila. According to the Upazila Parishad Act 2009, Upazila Parishad consists one elected Chairman and two Vice-chairmen, Chairmen of UPs and Mayor of Municipality within each Upazila including representatives from line agencies with an Upazila Nirbhai Officer as the Secretary. The election of the Upazila Parishad was held on 22 January 2009. Upazila Parishad runs the local administration.

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
AE	Assistant Engineer
BWDB	Bangladesh Water Development Board
CA	Community Assistant (Project Based – Subproject Level)
CO	Community Organizer
CPO	Community Participation Officer (Project based, District level)
CS	Construction Supervisor (Project Based – Upazila Level)
DAE	Department of Agricultural Extension
DDM	Detailed Design Meeting
DLIAPEC	District Level Inter-Agency Project Evaluation Committee
DOC	Department of Cooperatives
DOF	Department of Fisheries
DWRA	District Water Resources Assessment
EIA	Environmental Impact Assessment
EMP	Environmental Mitigation Plan
FMC	First Management Committee (of WMCA)
FSDD	Feasibility Study and Detailed Design
GoB	Government of Bangladesh
IEE	Initial Environmental Examination
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
ICM	Integrated Crop Management
IWRMU	Integrated Water Resources Management Unit (of LGED)
LCS	Labour Contracting Society
LGED	Local Government Engineering Department
MC	Management Committee (of WMCA)
MEP	Member Education Program
MIS	Management Information System
MLGRDC	Ministry of Local Government, Rural Development and Cooperatives
NGO	Non-Governmental Organization
O&M	Operation and Maintenance
PAP	Project Affected Person
PE	Performance Enhancement
PEA	Performance Enhancement Appraisal
PM	Planning Meeting
PMO	Project Management Office
PRA	Participatory Rural Appraisal
QC	Quality Control
SAE	Sub-Assistant Engineer
SAPROF	Special Assistance for Project Formulation
SP	Subproject
SSWR	Small Scale Water Resources
SSW-1	SSWR Development Project Phase I (ADB), 1996-2002
SSW-2	SSWR Development Project Phase II (ADB), 2002-2009
SSW-3	SSWR Development Project (JBIC), 2009-2016
SSW-4	Participatory SSWR Project (ADB) 2010-2017
TA	Technical Assistance
UDCC	Union Development Coordination Committee
UE	Upazila Engineer
UP	Union Parishad (local council)
UzP	Upazila Parishad
WMCA	Water Management Cooperative Association
XEN	Executive Engineer (usually used in LGED)

FARM, LAND AND SUBPROJECT CATEGORIES

FARM CATEGORIES

Land Holding		Farm Category
(ac)	(ha)	
<0.51	< 0.21	Landless
0.51 – 1.00	0.21 - 0.40	Marginal Farmer
1.01 – 2.49	0.41 – 1.00	Small Farmer
2.50 – 7.49	1.01 – 3.03	Medium Farmer
>7.50	>3.03	Large Farmer

LAND CATEGORIES

Depth of Average Monsoon Flooding		Land Category
(m)	(ft)	
<0.3	<1.0	Highland
0.3-0.9	1.0-3.0	Medium Highland
0.9-1.8	3.0-5.9	Medium Lowland
>1.8	>5.9	Lowland

SUBPROJECT CATEGORIES AND TYPES WITH USUAL WORKS AND OBJECTIVES

Category		Type		Typical Works and Objectives
I	**Simple** (without Regulation of Water Flow)	DR	Drainage	Re-excavate drainage *khals* to increase capacity of drainage systems to benefit agriculture as well as fisheries and local navigation
		TI	Tidal Irrigation	Re-excavate existing *khals* to enhance tidal flux (volume and propagation) in the *khals* in dry season to benefit irrigated agriculture in fresh water tidal areas as well as fisheries and local navigation (also increases capacity of drainage system)
II	**Complex** (with Regulation of Water Flow using gated or other kind of structures)	FM	Flood Management	Rehabilitate and construct embankments and / or sluices/ regulators to reduce extent and duration of flooding of farmland inside the subproject
		FMD	Flood Management & Drainage	Rehabilitate and construct embankments, sluices/ regulators and re-excavate *khals* to reduce extent and duration of flooding of farmland and increase drainage capacity of khal system of the subproject
		FMDTI	Flood Management, Drainage and Tidal Irrigation	Rehabilitate and construct embankments, sluices/ regulators and re-excavate *khals* to reduce extent and duration of flooding of farmland, increase drainage capacity and tidal flow

Category		Type		Typical Works and Objectives
				capacity of khal system of the subproject. Sluices/regulators of these subprojects will have arrangements of automatic flow of drainage and tidal inflow at the gates.
		WC	Water Conservation	Develop water retention capacity of existing *haors*, *beels* and *khals* to increase availability of surface water for irrigation in dry season by installing gated water retention structures (also *Rubber Dams* at appropriate sites) and by re-excavating *khals* and suitable water bodies
		FMDWC	Flood Management, Drainage & Water Conservation	Combination of works involved in FMD and WC type of subprojects outlined above
		CAD	Command Area Development	Development of existing irrigation schemes by providing better water distribution systems over the command area and, as agreed, pumping facilities. Works may include: improved canal network, lining of canals, installation of buried pipelines, installation of control structures, construction of pump house, etc.
		DRCAD	Drainage and Command Area Development	Development of existing irrigation schemes by providing better water distribution systems including drainage improvement measures for the command area and, as may be agreed, pumping facilities. Works may include: improved canal network, lining of canals, installation of buried pipelines, installation of control structures, construction of pump house, headwater tanks, regulators/sluices in drainage khals, etc..
		FMDCAD	Flood Management, Drainage and Command Area Development	Development of existing irrigation schemes by providing better water distribution systems together with flood management and drainage improvement facilities forr the command area and, as may be agreed, pumping facilities. Works may include: improved canal network, lining of canals, installation of buried pipelines, installation of control structures, construction of pump house, headwater tanks, etc and construction / rehabilitation of embankments, sluices /regulators in drainage khals, etc..
III	Performance Enhancement	Any Type of Existing Subproject		Any of the above described works for existing (developed and handed over) subprojects for which additional works are desirable to consolidate planed benefits / result in additional benefits

INTRODUCTION

1. This Document "G2 Identification and Selection of Subprojects" is made a separate document as the activities are mostly done by LGED field offices (Upazila and District) and IWRMU, LGED at the headquarters at Dhaka (refer Table I-1) and as such the activities constitute a continuous process in the IWRMU independent of any investment project is ongoing or not. The document outlines the usual processes adopted for Identification, Pre-screening and Reconnaissance of the subproject proposals to select potential subprojects for further study that involve extensive data collection and services of contracted firms.

2. Identification and selection of a new SSWRD subproject for undertaking studies to assess its eligibility to be developed for implementation comprises the first six (6) steps of the full Development Process for SSWRD Subprojects detailed in Document G1. The segment of the development process flow diagram that applies to identification, pre-screening and reconnaissance of subproject proposals is reproduced in Figure I-1 for ready reference.. At this stage, activities are common for all new subprojects (Category 1 and 2) and cannot be distinguished between technical or institutional characteristics.

3. For PE subprojects, identification and selection comprise of three (3) steps of the Development Process for PE Subprojects detailed in Document G1. The segment of the development process flow diagram applicable for the three steps involved at this stage is reproduced in Figure I-2. The activities in these steps are largely technical in nature.

4. Key personnel responsible for activities of different steps of SSWR subproject development are different. The Responsibility Matrix for all the involved steps of the process is given in Appendix B, Document G1. The part of the responsibility matrix that applies to identification and selection of subprojects, both new and PE, is reproduced in Table I-1. The Responsibility Matrix assumes that subprojects are developed with support from Development Partners for Project Consultancy, Feasibility Study and Detailed Design through local consultant firms, O&M and Grading Assessment and Performance Enhancement Assessment through local firms (if applicable), services of staff Facilitators for fisheries and agricultural development and other hired project staff as may be required.

Table I-1 Responsibility Matrix for Identification and Selection of Subproject Proposals

Step	Activity	Done by	Oversight or Quality Control
I NEW SUBPROJECTS			
A Identification			
1	Subproject Identification	Local Stakeholders and UP	LGED Staff at Upazila &District
2	Site visit and technical proposal preparation	Upazila Engineer, SAE, Community Organizer	Executive Engineer, LGED
3	Proposal presented to Upazila Parishad Meeting	Upazila Engineer	Executive Engineer, LGED
4	Proposal reviewed at LGED District Office	Executive Engineer, LGED	IWRMU (P&D Section)
B Pre-screening			
5	Pre-screening Proposal and GIS Mapping	IWRMU/PMO-Project Consultants	IWRMU (P&D Section)
C Reconnaissance			
6	Intensive Reconnaissance	IWRMU/PMO - Project Consultants, District Staff (CPO), Upazila Staff (UE, SAE & CO)	IWRMU (P&D Section)
II PE SUBPROJECTS			
A Identification			
1	Identification of PE Subproject	Upazila Engineer, WMCA with local stakeholders	Executive Engineer LGED IWRMU (O&M Section)
2	Completing PE Application and Forwarding	Upazila Engineer	Executive Engineer LGED IWRMU (O&M Section)
B Screening			
3	Screening of Application	PMO-Project Consultants	IWRMU (O&M Section)

Figure I-1 Development Process for New Subprojects (Category 1 and Category 2)
Steps for Identification, Pre-screening and Reconnaissance (3-6 months)

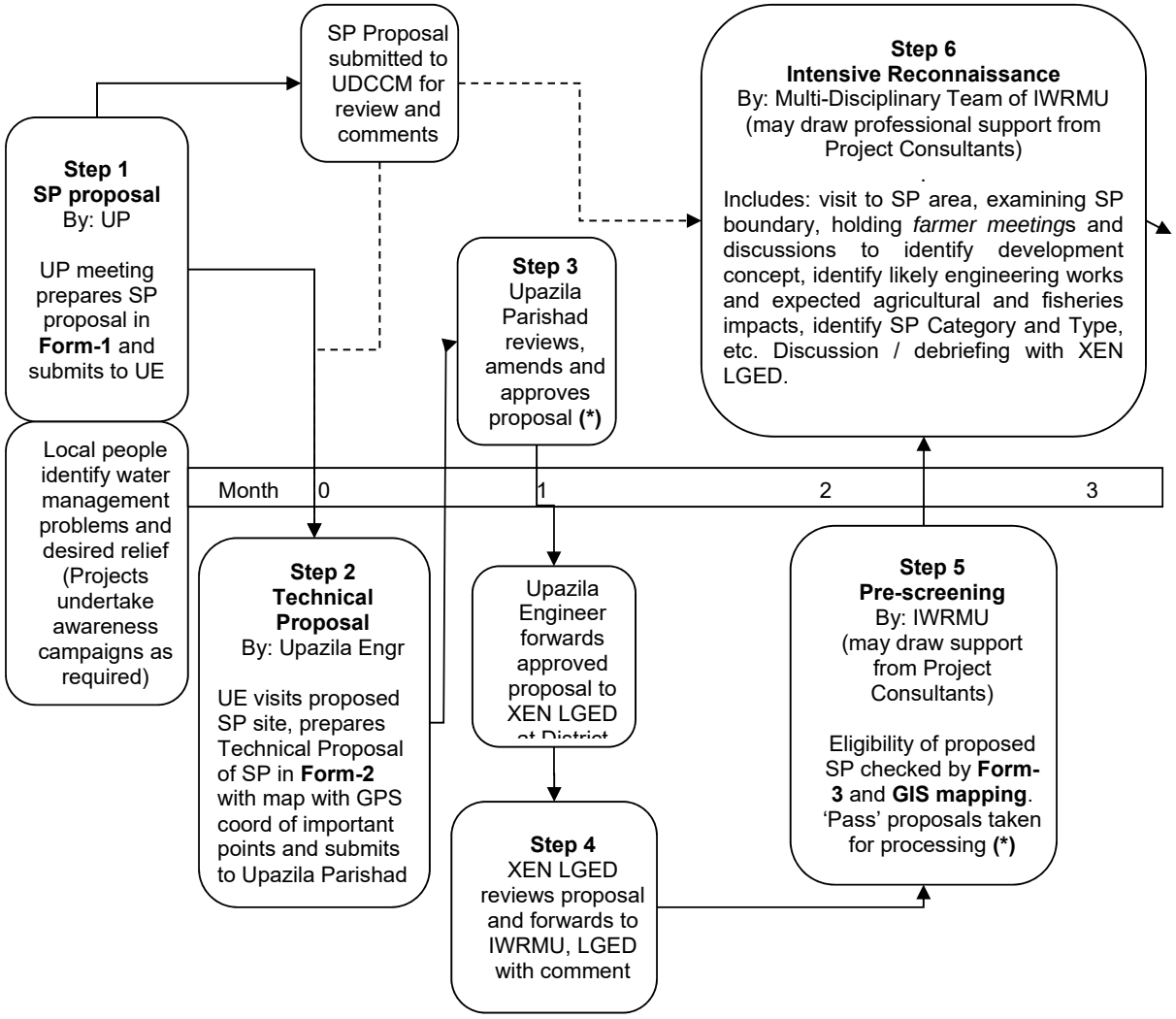
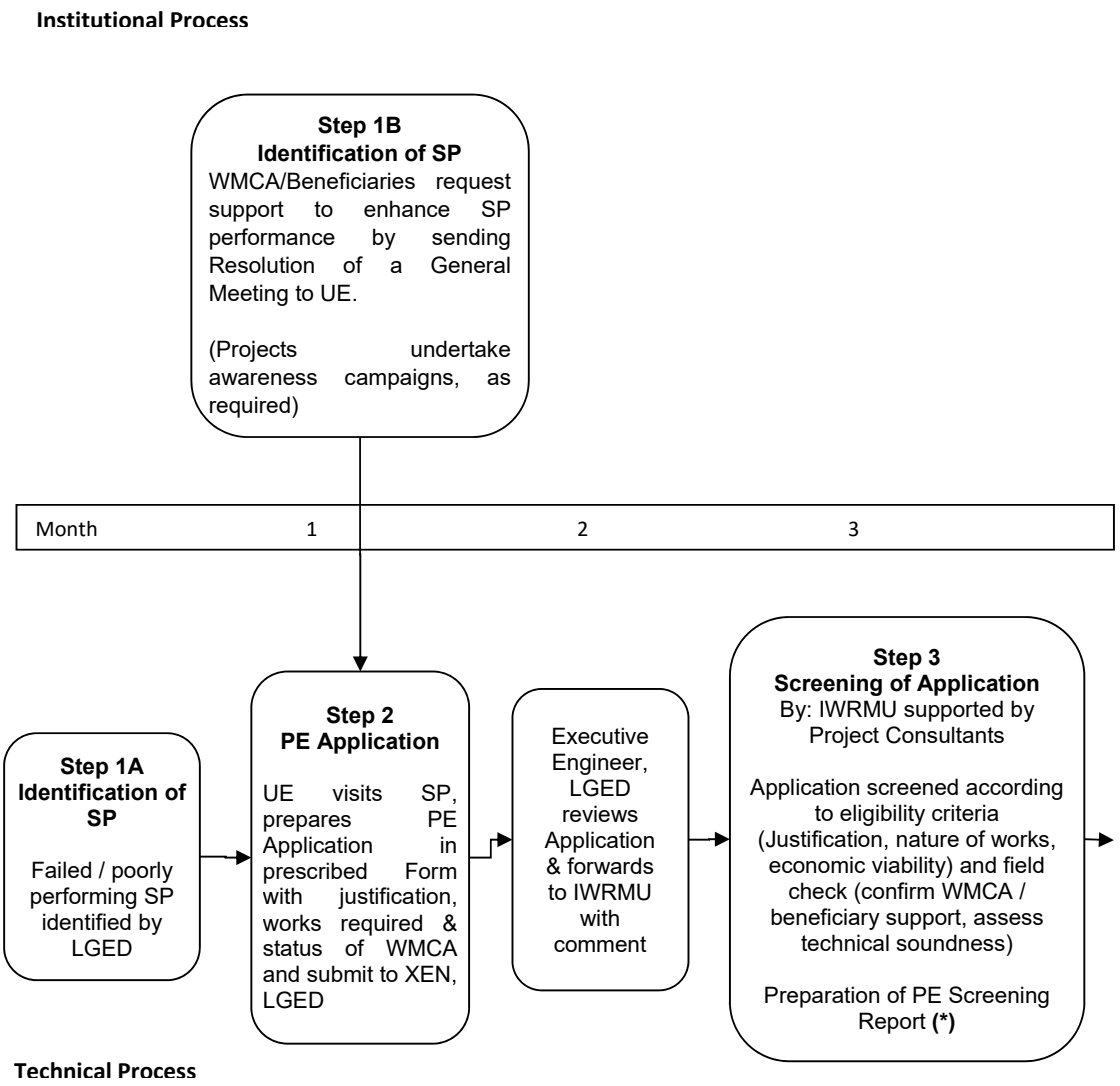


Figure I-2 Development Process for PE Subprojects (Category 3) Steps for Identification and Screening (4-8 months)



IDENTIFICATION OF SSWRD SUBPROJECT

1.1 New Subprojects

5. Awareness campaign under projects: LGED is implementing SSWR development in Bangladesh for more than 20 years. People generally know about LGED implementing SSWRD Projects. Therefore, there may not be a general need to generate awareness about this using mass media. However, as new projects are initiated, the IWRMU shall issue to Union Parishads in the project area a letter and a brochure of the new project that provides a clear explanation of the project and the process whereby local stakeholders can propose new SSWRD subprojects through the Union Parishad. The letter will include Form 1 – the Subproject Identification Form, appended to this Document as Exhibit G2-A, which will be used by Union Parishad to prepare a subproject proposal. This awareness campaign about the project may be followed up, as a more direct approach to the elected representatives of the UPs, with awareness workshops at Upazilas with Chairmen and Members of all Union Parishads of the Upazilla and knowledgeable / respected village leaders. A Project Consultants team comprising of water resources engineer, agriculturist, fisheries specialist and a community participation specialist will disseminate information about project facilities and requirements with explaining answers to questions of the participants regarding their water management problems and advise on possible subproject proposals to mitigate the respective problems. They will also explain filling up of Form 1 and subsequent procedure of processing the proposal.

6. Participants of the awareness workshops – the elected Chairmen and Ward Members of UPs and the village leaders, will then inform local people that they can request for solution of water resources management problems existing in their areas through Union Parishad under the new project of LGED and assist in developing consensus of the farmers and local people and making a formal request to the UP for a subproject to resolve their problem.

7. Step 1- UP adopts resolution and submits subproject proposal: When the Union Parishad receives a request from local people, the Parishad discuss the problem and solution suggested by them, formulate a subproject concept and fill out Form 1 - Subproject Identification Form that LGED sends to each UP. The subproject will usually fall within 1-2 Wards of the Union, and the concerned Ward Members are required to check and certify widespread support for the subproject. The Union Parishad then adopts a resolution whereupon it submits the filled up Form 1 along with the copy of UP resolution to the Upazila Engineer, LGED.

8. In case of the proposed subproject area falls in two adjacent Unions, the UP having major part of the proposed area in its jurisdiction will submit the subproject proposal (for the whole subproject area). It is preferable that the UP Chairperson who is processing the proposal discusses with the other UP Chairperson and obtains his agreement in the proposal. The UP resolution regarding the subproject proposal will mention about involvement of the other Union in the subproject area and about the outcome of discussion with the Chairperson of that UP. Later, the Upazila Parishad will draw on the point and recommend appropriate co-ordination.

9. UDCC assists UP by reviewing subproject proposal: The Union Development Coordination Committee (UDCC) is a standing committee of representatives from government offices at Upazila level formed by the Ministry of Local Government, Rural Development and Co-operatives to provide professional support to the Union Parishads in development related matters. The UP may have the SSWRD subproject proposal discussed

in a meeting of the UDCC beforehand and include its views/opinions in the UP resolution. If the UDCC meeting will take time to be held, the UP will take its resolution without having the UDCC discussion, submit the subproject proposal to Upazila Engineer and submit a copy of Form 1 to the UDCC to discuss the issue in a subsequent meeting and pass their views/opinions to the Upazila Engineer. The UDCC or some of its members, particularly the SAAO and the Fishery representative, may also be discussed by the reconnaissance team at a later stage.

10. DWRA Reports may assist subproject identification: LGED conducted a District Water Resources Assessment study under the Second SSWRDSP (2002-2009) supported by ADB and Government of the Netherlands to assess water resources management needs and delineate development strategies at Union and Upazila levels. The DWRA reports provide long-lists of potential SSWR subprojects by Unions and Upazilas for development under future investment projects after due feasibility studies. The IWRMU (P&D section) or PMO-Project Consultants may send this list to field offices for the Union Parishads to re-confirm needs of local people, if not already addressed under some projects, and submit the subproject proposal duly in Form-1 to the Upazila Engineer by adopting a UP resolution.

11. Step 2- Site visit and preparation of Technical Proposal: As soon as the Upazila Engineer gets a subproject proposal, he will undertake a field visit to the area of the proposed subproject to review the proposal of the UP and assess the problems and possible solutions. The UE will take the SAE in-charge of water resources works and the Community Organizer in his team and request the UP Chairperson and the Ward member of the area to join him during the site visit. If the subproject area falls in two Unions, Chairpersons and Ward members of both the Unions will be requested to attend. The team will carry copies of Form 2 - the Subproject Technical Proposal, appended to this Document as Exhibit G2-B, along with a Upazila Base Map to help in making observations and obtaining required data/information. As the Upazilas are now provided with internet facilities, the Upazila Engineer may download Google image of the proposed subproject area to use along with the Upazila Base Map. The team will visit important places of the subproject area, and also some outside places if necessary, to observe physical conditions of subproject components - khals, embankments, roads, proposed structure sites, proposed benefitted area lands, etc to assess subproject boundary along physical features like local roads, river banks, khals, etc and works required for the proposed subproject. The gross area of the subproject within the above assessed boundary and possible net area of the benefitted lands are also to be assessed. During the field visit, the team will talk to people of different social groups and local knowledgeable senior persons, both inside and outside of the subproject area, to understand local people's opinion, in support or in opposition and degrees thereof, about the proposed subproject. The team will make special effort to meet people who are likely to be impacted negatively due to implementation of the subproject and identify such groups and the negative impacts.

12. The Upazila Engineer will check the physical works proposed by the UP and he may add new works and/or drop any work according to the judgement of the visiting team. All works so decided will be defined by taking GPS co-ordinates at start point, end point and intermediate points as may be considered necessary for embankments and khals and at the locations of structures. After the detail visit of subproject area as outlined above, the Upazila Engineer will have adequate technical and social data and information about the proposed subproject. He will then complete Form 2 - the Subproject Technical Proposal with all data and information, particularly the subproject Proposal Map with all details as explained in Form 2. The locations/alignments of the works with GPS co-ordinates are to be shown in the subproject proposal map. The Subproject Technical Proposal will then be submitted to the Upazila Parishad Meeting for review and recommendation.

13. Step 3 - Upazila Parishad reviews and approves subproject proposal: The Upazila Parishad will discuss the subproject proposal in its meeting. This meeting includes all Union Parishad Chairpersons under the Upazila and, therefore, Chairperson of any adjacent Union that might be negatively impacted by the proposed subproject can review the proposal and give opinions.

14. If the subproject area involves two Unions, the Upazila Parishad may recommend that the UP having the major part of the subproject area will co-ordinate with LGED and the PMO in respect of the subproject on behalf of all the beneficiaries and local stakeholders.

15. If the Upazla Parishad meeting does not find any ambiguity or opposition to the proposal, the meeting will accord approval to further processing of the subproject through the minutes of the meeting. The Upazila Engineer will then forward the subproject proposal in Form 2, along with the approval of Upazila Parishad to the District Executive Engineer, LGED. If the Upazila Parishad meeting finds any ambiguity, contradiction or opposition in the proposal, it will return the proposal to the Upazila Engineer to either drop the proposal or resubmit it for consideration after necessary modifications in the light of the meetings findings. If the proposal is resubmitted after necessary modifications, the Upazila Parishad will repeat the process and accord due approval to the proposal.

16. Step 4- Executive Engineer reviews proposal and forwards to IWRMU: The Executive Engineer, LGED will review the proposal sent by Upazila Engineers in the context of these Guidelines and the water resources development strategy of the District as per DWRA studies and, if satisfied that the proposal contributes to the development objectives of the District, the Executive Engineer will forward it to the IWRMU, LGED Dhaka with his comments.

1.2 PE Subprojects

17. Step 1- Two routes for identification of PE subprojects: Need for performance enhancement of a subproject may mean that the subproject is not performing satisfactorily to achieve its planned benefit target for some deficiency which can be rectified by providing additional facilities/works. However, it may also mean that a subproject is performing quite satisfactorily in respect of its planned benefit but has the potential of achieving further if some additional facilities/works are provided. These two types of PE needs indicate the two sources from which PE Subprojects can be identified.

18. Step 1A- Identified by LGED based on performance records: LGED can identify the poorly performing and/or failed subprojects through MIS records and field level monitoring. Usually, deficiency and/or failure of engineering infrastructure are the main reasons for these poor performances and LGED has responsibilities to address them. Thus, LGED would have a list of poorly performing / failed subprojects and may propose subprojects from the list based on priority and/or other considerations, as it may be.

19. Step 1B- WMCA identifies PE subproject: Local farmers and WMCA may have identified additional potential of an otherwise well performing subproject where some additional facilities /works would significantly enhance subproject performance. WMCA may propose such subprojects for Performance Enhancement.

20. Where performance enhancement is requested by the WMCA, it should convene an extra General Meeting of its members to seek support for submitting a request for the subprject's performance enhancement works. If general members of the WMCA and the farmers that are likely to be newly benefitted indicate wide support for the request, the WMCA will submit the request along with the resolution of the General Meeting to the concerned Upazila Engineer with a copy to the Union Parishad.

21. Step 2- Completing and forwarding PE Application: The Upazila Engineer assisted by his staff will prepare, for the subprojects identified by either LGED or WMCA, PE Application in the standard format for it with justification for PE, scope of engineering works required and status of the WMCA in terms of membership, holding meetings and record keeping and whether there is a standing elected Management Committee. Where the request is from the WMCA, the resolution of GM of WMCA shall be appended to the PE Application. The Upazila Engineer will submit the PE Application to the Executive Engineer, LGED for further action.

22. The Executive Engineer, LGED will review the PE Application and forward it to the IWRMU (P&D Section) with his comment for further processing.

PRESCREENING OF SSWRD SUBPROJECT PROPOSAL

1.3 New Subprojects

23. Step 5- Pre-Screening and GIS Mapping: Pre-screening is an assessment of a subproject proposal to ensure that the proposal were submitted following the specified procedure and that the proposed subproject is likely to meet the eligibility criteria. The basic criteria on the basis of which proposals are pre-screened include: (i) documentation and maps adequate to provide a reasonable understanding of the problems/constraints and the interventions desired, (ii) site visit undertaken by the Upazila Engineer, (iii) there is popular support for the subproject and it is not likely to cause significant negative impact on adjacent areas, and (iv) Upazila Parishad discussed the subproject in its meeting and accorded approval to the proposal. Pre-screening is done by the IWRMU (P&D Section) using a standard format given in Form 3 – Pre-screening of Subproject Proposal appended to this Document as Exhibit G2-C. However, if a SSWRD Project is ongoing, assistance from the Project Consultants may be drawn to assist the IWRMU personnel in pre-screening and preparation of the subproject map. The pre-screening process will lead to a decision whether the subproject is recommended for further processing or be kept pending in wait for wanting documents to be available..

24. Map of proposed subproject attached (in 1:50,000 scale Upazila Base Map, sometimes supported also by Google map) in the technical proposal will usually give an approximate indication of the subproject area and its size along with the locations of the proposed physical works with GPS co-ordinates. However, a more detail Subproject Map will be prepared using Google map of the area and showing subproject features like boundary, khal and embankment alignments, roads, homestead areas, low-lying (beel) areas, agricultural fields, ponds, etc. and enabling the gross and net beneficiary areas to be determined accurately using AutoCAD. These maps will be printed out in A3 sheets for use in field reconnaissance. Land elevation contours may not be necessary at this stage.

1.4 PE Subprojects

25. Step 3- Screening of Application: The IWRMU (P&D Section) will check the PE Application for completeness and meeting the eligibility criteria. The eligibility criteria for PE subprojects are given in Document G1 which is reproduced in Table III-1 for ready reference. If considered necessary, a field visit may also be made to check the application. The IWRMU (P&D Section) will then register the application in the MIS and forward, along with their comments, to the PMO for further processing.

Table III-1: Eligibility Criteria of Subprojects for Performance Enhancement

Nr	Criteria	Requirement
1	Existing Handed-over Subprojects	The subproject must have been developed by LGED under a previous SSWR development project (SSW-I, SSW-II, etc), and properly handed over to the WMCA for management, operation and maintenance.
2	Beneficiary Request	The request for performance enhancement must emanate from the beneficiaries.
3	Status of WMCA and Contribution	Preference shall be given to subprojects where WMCAs have demonstrated capability and commitment though MC elections, membership, fund collection, etc. If necessary, the beneficiaries must agree to update the WMCA and hold election for a fresh MC. Nevertheless, the beneficiaries must agree to make the required upfront contribution for the PE infrastructure works[1].
4	Nature of Engineering Works	Performance enhancement works shall not include any (routine or periodic) maintenance works – for example re-excavation of a khal already excavated by LGED is not permissible[2]. Works may however include any of the following: (i) new structures/ works which will increase production in the subproject – for example a new regulator, extension of a khal/ embankment, provision of an office building or a pump station; (ii) rehabilitation of structures where this is clearly beyond the scope of WMCA/ periodic maintenance.
5	Economically Feasible	The proposed works shall be economically viable and/ or be within cost limits specified

[1] Upfront contribution shall be as for new subprojects, currently 3% of earthworks cost and 1.5% of concrete/ permanent works cost, or as mutually agreed with Development Partners for a particular project.
[2] Khal re-excavation may be supported by LGED using funds allocated for maintenance.

intensive reconnaissance of proposed subproject

1.5 New Subprojects

26. Step 6 - Intensive Reconnaissance: If the pre-screening process recommends the subproject proposal to proceed further, the IWRMU (P&D Section) with required support from PMO will organize a multi-disciplinary field reconnaissance of the subproject area. The multi-disciplinary team for reconnaissance of a proposed subproject will be formed from among the staff of the IWRMU (P&D Section), PMO-Project Consultants, staff from Upazila Engineer's office including the SAE in-charge of water sector works and the Community Organiser and Project staff, particularly, the Community Participation Officer from the District LGED office.

27. Project consultant support to the reconnaissance team will usually include a Water Resources Planning Engineer, an Agriculturalist, a Sociologist, an Environmentalist and a Fisheries Specialist. The reconnaissance team will take the Google image based subproject map prepared during pre-screening of the subproject to the field and verify the subproject boundary, the main physical features and the proposed physical works. The map will also facilitate communication with local beneficiaries. To facilitate streamlined collection of information during field reconnaissance, standard forms with checklists of information that are considered essential have been developed as in Form 4 in six (6) parts – one for the summary and five (5) others each for one specialist professional. The Form 4 in six (6) parts is appended to this Document as Exhibits G2-D1 to G2-D6. The specialists will also note any other data/information as they consider necessary in the Form.

28. The field visit will include discussions with local stakeholders, develop a strong understanding of constraints and the benefits from the proposed engineering works, confirm that the eligibility criteria are likely to be met, and culminate in a public Farmer Meeting on the last day. The reconnaissance team, being professional specialists from the Project Consultants, will evaluate the proposed physical works in the context of existing constraints and potential benefits that is likely to be achieved from the subproject and propose a comprehensive list of physical works, including any revising necessary, and of benefits by areas and crops for the subproject. However, some conditions and criteria on soil, water and crops, basis of determining costs and benefits of proposed subprojects are given in Exhibit G2-E: Some Technical Notes on Reconnaissance of SSWRD Ssubprojects appended to this document for consideration if necessary. The reconnaissance team will also ensure that independent discussions are held with stakeholders who are potentially negatively affected including fishermen and/ or those living upstream or downstream.

29. For subprojects involving gated water regulating structures, considerations should be given for impact on local boat communication, particularly for transportation of harvests, indicating alternate transport availability or suggesting special measures, if any required.

30. The duration and number of field visits required for the reconnaissance study will depend on the complexity and size of the subproject. Typically 1-2 days will be required for simple subprojects involving 'no flow regulation' and 2-3 days for complex subprojects involving 'flow regulation' and CAD subprojects.

31. Intensive reconnaissance will confirm the subproject concept and if there is broad popular support for the proposed subproject. Following the field work a Reconnaissance Report will be prepared. The length of the report will vary according to the category/ type and size of subproject, but it will typically follow the following format:

(i) Summary Information – location, area, likely subproject category and type, coordinates, names of sponsors, any changes made to the submitted technical

proposal, engineering works and likely cost, a risk assessment and recommendation on its further processing for PRA and Prefeasibility analysis.

(ii) Technical assessment of soils, water resources, land types and cropping, and potential agricultural and fishery impacts/ benefits.

(iii) Social and institutional assessments covering livelihoods, local demand for subproject and environmental aspects.

(iv) Assessment of possible adverse impacts including nature and magnitude of the impacts and identification of specific groups of people affected.

(v) Mapping and supporting data.

1.6 PE Subprojects

32. For PE subprojects, field reconnaissance will not, generally, be required.

EXHIBITS

EXHIBIT G2-A: SUBPROJECT IDENTIFICATION FORM

FORM-1

(to be filled by Union Parishad)

Form for Identification of SSWRD Subproject

Subproject proposal by UP to solve local water resources management problem

[**Instructions**: The Chairman will call a Meeting of all Members of the Union Parishad and (i) discuss existing problems of water resources management in the Union area with respect to agriculture, how the problems can be solved and what physical works and structures will be needed for this; and (ii) fill up this form in the Meeting with unanimous opinion of the Parishad. The Proposal will then be submitted to the Upazila Engineer along with Minutes of the UP Meeting]

1. (a) Name of the Union: .....

   (b) Upazila: ..... District: .....

2. Major Problems of Water Management in the Union and its impact:

Problem		Mark √	* Give serial number as per importance	Write in short about the damage that happens to crops due to the problem
Flood	Early Flood (April-May)			
	Monsoon Flood (June - October)			
Water logging	During Pre-monsoon Rains (April - May)			
	During Post-monsoon (November-December)			
Drought/ No Rainfall	At start of Monsoon (June-July)			
	At end of Mnsoon (September – October))			
Lack of Irrigation	During Rabi/Boro season			
	During Monsoon drought			

* Give numbers as 1 for major problem, 2 for second problem.

3. Proposal for required subproject to solve the problem:

   (a) Name of subproject: .....

   (b) Objective and Brief Description of the subproject .....

   .....

   .....

(c) Names of Village/Mouza and Net Benefited Area (approx): .....

   .....

(d) Describe what physical infrastructure are required and where these will be located / constructed to solve the problem best:

(1) Embankment Construction (from where to where): .....

(2) Khal Re-excavation (from where to where):.....

Branch Khal-1: .....

Branch Khal-2: .....

Branch Khal-3: .....

(3) Regulator/Sluice (How many and where): a).....

b).....

c).....

(4) Water Retention Structure (How many and where)

a).....

b).....

(5) Other structures, if required: .....

4. Minutes of concerned meeting (with names and signatures of Members present) of the Union Parishad should be enclosed with the filled-up form.

Signature of UP Secretary	Signature of UP Chairman
Name:	Name:
Seal:	Seal:
Date:	Date:
Phone No.:	Phone No.:

EXHIBIT G2-B: TECHNICAL PROPOSAL FOR SSWRD SUBPROJECT

FORM-2

(to be filled by Upazila Engineer)

Technical Proposal for Proposed SSWRD Subproject

[**Instruction**: Upazila Engineer will fill up this Form for each subproject identified by Union Parishad after physical inspection of the proposed subproject area and discussion with local people. During inspection of the proposed subprojects, concerned Sub-Assistant Engineer and Community Organizer of Upazila Engineer's Office and, if possible, Water Resources Engineer/Community Participation Officer from Executive Engineers Office will participate. The Sub-Assistant Agriculture Officer (SAAO) of Department of Agriculture Extension (DAE) may be requested to participate in the inspection team to provide assistance in agricultural aspects]

1. Name of the proposed sub-project: .....
2. Location of of the proposed sub-project:

   District: ..... Upazila: ..... Union: .....

   Mouza(s) .....

   Name of adjacent Union that may be influenced: .....
3. Area of the subproject:

   Name of Mouzas: …….

   Gross Area: .....ha (*)

   Possible Net Benefited Area: .....ha (*)
4. Problem identification by farmers and professional persons present at site:

Group	Briefly describe major problem
High Land Farmers	
Medium High Land Farmers	
Low Land Farmers	
Fishermen	
Boatmen	
Landless	
Destitute Women	

* 1 hectare=2.47 acre

5. Physical Objective of the Subproject and How that will be achieved.

Physical Objective of Subproject (mark with √)		**How Objective will be achieved (mark with √)**
Flood Management (FM) Support improved cultivation in the land of subproject area through construction /re-construction of flood embankment and construction of regulator/sluice.	Pre-monsoon	Through reduction of duration / depth of flood / salinity control
	Monsoon	Through reduction of duration / depth of flood / salinity control
	Post-monsoon	Through reduction of duration / depth of flood / salinity control
Drainage Improvement Increase agricultural / fisheries production and improve local navigation though khal re-excavation.	Pre-monsoon	Through removal of water logging / water conservation in khal for irrigation
	Monsoon	Though removal of water logging / water conservation in khal for irrigation
	Post-monsoon	Though removal of water logging / water conservation in khal for irrigation / ncrease availability of tidal water for irrigation
Tidal Irrigation Increase availability of tidal water for irrigation through khal re-excavation	Later part of monsoon	Through increased availability of tidal water for irrigation
	Post-monsoon	Through increased availability of tidal water for irrigation
Water Conservation Increase irrigation facility through conservation of water in khal/river by construction of Water Retention Structure.	Post-monsoon	Through supplementary irrigation / full irrigation / increase availability of water for household use
	Rabi-Dry season	Through supplementary irrigation / full irrigation / increase availability of water for household use
Command Area Development (CAD) Increase of irrigation efficiency and irrigated area through development of irrigation system of existing irrigation scheme.	Rabi-Dry season	Through construction of pucca irrigation canal / installation of underground irrigation pipeline / adopting improved water distribution system / construction of aqueduct / siphon / pump-house / other structure.
Other Objectives, if any (a) …… (b) ……		

6. Possible adverse impact of the subproject

On what type of people, the subproject can impose adverse impact (Give √). Briefly write the impact.

☐ Farmer	Outside ☐	or Inside ☐	of subproject	Impact:
☐ Fishermen	Outside ☐	or Inside ☐	of subproject	Impact:
☐ Medium	Outside ☐	or Inside ☐	of subproject	Impact:
☐ Landless	Outside ☐	or Inside ☐	of subproject	Impact:
☐ Women	Outside ☐	or Inside ☐	of subproject	Impact:
☐	Outside ☐	or Inside ☐	of subproject	Impact:
☐	Outside ☐	or Inside ☐	of subproject	Impact:

7. Write the name of physical works of the subproject and indicate location of the work through GPS coordinate recorded at field.

No.	**Name of Physical Work**	**Work location indicative GPS coordinates**		
		Start Point	One or more Points along the course	End Point
1.	Khal excavation/re-excavation (a) (b) (c)			
2.	Embankment Construction (a) (b)			
3.	Regulator / sluice / Water Retention Structure (including name of place or khal) (a) (b)			

8. Do the subproject fall within the area of any existing Project of Bangladesh Water Development Board or related to it? .....Yes/No

if yes, then mention name of BWDB Project and present condition: ……..

.....

9. Are the people of the subproject area willing to pay contribution for O&M (1.5% for concrete work and 3% for earth work) and take full responsibility of operation & maintenance of the subproject? .....Yes/No

10. Are the people of the subproject willing to form a Water Management Cooperative Association (WMCA) for O&M activities of the subproject and socio-economic development of the area? …… Yes/No

11. Is the subproject proposal approved in Upazila Parishad Meeting? ..... Yes/No

If yes, mention the date of approval..... and enclose Minutes of the Meeting.

12. Enclose **Index Map** of the proposed subproject after preparing as below:
    - Subproject area (gross area, net benefited area, drainage/catchment area) to be shown in Upazila Base Map or Topographic Map (Scale 1: 50000)
    - All villages, rivers, khals and beels to be shown in the map
    - For showing structure and other features, use LGED's standard legends and marks.
    - Use **black ink** (pen) for showing existing structure
    - Use **red ink** (pen) for showing proposed structure and write **GPS coordinate** values beside it.
    - Use red ink for showing proposed khal re-excavation/embankment reconstruction/ construction and write GPS coordinate values of start, middle and end point at appropriate place.

13. Signature with date and seal

    Upazila Engineer
    Upazila:

14. Remark by Executive Engineer ……..
    ……

    Signature with date and seal

    Execitive Engineer
    District

EXHIBIT G2-C: PRE-SCREENING OF SUBPROJECT PROPOSAL

FORM-3
(to be completed in IWRMU)

Pre-Screening of SSWRD Subproject Proposal

Name of Subproject: .....

District: ..... Upazila: ..... UP: .....

Pre-screening Date: .....

Subproject Eligibility Criteria		Subproject Information	Comments
Physical	Flood Management (FM)		
	Drainage Improvement (DR)		
1. Objective	Water Conservation (WC)		
	Command Area Development (CAD)		
	Combination of above (please specify)		
2. Benefited Area	50-1000 ha		
3. System Definition	Rehabilitation/Upgrading of existing system		
Planning	Upazila Engineer inspected subproject area	Yes / No	
	Subproject Map with GPS Co-ordinate of works attached	Yes / No	
	New structures (number)		
4. Local Planning	UP Subproject Identification Form included	Yes / No	
	Approved by Upazila Parishad	Yes / No	
	Conflicting/Overlapping with BWDB Project	Yes / No	
5.Regional Planning	In line with Regional Plan	Yes / No	
6. National Planning	In line with National Water Policy	Yes / No	
Social 7. Resettlement	Requires displacement of people or has impact on sensitive areas	Yes / No	
8.Inclusive development	More than 40% of benefited area operated by landless sharecroppers to small farmers	Yes / No	
	Less than 30% of subproject households depend on capture fisheries as main livelihood	Yes / No	
Environmental	Within environmentally sensitive area(s)	Yes / No	
9.Environmental soundness	May have major adverse environmental impacts	Yes / No	
	The expected environmental impacts may be within acceptable level	Yes / No	
Economic	Max. $ 1,500/ha for CAD subprojects		Estimates based on recent SP cost (MIS)
10. Unit Costs	Max. $ 1,000/ha for other types of subprojects		
Beneficiary Participation	Subproject has strong support of local community	Yes / No	
11. Indication	Beneficiaries willing to take full responsibility for O&M and make up-front contribution of 1.5% of the cost of structures and 3% of the cost of earthworks	Yes / No	
Map 12.Index Map of SP (Google)	Preliminary Index Map of the proposed subproject will be prepared using Google Imagery based on GPS co-ordinates and other information obtained.	Yes / No	
Subproject Recommended for Multidisciplinary Field Reconnaissance		Yes / No	Date:
Name and Signature of IWRM Engineer:	*Name and Signature of Project Consultant:*		

EXHIBIT G2-D1: RECONNAISSANCE OF PROPOSED SUBPROJECT (FORM 4 SUM)

FORM 4: SUMMARY
Summary of Reconnaissance Report
(Team Report)

1. Name of Subproject: .....
   (Proposed by Reconnaissance Team)

2. Type of Subproject: (FM/FMD/FMDWC/DR/DRWC/TI/WC/CAD/CAD&FMD/...../.....)

3. Location of Sub-Project: District: …… Upazila: …….. Union: …….
   Name of Moujas: .....……
   Name of Villages: ……..

4. Area of Subproject: Gross Area ……. Ha Net Benefitted Area……. Ha

5. Catchment Area (if different from subproject area): …….. Hectare

6. Population of Villages under the Subproject: ……

7. Number of HH: Landless (less than 0.50 Acre): .....… Large Farmer (more than 7 Acre): .....

8. Recommended Physical Works:
   - Regulator : Nr ….....Location ……..
   - Sluice : Nr ….....Location ……..
   - WRS : Nr ….....Location ……..
   - Pipe Sluice : Nr ….....Location ……..
   - Other Structures : Nr ….....Location ……..
   - Irrigation Canal : Nr ….....Location ……..
   - Buried Irr Pipeline: Nr ….....Location ……..
   - Overhead Tank : Nr ….....Location ……..
   - Embankment : New Length …..... km
     Resectioning Length …..... km
   - Khal : Re-excavation Length ..... km
   - Others, if any : ……..

9. Cost of Subproject (app) Physical Cost (LTk) ……...
   Misc. Cost (LTk) …… .....
   Total Cost (LTk) …….

10. Subproject Benefit:

Rabi-Boro	:Benefited Area :……..… Ha	Crop:…….	Price (LTk): ……	
Kharif-1	:Benefited Area:… Ha	Crop:…….	Price (LTk)……	
Kharif-2	:Benefited Area:…… Ha	Crop:…….	Price (LTk) ……	

11. Land Acquisition : Yes/No If yes, probable land area……..... Ha
12. Need for Rehabilitation : Yes/No If yes, number of HH …….

13. Is the proposed subproject situated within BWDB Project? Y/N
    If yes, provide information about BWDB Project and say if the proposed subproject is compatible with the objective of BWDB Project.

.....
……

14. Are the beneficiaries willing to form WMCA? Y/N

15. Are the beneficiaries willing to pay contribution for O&M cost before starting work? Y/N

16. Is there any social conflict in villages of the sub-project area? Y/N
    If yes, describe the subject and severity of the conflict: ……...
    ……..

17. Is there any village against the implementation of this sub-project? Y/N
    If yes, mention name of the village and reason for the opposition

18. Are the women interested to be member of WMCA? Y/N

19. Will there be sufficient labour available for doing earthwork? Y/N

20. Will there be employment generation due to the sub-project? Y/N
    If yes, explain how and in which sector? ……

21. Give an estimate of increase or decrease in production in fisheries sector due to the sub-project :
    ……..

22. Specific comments by the Reconnaissance Team:

    Agronomist: ……
    ……
    ……..

    Fisheries Specialist: …….
    ……

    Environmentalist…….

    Sociologist/Socio-Economist: ……
    ……
    ……

    Water Resources Engineer ……
    ……
    ……..

23. Evaluation of the Subproject Proposal:
    Technical viability : Very Good/Good/General/Poor
    Agriculture viability : Very Good/Good/General/Poor
    Fisheries/Environmental Effect : Acceptable/Mitigation Needed/Not Acceptable
    Social Acceptabiity / Soundness : Very Good/Good/General/Poor

24. Team Recommendation: Proceed for PRA/To be Dropped for not haing significant merit.
    Explain if the proposal can be improved by modification, etc.

Agronomist	Fisheries Specialist	Environmentalist	Sociologist	WR Engineer
.....	.....	.....	.....	.....
Name	Name	Name	Name	Name

EXHIBIT G2-D2: RECONNAISSANCE OF PROPOSED SUBPROJECT (FORM 4 WR)

FORM 4 (WR)

Report of
Water Resources Engineer

Sub-project Name: ……. .....

District: …….. Upazila: …… Union: ……..

[The Water Resources Engineer shall use GIS Map to show boundary of subproject and catchment area (if different from subproject boundary) and identify present status of roads, bridges, culverts, bazars, name & alignment of khals, beels, baors and other water bodies, existing regulators/sluices /WRS (if any). Highlight areas affected by water related problems (e.g. flood, drainage impediment, waterlogging, etc), locations of river bank erosion (if any) and physical works suggested by team, etc., to be included in the map]

Sl No.	Activity/Problem	Description of Data-Information, Reasons, Solutions, etc.
1	Description of proposed Sub-Project location including name of mouzas with unions (may be more than one) after field verification.	
2	Select the sub-project boundary in consultation with local people. Description of river, khal, road and high land indicating the north, south, east and west boundary of subproject should be given in detail. Such as start from which place/village to which place/village what type of road or khal, etc.	
3	Describe land type in the Subproject area like percentage of high, medium & low land, beels & other water shed area. Low land & beel should be shown in map.	
4	Name and describe outfall river and other river/khal near the boundary. Mention distance of proposed structure from river. Write the name and distance of Water Level gauge station nearest to the sub-project. Describe the river erosion information such as depth of river, erosion in m/year (avg). Describe if there is siltation of river bed and char land.	
5	List and locate the infrastructure like-road, bridge, culvert, canal, regulator, sluice etc existing inside the sub-project and nearby boundary and show in map.	
6	Describe existing water related problem in the subproject area viz. flood, drainage congestion, water logging, scarcity of irrigation water including its source/reason. Show natural drainage system in the map.	

Sl No.	Activity/Problem	Description of Data-Information, Reasons, Solutions, etc.
7	Describe the infrastructures needed (viz. regulator, sluice, embankment, khal re-excavation etc.) considering the infrastructures proposed in the subproject proposal and discussing with the local peoples and show in the map.	
8	Is there any land acquisition and resettlement need to implement the subproject? If needed, describe the area of land and number of resettlements needed for specific structures.	
9	Provide information on: *khash* water body/beel in the subproject and if these are leased/non-leased. If leased, who are the leasee and what is the lease period and money?	
10	Based on the above information, the WRE will update the subproject map (Google Map) and enclosed with this Report.	(Please attach map)
11	Any other issues found during the reconnaissanc	

Signature :

Date :

Name :

Designation :

EXHIBIT G2-D3: RECONNAISSANCE OF PROPOSED SUBPROJECT (FORM 4 AGRI)

FORM 4 (Agri)

Report of Agriculturist

Sub-project Name: ……. .....

District: …….. Upazila: …… Union: ……..

1. Type and Use of cultivable land
(Fill the following table considering each cell 10% for showing the percentage of land type in relation to total cultivated land within proposed sub-project area)

Land Type	Kharif-1									Kharif-2									Rabi								
Free from Water logging																											
Flood Free																											
Drought Free																											
Irrigated																											
Waterlogged																											
Flooded																											
Droughty																											
Non-irrigated																											

2. Crop Production Problem

Season	Name of Crop	Cultivated Area (% of Total Cultivable land)	Avge Production (Kg/acre)	Problem
Kharif-1				
Kharif-2				
Rabi				

3. Local Farmer opinion:

a) Importance of Subproject: (√)

Removal of Water logging	Timely Drainage	Flood protection	Reduce Flood Depth	Water Conservation	Irrigation water supply	Supplementary Irrigation	CAD	Others

b) Effectiveness of Subproject: (√)

Reduce Crop Damage	Increase Cropped Area	New Crop cultivation	Increase HYV Cultivation	Increase Cropping Intensity	Change of Crop Pattern	Increase Production	Adverse Impact, give reason	Others

Name: Signature:
Designation: Date:

4. Show cropping pattern and constraints of crop production & affected area.

EXHIBIT G2-D4: RECONNAISSANCE OF PROPOSED SUBPROJECT (FORM 4 SOC)

FORM 4 (Socio)

Report of Sociologist

Sub-project Name: ……. .....

District: …….. Upazila: …… Union: ……..

Sl No.	Activity/Problem	Description of Data-Information, Reasons, Solutions, etc.
1	Describe opinion of related UP Chairman, UP Member (including the Woman Member) about the poposed subproject.	
2	Discuss about the proposed subproject with local people at different locations and write their opinion (both in favour and against) about the subproject.	
3	Who initiated to send this subproject proposal? (UP Chairman, UP Member, MP, Officials from Government/Autonomous Organisation or any other)#	
4	Write names of Co-operative Society, Informal Community Organisation, Social Welfare Club/Trust etc working in the area and mention there main activities.	
5	Write names of NGOs working in the proposed subproject area and describe their area of activities.	
6	Make an idea of earthwork required in the subproject and judge if local labor will be available to do the earthwork by LCS. Will women labor work under LCS management?	
7	What are the %age of different villages of the total land, HH,	

Sl No.	Activity/Problem	Description of Data-Information, Reasons, Solutions, etc.
	population and landless HH of the subproject area? What % of cultivated area are cultivated by (a) landless share croppers (<0.5 acre) (b) marginal and small farmer (>1.0 acre).	
8	Identify areas (Mouza, village) and communities of the subproject that will face adverse impact due to the subproject. What are the opinions of the affected area peoples and communities? How the adverse impacts can be mitigated?	
9	Will land owners give land if needed for construction of infrastructure? If agreeable, then wheather they will donate or need to be acquired?.	
10	Is there any social conflict in the subproject area? If any, then identify the conflict issue and see if this conflict will play adverse role in subproject implementation.	
11	Verify possibility of any conflict arising between villages/groups due to implementation of this sub-project. In there is anyany, how this can be mitigated?.	
12	Describe profession, culture and relation with local community of aborigines/tribal groups in the sub-project area. How would sub-project implementation affect them. If it creates any problem then how it can be mitigated..	

Signature :

Date :

Name :

Designation :

EXHIBIT G2-D5: RECONNAISSANCE OF PROPOSED SUBPROJECT (FORM 4 ENV)

FORM 4 (Env)

Report of Environmentalist

Sub-project Name: …….....

District: …….. Upazila: …… Union: …….....

Sl No.	Activity/Problem	Description of Data-Information, Reasons, Solutions, etc.
1	Is the proposed subproject situated within conserved wet land (e.g. Tanguar Haor in Sunamganj district) or ecologically important Haor or permanent water body or if the proposed subproject may have any impact on those water bodies? If so, identify the positive or adverse impacts. If the impacts are adverse, suggest possible mitigation measures.	
2	Is there any forest within the proposed subproject? If so, what is the area of the forest and if it is a conserved forest? Locate the forest in Map (WRE may assist). Will there b any positive or negative impact on the forest due to the subproject implementation? If any adverse impact, then what steps can be taken to mitigate the adverse impacts?.	
3	Give description of any place of archeological or historical importance within or near the subproject area. Will there be any adverse on these establishments due to the subproject implementation? How these can be mitigated? (Indicate the places in map).	
4	Is there any possibility of creating adverse environmental	

Sl No.	Activity/Problem	Description of Data-Information, Reasons, Solutions, etc.
	situation like drainage impediment or decrease/stoppage of irrigation water availability due to construction of cross-dam or soil deposition on agricultural land, etc. during construction of the subproject? What is the opinion of local people regarding this type of short term problems?	
5	Is there any possibility of developing adverse environmental impacts like.inundation of some low lands due to water conservation, decrease of water availability at the down stream area, drainage impediment at some places due to embankment construction, excessive drainage due to khal re-excavation, etc. due to subproject implementation or during its /operation? Describe location of such possible problem areas and local opinion for about mitigation after discussion with local people.	

Signature :

Date :

Name :

Designation :

EXHIBIT G2-D6: RECONNAISSANCE OF PROPOSED SUBPROJECT (FORM 4 FISH)

FORM 4 (Fish)

Report of Environmentalist

Sub-project Name: …….....

District: …….. Upazila: …… Union: …….....

Sl No	**Activity/Problem**	Description of Data-Information, Reasons, Solutions, etc.
1.	Present water body for fisheries in proposed subproject area. and production	(a) Fish water body: Open water body (khal, beel & haor)) = ... hectare Closed water Body (pond…….....) = ...hectare Total = ... hectare (b) Production : Open water body = ... ton Fish Culture = ... ton Total = ... ton
.2.	Number of people engaged in fisheries activities in the proposed subproject area.	a) Total number of persons in fisheries activities = b) Fishers - Full time = Part time = c) Fish Farmer - Full time = Part time =
3.	Number and percentage of fishers in the subproject area.	a) Number Fishers (Fisherman) = b) Percentage of fishers in respect to total population……Percent
4.	Conserved fish water body or fish sanctuary in the proposed subproject area.	Conserved fish water body: Yes/No Fish sanctuary: Yes/No Description:……..
5.	What will be the impacts on fisheries sector due to implementation of proposed subproject?	☐ Will hamper fish migration ☐ Will reduce fish water body ☐ Will reduce fish production ☐ Will reduce opportunity of fishers to catch fish ☐ Will hamper/increase scope of fish culture ☐ Others
6.	What possible measures could be taken to mitigate adverse impacts of the subproject on fisheries?	☐ Regulator invert level be fixed properly to limit drainage of permanent water bodies. ☐ To prevent escape of fish by fixing fishnet with the regulators ☐ To rehabilitate affected fishers. ☐ Undertake fish culture programs in water bodies created/developed under subproject.

Signature _____ Date _____ Name _____ Designation _____

EXHIBIT G2-E: SOME TECHNICAL NOTES ON RECONNAISSANCE OF SSWRD SUBPROJECTS

I. Introduction

1. Reconnaissance field visit to proposed subproject sites are undertaken after a screening exercise confirms that all the procedures required at the local government level and preliminary conditions in forwarding the subproject proposal for consideration for implementation have been met. Reconnaissance visit and planning examination of the proposed subproject is done by a team of professionals that comprise of Water Resources Engineer, Agriculturist, Fisheries-cum-Environment Specialist, Sociologist and a Gender Specialist.

2. The Reconnaissance Team visits important locations of the proposed subproject area and observes local conditions, talks to farmers and local inhabitants and understands the water management problems and other constraints to agriculture, examines adequacy and addition or alterations of the proposed water management interventions in the context of the problems and potentials of the area. The professional specialists use their knowledge, experience and ready secondary data/information for a qualitative assessment of technical, social and environmental viability of the proposal and a preliminary assessment of agricultural and fishery benefits based on local information and estimates. Economic assessments are not carried out but the tentative unit cost (Tk / ha) should be comparable with average unit costs of recently completed projects.

3. The duration and number of field visits required for the reconnaissance study depend on the complexity and size of the subproject. Typically 1-2 days will be required for non-regulatory subprojects and 2-4 days may be required for regulatory and CAD subprojects.

4. To qualify for being implemented a subproject will have to meet the eligibility criteria given below in ***Table G2E-I.1***. These may vary for specific Projects as required and agreed with Donors. For CAD subprojects additional specific criteria are given. These criteria will have been applied to during pre-screening the application; however the reconnaissance team may review the checking.

Table G2-E I-1 Eligibility Criteria[3]

Nr	Criteria	Requirement
General Criteria (all new SPs)		
1	Beneficiary Demand	The request for the subproject must emanate from the beneficiaries.
2	Area Limitation	The benefited area served by the subproject must be more than 50 ha and must not exceed 1,000 ha.
3	Administrative Boundary	The subproject must fall within one district.
4	Land holding	More than 40% of the subproject benefit area will be *operated* by landless sharecroppers and marginal or small farmers (up to 1.0 ha).
5	Fishery Livelihoods	No more than 30% of the households shall depend on subsistence capture fisheries as their main livelihood.
6	WMCA and	Each new subproject will entail rehabilitating / upgrading an existing water

[3] The percentages given may change for any particular project as mutually agreed with the Donor(s)

Nr	Criteria	Requirement
	Works	resource system where a farmer organisation (WMCA) has not previously been established or works carried out by the IWRMU. Interventions involving submersible embankments in the deeply flooded part of the Northeast region will not be considered unless it can be shown that the beneficiaries have the capacity of ensuring the sustainability of submersible embankments.
7	Technically and Economically Feasible	Each subproject shall be technically feasible and economically viable with an economic internal rate of return (EIRR) of at least 12% and a development cost of not more than $1,500 / ha (CAD schemes) or $1,000 / ha (other schemes) without prior approval of the Additional Chief Engineer and others concerned[4].
8	Inclusive Development	At least 70% of direct beneficiary households (owners and tenants) have enrolled representation on the Water Management Cooperative Association (WMCA).
9	Resettlement	Each subproject shall be socially and culturally sound requiring no displacement of people or impingement on sensitive areas. Resettlement and asset acquisition costs shall not exceed 20% of the engineering base costs.
10	Environment	An Initial Environmental Examination (IEE) shall be undertaken with consultation with beneficiaries and project affected people, and conclude that any negative consequences can be mitigated to an acceptable level. No subproject shall be approved that involves any of the following: • Location in nature reserves. • Any significant loss of primary forest, mangroves or sensitive wetland. • Any permanent negative effect on known rare or endangered species. • Any significant impacts on air quality and water quality. • Any permanent damage to cultural relics and archaeological sites.
11	O&M Costs	The routine maintenance costs of the subproject shall be fully borne by the WMCA as well as the periodic maintenance costs (less any matching funding assistance that may be available from GoB from time to time). The WMCA shall agree to this condition and shall raise funds for O&M in an equitable manner from benefiting land owners or cultivators.
12	Char Lands	To ensure sustainability, subprojects should not be taken in Char lands (unstable land in or along a river course) and other area vulnerable to river erosion and requiring significant river bank protection works (however, subprojects may be allowed in Char lands that have become significantly stable over the years).
13	DLIAPC Approval	The subproject shall be consistent with the District Water Resources Assessment (where finalized) and approved by the District Level Inter-agency Project Evaluation Committee.
Additional Criteria for CAD SPs		
1	Water source	The water source must be perennial with sufficient water in an adjacent river / khal even in a dry year to meet demand. Highly unstable rivers should also be avoided.
2	Other Users	Increased pumping from the water source must not adversely impact on other users (whether for domestic, agricultural or fishery use)

[4] Cost limits may be updated from time to time

Nr	Criteria	Requirement
3	Existing irrigation system	There should be an existing low lift irrigation system (open channel / pipe) in the subproject area demonstrating community interest and ability to manage an irrigation system
4	Groundwater pumping	If the command area is already irrigated by either: (i) small privately (household) owned shallow wells; or (ii) a few number of deep tubewells it should not be developed as a CAD SP
5	Flooding / land elevation	Irrigation facilities should not extend over land which is extensively flooded in the monsoon. If the proposed SP contains extensive low and bottom lands (say >40%) it should not be developed as a CAD SP.
6	Power source and Pumps	Reliable power supply must be available – assuming electric pumps this implies that a suitable power line is available within (say) 3 km. Also the local community must demonstrate ability to procure the required pumps and, if appropriate, electrical connection.

II. OVERVIEW of Agriculture, Soil and Water constraints

5. Benefits from all small scale water resources subprojects mostly accrue by addressing the water constraints to cropping, for example shortages in the dry season and flooding or water logging in the pre-monsoon, monsoon and post monsoon period. Benefits may also accrue from fisheries, for example by retention of water and development of culture fisheries.

6. Cropping in Bangladesh revolves around three seasons:

(i) Monsoon (May to October) when 90% of annual rainfall occurs and characterised by high temperature, high humidity and low solar radiation;

(ii) Rabi, dry cool season (November to February) with negligible rainfall and characterised by low temperature, low humidity and high solar radiation; and

(iii) Pre-monsoon season (March to April) with erratic rainfall, high temperatures and high evaporation.

7. In Rabi the high solar radiation enables high crop production if water shortages can be met through irrigation. In other seasons flooding and / or poor drainage constrain cropping as well as lower solar radiation. In the drier eastern part of the country average annual rainfall is about 1,400 mm and here irrigation is particularly important, see ***Figure G2E-II.2***. In the north-east and south-east average rainfall is 3,000 mm of more and flooding is more problematic.

8. The need for irrigation in Rabi, and its timing and frequency, depends largely on land elevation (see below) and soil water holding capacity. The major soils are shown on ***Figure G2E-II.3*** and comprise:

Soil Type	Particulars
1a, 1b:	Alluvium, particularly near the coast where they may be seasonally saline.
3, 4	Calcareous grey-dark grey flood plain soils.
5, 6, 7, 8	Non-calcareous grey-dark grey-brown flood plain soils.
13	Brown hill soils
14, 15	Shallow-deep grey-red brown terrace soils

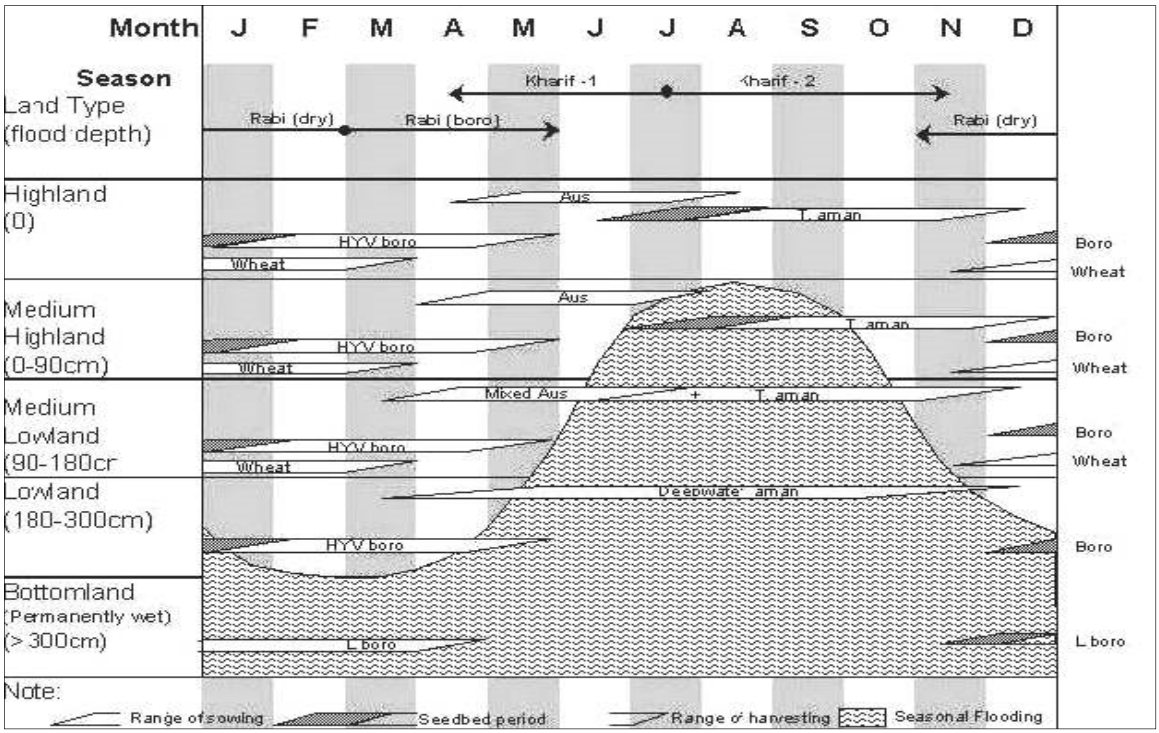
9. The various flood plain soils which extend over 70% of the country exhibit a general pattern of silt-loams or sandy-loams on the higher land grading through to heavier silty-clays or clays in low lying basins. Moisture holding capacity is high for the loams and low for most basin clays.

10. The hill soils include a wide range of soils developed over the unconsolidated sandstones, siltstones and shales which make up the eastern and northern hills. The majority are deep, well drained and occur on steep slopes.

11. The terrace soils have formed over Madhupur clay and uplifted fault blocks which mainly stand a few meters have flood levels on adjoining flood plains.

12. .Cropping patterns revolve around the three seasons, and are highly dependent on land elevation which influences the depth and duration of flooding in the monsoon. Flooding starts in April-June for basins and in June-July for higher land. For the higher land, if irrigation is practicable, triple cropping is possible. For bottom land land cropping may only be possible in Rabi, see ***Figure G2E-II.1.***

Figure G2-E II-1 Typical Cropping Pattern by Land Type



13. Land resources are grouped into five land types on the basis of flood depth in the monsoon. Cropping potential, constraints and opportunities by land type are shown below in ***Table G2E-II.1.***

Table G2-E II-1 Water Constraints and Opportunities by Land Type

Land Type	Monsoon Flooding (m)	Cropping Potential	Typical WR Constraints	Typical Engineering Opportunities
F0 Highland	0	3 crops/year	Water shortage in Rabi season	(i) Water retention structures and khal re-excavation to retain water in khals, water bodies for pumping by farmers during Rabi. (ii) Water distribution facilities, buried pipe or open canals, to allow water from perennial sources to be pumped and distributed efficiently.
F1 Medium highland	0 – 0.9	2-3 crops/year	Water shortage in Rabi, flooding in monsoon and flash floods in pre-monsoon	The above water retention and irrigation system development, Plus: (i) drainage improvement though khal excavation; (ii) flood management through embankments and regulators.
F2 Medium lowland	0.9 – 1.8	2 crops / year		
F3 Lowland	1.8 – 3.0	1 crop/ year		
F4 Bottom Land	> 3.0	1 crop /year	Flooding in monsoon and flash flood in pre-monsoon	Flood management through flood bunds and regulators.

Figure G2-E II-2: Mean Annual Rainfall (mm)

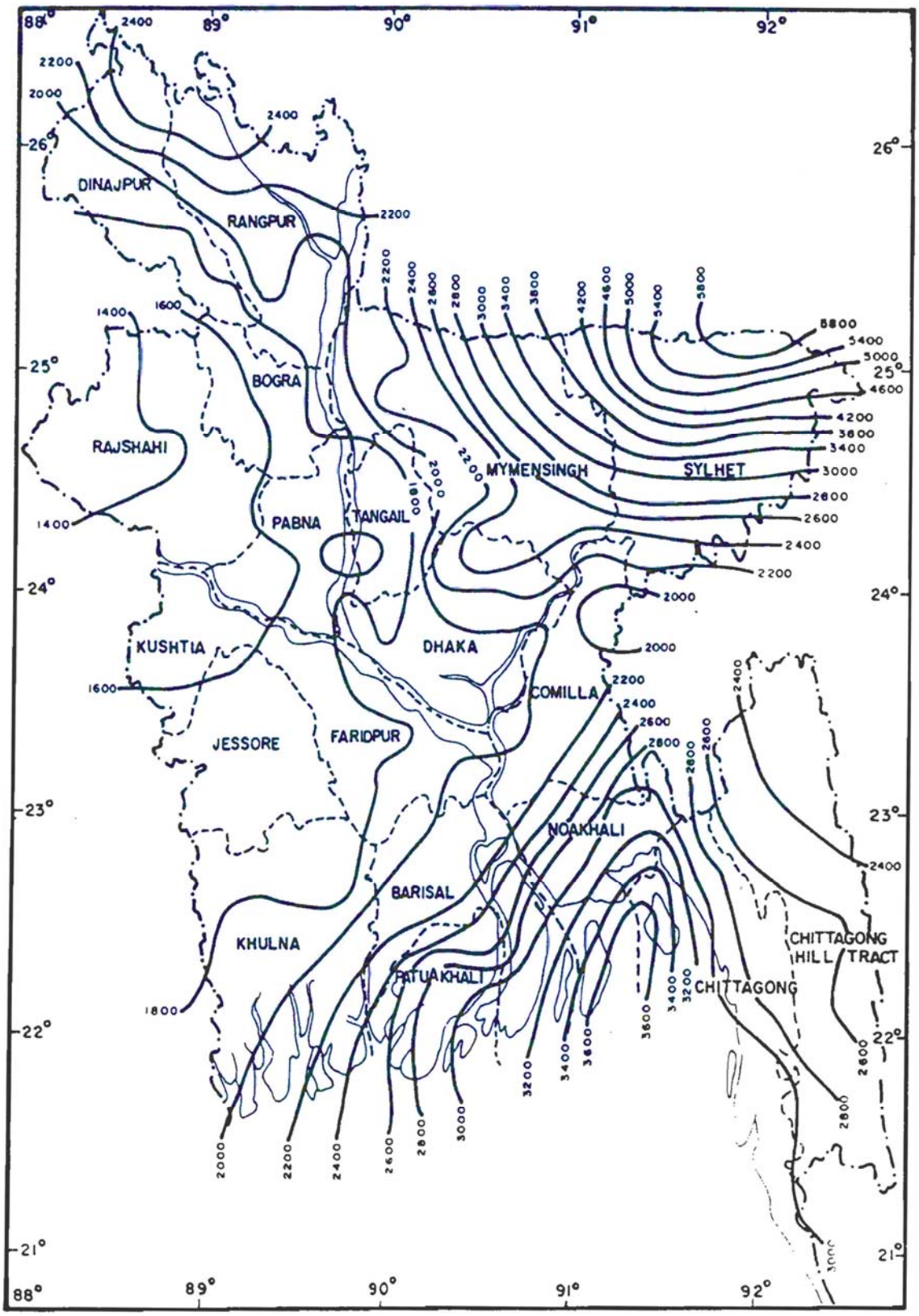
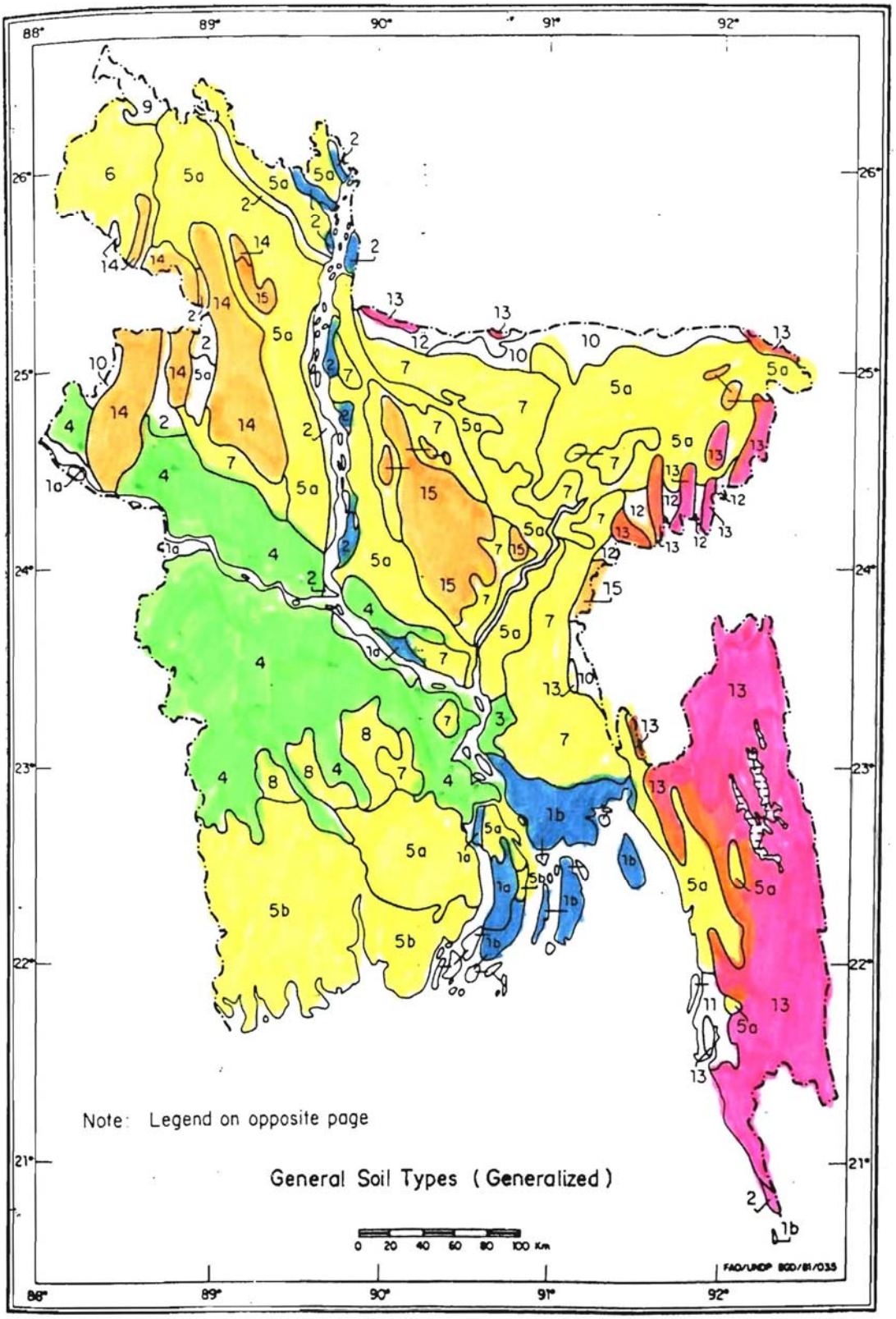


Figure G2-E II-3 General Soil Types



III. TYPES OF SUBPROJECTS, TYPICAL COSTS AND ANTICIPATED BENEFITS

3.1 Types of Subprojects

14. There are four basic types of subprojects according to the purpose of the engineering infrastructure provided, as well as many combinations of these basic types, see ***Table G2E-III.1.***

Table G2-E III-1 Type of Subprojects and Typical Emgineering Works

Subproject Type		Category	Typical Engineering Works
DR	Drainage	Without Flow Control (no gated structures)	Re-excavate drainage khals to increase the capacity of drainage systems to benefit agriculture as well as fisheries and local navigation.
TI	Tidal Irrigation		Re-excavate tidal drainage khals/creeks to increase volume and propagation of fresh tidal water for irrigation as well as fisheries and local navigation.
FM	Flood Management	With Flow Control (with gated structures, valves)	Rehabilitate and construct embankments and/or sluice/regulators to reduce the extent and duration of flooding of farmland
WC	Water Conservation		Develop water retention capacity of beels, khals, rivers to increase availability of irrigation water by installing water retention structures including Rubber Dams and re-excavating beds..
CAD	Command Area Development		Development of existing irrigation schemes by providing better water distribution systems (improved canal network, lining of canals, installation of buried pipelines, installation of control structures, etc.) to extend the irrigated area
FMD	Flood Management & Drainage		Combinations of the above
FMWC	Flood Management & Water Conservation		

15. Subprojects without flow control (Drainage, Tidal Irrigation) are relatively cheap as they only involve earthworks and they make up about a quarter of SSWRD subprojects developed. Subprojects with flow control comprising a mix of drainage, water conservation, flood management, irrigation make up most of the balance of developed subprojects. CAD subprojects are expensive and to date make up a very small proportion (<5%) of SSWR subprojects.

3.2 Typical Subproject Costs

16. Subproject costs vary widely depending on type, and are typically lowest for subprojects without flow control, and most expensive for CAD buried pipe systems. Average cost per unit area of subprojects constructed under the JICA-supported SSWRD Project, 2009-2015 were as follows: (i) CAD subprojects with buried pipe systems: Tk 80,000 / ha with about 92% of the cost being for the pipe system and control structures; (ii) Subprojects without flow control structures: Tk 18,000 / ha with about 83% of the cost being for earthworks, largely khal excavation; and (iii) Subprojects with flow control structures: Tk 36,000 / ha with about 66% of the cost being for the gated reinforced concrete flow control

structures. ***Table G2E-III.2*** below gives a break up of construction costs of 215 subprojects of the JICA-supported SSWRD Project. These may be used as a basis, with necessary adjustments, to assess cost of proposed subprojects as a whole at the reconnaissance level.

Table G2-E III-2 Subproject Construction Costs (SSWRDP-JICA, 2009-2015)

	Item	Units	Category of Subproject					
			CAD	%	Without Flow Control	%	With Flow Control	%
1	Nr of Subprojects	No	41		41		133	
2	Net Benefit Area	Ha	22,279		22,279		69,626	
3	Av. Area of SP	Ha	543		543		524	
4	Earthworks Cost	LTk	58.25	3.4	3267.10	83.3	6925.53	27.3
5	WMCA Offices	LTk	81.69	4.8	490.14	12.5	1810.78	7.1
6	Cost of Structures	LTk	1553..80	91.7	164.00	4.2	16610.26	65.5
7	Total Cost	LTk	1693.73	100	3921.24	100	25346.57	100
8	Cost per SP	LTk/SP	282.29		95.64		190.58	
9	Cost per ha	1000Tk/ha	79.70		17.60		36.40	

Exchange rate US$ 1.00 = Tk 78

17. Reconnaissance level cost estimates of subprojects are best done by using average cost of usual components – re-sectioning/ipgrading of embankments, re-xcavation of khals and construction of hydraulic structures derived from completed projects and including appropriate cost escalation factors because quantities of the component works are the most known at this stage. The average component costs estimated by the JICA Survey Team for the proposed SSWRDP-Phase 2, based on LGED Rate Schedule of 2016, are given below in ***Table G2E-III.3.*** The table also gives average costs different types of hydraulic structures based on construction costs from the completed JICA-supported SSWRDP (2009-2015).

Table G2-E III-3 Estimated costs of Component Works of SSWRD Subprojects

Nr	Components	Unit	Project	
			Prop JICA-supported SSWRDP -2 LGED Rate 2016	**Compld JICA-supported SSWRDP** LGED Rate (2009-2015)
1	Re-sectioning/Upgrading of Embankments	LTk/Km	14.45	9.45
2	Re-sctioning of Khals	LTk/Km	13.92	8.90
3	Hydraulic structures	LTk/each	65.20	42.62
4	Regulators/Sluices/WRS			
	1-Vent			35.00
	2-Vent			43.00
	3-Vent			55.00
	4-Vent			65.00
	5-Vent			80.00
	6-Vent			100.00
	7-Vent			120.00
	8-Vent			140.00
	10-Vent			150.00
	12-Vent			160.00

18. Ability to assess the benefits that will accrue to each type of subproject requires first that these are well understood, and are then estimated based on measurement of the

subproject benefit area and its land types. Anticipated benefits of different types of subprojects are discussed below.

3.3 Command Area Development Subprojects

19. The command area development subprojects include rehabilitation of existing and construction of new / additional infrastructure for water distribution within irrigation systems. The direct impact of CAD subprojects is reflected by additional cultivable area brought under irrigation and/or improved water availability for timely irrigation. The indirect impacts of CAD subprojects are increased irrigation water efficiency and improved water management, which result in reduced cost of crop production.

20. The benefited area of a CAD subproject depends on the type and extent of works carried out. In general, if the subproject involves rehabilitation of a whole existing irrigation system the benefited area should include the whole subproject irrigated area. In case of only expanding existing command area by constructing additional irrigation canals the benefited area should include only the new or additional irrigated area.

21. Other cases may include rehabilitation of different components of the irrigation system like pumping station, main canals, secondary canals or cross drainage and other infrastructure. In this case the benefited subproject area will depend on how much of the net subproject irrigated area is affected by the proposed works.

3.4 Subprojects Without Flow Control

3.4.1 Drainage Subprojects

22. Drainage improvement works are designed to remove excess water from an area, and/or to reduce time required to drain that water. This is usually achieved by excavating new channels or re-excavating existing silted channels.

23. Possible agricultural benefits that can be derived from improved drainage are:

- Increased production of pulses and oilseeds in the rabi season since crops can be planted earlier.
- Increased area under short duration crops (mustard, pulses, potatoes) between hyv Aman and hyv Boro.
- Reduced crop damage in Kharif I (pre-monsoon) and in Kharif II (monsoon) seasons.
- Additional land available for cropping where shallow swamplands (beels) are drained.

24. Though more difficult to quantify, excavation and re-excavation of drainage channels increase their water storage capacity and thereby improves fisheries habitat and water availability for irrigation.

25. To determine the benefited area of a drainage improvement subproject it is necessary to establish (i) the pre-subproject boundary of cultivable area presently affected by inadequate drainage and (ii) the post-subproject boundary of cultivable area that remained affected by inadequate drainage (if any). The difference between these two figures gives the subproject's benefited area. In case of drainage of lowlands, the area reclaimed from the uncultivable lowland may increase the benefited area. In case of channel excavation or re-excavation the benefited area should include loss of cultivable land taken by the channel.

26. The pre- and post-subproject boundaries of respected areas should be demarcated and measured on the subproject Index Map (Google Map) with contours. If contours are not available, points at several locations be identified on the subproject map along the possible boundary line and the boundary line completed. This should be done on-site with the help of local people conversant with water and agriculture of the area.

3.4.2 Tidal Irrigation Subprojects

27. Tidal irrigation subprojects apply to fresh water tidal areas. Typically, drainage in these areas may not be critically affected by silting up of tidal khals but tides during dry months do not reach sufficiently inland. Usually, in these areas, use of ground water for irrigation is not popular. Existing silted up khals are to be re-excavated to enhance tidal flux (volume and propagation) in the *khals* in dry season to benefit irrigated agriculture. Re-excavations impact local fisheries and navigation positively as well as increase capacity of drainage systems.

28. In some areas like in Barisal, Jhalokati districts, tidal khals in the subproject area form an interconnected network. In such subprojects, usually the whole subproject area comes under irrigation after re-excavation of khals. The subproject area that is currently being irrigated under pre-project condition is identified through local information by marking several points on the subproject Index Map and completing the boundary and measuring the area. Thus the difference between the assessed current irrigated area and the total benefitted area of the subproject gives the additional irrigated area to be considered in benefit analysis.

29. In other areas, like in Madaripur, Gopalganj district areas, the khals may not form into closely interconnected networks, rather they form independent closed end branches of the main khals. In this condition, the points to which water presently reaches at high tides during the dry months in each of the khals in pre-project condition are noted. Then, considering a pragmatic depth of excavation of the khal system based on observed low tide level during the dry months, an assessment is done to which corresponding points water may reach at high tides after re-excavation of the khals. The distances between corresponding pre-project and post project tidal apex points in the khals together will give the increased length of khals coming under tidal flow as a result of the subproject. It is assumed that water can be taken by farmers to about 400m from the bank of the khal on either side by using pumps and canals/ hose pipes. The area given by this total length of the khals times the maximum irrigation strip width 800m will be the maximum gross irrigation area under the subproject. However, flow of water required to irrigate all of this estimated lands may not be available under the conditions of water level and tide at the place. A conservative assessment should be made at this stage.

3.5 Subprojects with Flow Control

3.5.1 Flood Management (FM)

3.5.1.1 Impact on Agriculture

30. The direct impact of flood management subproject is reflected in the reduced flood water levels within the protected area during pre-monsoon and monsoon seasons. The present (pre-subproject) and the projected (post-subproject) water levels are the basis for estimating agricultural benefits.

31. The FM subprojects have two-fold positive impact on agricultural production:

- Reduced crop damage due to floods, and

- Changed land types as a result of reduced flood depth.

32. The present crop damages from flood are estimated below the 1:10-year flood level. 1:10-year annual flood level should be used in high embankment subprojects and 1:10-year pre-monsoon flood level should be used in submersible embankment subprojects. Cultivable area inundated by the 1:10-year flood should be used for determining the area of pre-subproject flood damaged crops.

33. The present without subproject land type estimates are based on the average annual flood or 1:2.33-year annual flood elevation. The design basin level (monsoon) should be used as the post-subproject flood level. It should be noted that the land types do not change in submersible embankment subprojects.

34. To avoid errors that may arise from incorrect estimation of flood levels and/or subproject ground topography, the subprojects' crop damages from floods shall be crosschecked using primary data collected in three ways and verified with the benefited area defined above. For details see ***Document G4 Feasibility Study of Subprojects, Section 3.4: Agricultural Analysis, Subsection 3.4.2 Data Requirement and Collection***.

35. As a result of flood management measures, like constructing embankments and drainage regulators, more land becomes free from flood and the overall depth and duration of flooding is reduced, which results in increased area of land suitable for cultivation of transplanted Aman.

36. In the design of subprojects having larger basins, monsoon flood routing (water balance) for the months from June through October is the most appropriate analytical methodology. This methodology requires 1 in 10 year daily rainfall inside the protected area and 1 in 10 year daily water levels for the adjacent river. In practice, however, the data frequently used are water levels for a particular year, which correspond to 1 in 10 year river water levels and the daily rainfall, which corresponds to that year.

37. The criteria for estimating water level changes due to subproject intervention for agricultural impact analysis are given in ***Table G2E-III.4*** below.

Table G2-E III-4 Hydrological Design Criteria for Agricultural Analysis

Pre-Project Water Levels		**Post-Project Water Levels**		
Item	**Description**	**Description**	**Approximate Estimate**	**Detail Analysis**
Pre-Monsoon Flood Protection with Submersible Embankments in Haor Areas of Sylhet Basin (Land Type will not change)				
Pre-Monsoon Design Flood Levels	1:10-year Flood Level in the outfall river (at subproject site) in the month of May	Basin Water Level generated by the pre-monsoon Design Storm (5-day, 1:10-year storm)	May [(Mean Max WL + Mean Min WL)/2]+0.3 m	Basin Water Level determined from routing of the Pre-Monsoon Design Storm using suitable Drainage Rate corresponding to project acceptable crop damage criteria.
re-Monsoon Flood Protection with Submersible Embankments in Other Areas of Bangladesh (Land Type will not change)				
Pre-Monsoon Design Flood Levels	1:10-year Flood Level in the outfall river (at subproject site)	Basin Water Level generated by the pre-monsoon Design Storm	In Tidal Area: June [(Mean Max HTL+ Mean Min LTL)/2]+0.3m In Non-Tidal Areas:	Basin Water Level determined from routing of the Pre-Monsoon Design Storm using suitable Drainage Rate corresponding to project accepted crop damage criteria.

Pre-Project Water Levels		Post-Project Water Levels		
Item	**Description**	**Description**	**Approximate Estimate**	**Detail Analysis**
	in the month of June	(5-day, 1:10-year storm)	June Mean WL + 0.3m	

Pre-Project Water Levels		Post-Project Water Levels		
Item	**Description**	**Description**	**Approximate Estimate**	**Detail Analysis**
Monsoon Season Flood Protection with High Embankments (Land Type will change according to Post-Project Basin Water Level)				
Monsoon Season Design Flood Levels	1:10-year Annual Flood Level in the outfall river (at subproject site)	Basin Water Level generated by the monsoon Design Storm (5-day, 1:10-year storm)	In Tidal Areas: July or August [(Mean Max HTL + Mean Min LTL)/2]+0.3m In Non-Tidal Areas: July or August Mean WL+ 0.3 m	1. If the outfall river level permits drainage: Basin Water Level determined from routing of the Monsoon Design Storm using suitable Drainage Rate corresponding to project accepted crop damage criteria. 2. If the outfall river water level is high: Basin Water Level determined from Water Balance analysis. (ref: para 49).

Notes:
1. The "Approximate Estimate" may be used at the pre-screening stage of subproject investigation.
2. Basin water levels determined from "Detail Analysis" using routing of Design Storms should be used in subproject feasibility analysis.

38. Generally flood management interventions, by protecting area with embankments and drainage sluices, are successful in protecting Boro crops from the pre-monsoon floods with submersible embankments; this type of intervention is called partial flood management. Also, it is possible to protect Aus and Aman crops grown along flashy rivers with high embankments; this type of intervention is called full flood management.

39. The full flood management interventions are successful in tidal areas, where cultivated lands are protected from saline water and tidal flooding by high embankments and structures like regulators and sluices provided for drainage of local runoff, and water management inside the protected area. During storm the rainwater is drained from the basin twice daily during low tide. In order to have sufficient discharge capacity to drain the design storm (1:10-year, 5-day rainfall), the structures are sized for the required drainage modulus (DM), while the basin water level does not exceed the allowable, or the design basin level in July or August.

40. In non-tidal zone, especially in deeply flooded areas like floodplains of big and medium rivers, which remain inundated from June to October, complete flood protection or full flood management (FM) is generally not possible because of accumulation of rainfall runoff and seepage through the embankments into the protected area. Under these conditions pump drainage is required for effective full flood management. However, a limited flood protection can be achieved by constructing high embankments in non-tidal zone. The degree of protection, or reduction in flood levels will depend on the subproject topography, hydrology (water levels in the outfall and surrounding rivers) and climatic data namely rain, evaporation and evapotranspiration in the area.

41. To verify technical feasibility and determine the post-subproject water levels, the following hydrological assumptions can be made for conducting water balance analysis. These are considered adequate to determine the water levels throughout the monsoon on monthly basis:

- Initial Storage in the subproject basin is considered to be an average water level in May based on long-term records from the outfall river or observed at the subproject site. This assumes that gates are open through the end of May.

- Accumulation of rainfall inside the subproject is 100% of average rainfall in June, July, August, and September based on the mean monthly rainfall from the nearest rainfall station.

- Water losses include average evaporation from 50% of the subproject catchment and evapotranspiration from the remaining 50% of the subproject catchment area.

- Post-subproject monthly water levels inside the subproject correspond to the initial storage level plus accumulated rainfall minus Eo and Eto, as above. The water levels are determined using the subproject elevation - storage volume data (rainfall-Eo/Eto in millimeters should be converted to cubic meters using the catchment area).

42. Depending on local conditions the post-subproject basin water level may be below or above the pre-subproject 1:2.33-year annual (or average) flood level. For practical purpose, considering the quality of data, if the difference between the calculated basin water level and the pre-subproject 1:2.33-year annual water level is less than (+ or-) 0.3 m it should be considered that there will be no change in land classes.

43. However, even if there is no change in land classes, the high embankments will benefit the area by protecting crops from higher than average monsoon floods (1:5-year, 1:10 year). This can be accomplished under proper flood management by closing regulator gates before rising peak floods and opening when the river level falls below the basin water level. Under this condition there will be smaller negative impact on fisheries.

3.5.1.2 Impact on Fisheries

44. Flood management subprojects are expected to have different impact on fisheries than that on agriculture. While reduced flood level, in general, has positive impact on agriculture it has negative impact on fisheries. However, the bases for estimating the impacts are different. While the flood protection *agricultural benefit* estimates include protected land defined by 1:10-year flood level, which is derived from extreme-short duration peaks that damage crops, the *fisheries damage* refers to flood plain area that is used by migrating fishes as grazing ground during flood season.

45. For seasonally flooded land to be considered fish grazing ground it has to remain inundated for a reasonable period of time. To eliminate any short duration inundated land, the floodplain fisheries have been defined as land that is inundated by annual average flood to more than 0.90 m depth, which corresponds to agricultural land types F2 and F3. The criteria for estimating changes in flood plain areas due to subproject intervention fr fisheries analysis are given in ***Table G2E-III.5*** below.

Table G2-E III-5 Hydrological Design Criteria for Fisheries Analysis

Reference Pre-Subproject Water Level		Reference Post-Subproject Water Level		
Item	**Description**	**Description**	**Approximate Estimate**	**Detail Analysis**
Pre-Monsoon Flood Protection with Submersible Embankments (During monsoon flood plain area will not change)				
Present Floodplain Fish Habitat	Average (1:2.33-year) Annual Flood Level–0.90 m [Present area of F2 + F3 lands]	Future Floodplain Fish Habitat	No Change	Determine impact of restriction on migration and disruption of fish migration in April, May and June on annual fish production.
Monsoon Season Flood Protection with High Embankments (Flood plain fish grazing area will change according to effective basin water levels)				
Present Floodplain Fish Habitat	Average (1:2.33-year) Annual Flood Level–0.90 m [Present Area of F2 + F3 lands]	Future Floodplain Fish Habitat	Design Basin WL – 0.90 m [Post Subproject Area of F2 + F3 lands]	

3.5.2 Water Conservation (WC)

46. Assumed is that 100% of the irrigation water retained by a hydraulic structure is available for supplementary irrigation within the area of influence of the water body. The benefited area is evaluated by determining the amount of land that can be irrigated by the available water. Irrigation may be done by gravity or by lifting water by LLPs or other means. Usually land situated below the level to which water is retained is considered to be commanded. Where contour maps are unavailable, this area is considered to extend up to 400 m on both sides of the channel along the length measured from the structure to the meeting point of the water retention level and the channel bed subject to the limit given by water availability consideration.

47. In addition to providing water for supplementary irrigation, the water conservation subprojects also increase the residual moisture available within the soil profile. This can facilitate cultivation of early rabi crops, though for the purpose of the impact analysis, this benefit is difficult to quantify and thus not factored into the overall benefit analysis.