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

G5 Environmental Assessment 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 benefit 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: G5 Environmental Assessment of Subprojects"** has been issued following amendments and up-gradations as outlined below:

Revision	Description	Date
	Guidelines for Participatory Process of Small-scale Water Resources Development, initially developed and used for ADB-supported SSWRDSP (1995-2002) and SSWRDSP-2 (2002-2009). The Guideline included a section on environmental assessment of SSWRD subprojects which was followed for the purpose.	1995-96
A	The document "Planning and Design Guidelines (2009)", an updated version of the earlier document, was adopted for implementation of the JICA-supported SSWRDP (2009-2015). This Guidelines document included a Section titled "Environmental Planning, Assessment and Management" which was used to conduct EA of the subprojects.	April 2009
B	This Document **"Guidelines for SSWR Development: G5 Environmental Assessment of Subprojects"** is the ***Fifth*** Document of the 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, building upon the Environmental Planning, Assessment and Management section of the "Planning and Design Guidelines (2009)" and incorporating lessons learned over the time, is now presented as a separate document.	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

INTRODUCTION

1. Small Scale Water Resources Development Projects need to be environmentally sound without any significant adverse impact on environment. Accordingly, all SSWRD projects are to comply with environmental requirements. For projects that are assisted by development partners, environmental requirements of both Bangladesh and the partner agencies need to be fulfilled. LGED, since mandated for SSWR development in the country, has implemented four SSWRD projects – three projects with technical and financial assistance from ADB (1995-2017) and one project from JICA (2009-2015). Environmental assessment of all subprojects under these four projects were done using project developed environmental management guidelines. This Guideline for Environmental Assessment of SSWRD Subprojects builds on the environmental guidelines of those implemented projects and thus is considered to have included requirements of those two partner agencies. However, all upcoming development partner supported new projects will need to review this guideline to check for its adequacy in respect of possible updates in regulatory requirements both in Bangladesh and the partner agencies.

2. The Bangladesh Environment Conservation Act, 1995 and Bangladesh Environment Conservation Rules, 1997 govern matters related to environment for all industries and projects. The Department of Environment (DoE) issues environmental clearance to new industries and projects. For this purpose, all projects are classified from environmental point of view into three categories as below:

Category Green:	Projects under this category are unlikely to have adverse environmental impacts. No EIA or IEE is required for these projects. The owners will apply giving particulars of projects and environmental clearance will be given.
Category Orange:	This category projects will need to submit IEE and EMP along with other particulars for environmental clearance.
Category Red:	This category of projects will need submission of IEE study followed by EIA and EMP along with certain other particulars for environmental clearance.

3. The Environmental Conservation Rules (1997) provides lists of industries and projects under each Category. Water resources development project is not named in the lists except that (a) construction/reconstruction/extension of Flood Control Dam, Polder, Dike, etc (regional, national and international) and (b) construction/reconstruction/extension of Roads (regional, national and international) are in the list of Red Category and construction/reconstruction/extension of roads (feeder and local) is in the list of Orange Category.

SSWRD projects are comprised of a large number of subprojects that are identified, studied and implemented in a rolling process throughout the period of project implementation and thus the subprojects that will be implemented are not known beforehand. However, the subprojects that will be considered under the projects for implementation are governed by project specified *eligibility criteria* like the subprojects must be small – less than 1000 ha benefited area and only involve rehabilitation of existing systems for improving water management to enhance agricultural and fisheries production and to reduce rural poverty through generation of local employment. Accordingly, SSWRD projects and, for that matter, all SSWRD subprojects are considered to be in Orange Category that are not likely to have significant adverse environmental impacts. The SSWRD projects are therefore given environmental clearance for implementation subject to the condition that environmental

assessment of all subprojects under the project shall be done in course of their study and copies sent to the DOE for review and clearance. Accordingly, IEE is conducted for all subprojects including indicator monitoring plans and EMP during feasibility study and copies submitted to DOE for their review and clearance.

4. For SSWRD subprojects, as they involve rehabilitation of existing systems, IEEs are likely to indicate only insignificant impacts, if any at all, and so IEE will usually be accepted as the final EA of the subproject. However, if in any subproject, IEE indicates significant adverse impact, either a detail EIA will be undertaken or the subproject will be dropped.

5. A monitoring program for two important environmental indicators namely water quality and bio-diversity for a group of representative sample subprojects (approximately 10-15) based on each agro-ecological zone and subproject type will have to be carried out for a minimum period of 5 years. A set of baseline data will have to be collected before starting operations of the subprojects and the same are to be followed and compared with those collected during operation stage. The results of monitoring will then be analyzed and evaluated for designing the required appropriate protective measures against any adverse impacts.

6. In addition, implementation of a common program for the protection and enhancement of natural resources and its habitat will be necessary for all proposed subprojects. This will facilitate environmental sustainability of the project development initiatives and at the same time it will enhance natural resource base in the concerned subproject locality. This common program will include the following.

- Integrated pest management (IPM) training for the farmers
- Training of WMCA for water quality impact monitoring of subprojects and use of environmental laboratories of LGED or other agencies, if required, for the purpose.
- Agricultural land soil analysis and soil fertility dose fixation for the farmers
- Environmental awareness raising through education and training for the stakeholders and
- Fishery production training for the professional fishermen and fish farmers.

7. Details about the common program for environmental sustainability are described in ***Exhibit G5-A*** attached to this document.

8. These environmental guidelines for the subprojects of SSWRDP are subject to modification using new experiences from the field, if any, during implementation and post implementation period of individual subprojects.

ASSESSMENT OF ENVIRONMENTAL FEASIBILITY OF SUBPROJECTS

1.1 Step-1: Field Visit and Scoping of Important Environmental Components (IEC)

9. Field investigative visit is to be undertaken by the environmentalist of the FS Consultant Firm for this purpose. It is recommended that the environmentalist performs the visit as a member of the multidisciplinary team comprising water resources engineer, agriculturist, fishery specialist, and sociologist. This will help him having interaction with professionals of associated disciplines and obtain information on the technicalities of the subproject which will enable him better to understand the environmental issues there.

10. Preparatory activities including communication with field offices of LGED will be mainly done by the WR engineer as the Team Leader. However, the environmentalist will get himself familiar with the working and procedure of field investigation as detailed in ***Exhibit G4-A***.

11. In case of the field investigation visit being the first one of the FS Consultant firm, the PMO-Project Consultants will provide the team with a brief training on the project and the procedure of working including quality requirements. Relating to environment, the training will cover environmental impact data collection and analysis, IEE/EIA report preparation, and benchmark data collection for environmental impact monitoring program. For subsequent field visits, if the environmentalist feels necessary he may seek discussion with the Environment specialist of the Project Consultants for necessary clarification and advice before undertaking the field visit.

12. The environmentalist will carry a separate copy of the GIS based subproject Index Map provided by the PMO (prepared by IWRMU during pre-screening of subproject proposal) for use by him and necessary Forms for environmental data/information collection and assessment. The subproject Index Map should indicate locations of river, khal, beel, baor, haor, water flow directions, natural forests, plantations, etc., along with the settlements, roads, bridges, culverts, and community places in and around the subproject area.

13. During the field investigation, the environmentalist will duly consider the scoping of environmental assessment required for the subproject. The Important Environmental Components (IEC) that are usual in SSWRD subprojects (all components may not apply always to individual subprojects) are listed based on knowledge and experience from the previous projects and a standard ***Questionnaire for Environmental Field Data Collection*** is developed based on these IECs. The questionnaire is given in ***Exhibit G5-B*** attached to this document.

14. The environmentalist will, as part of the scoping exercise, observe and examine if there are any other components that need to be included in the IEC of this particular subproject. If there be any, he will discuss with the relevant professional in the team and with local people to obtain their opinion and if appropriate will include it in the questionnaire as additional IEC for the subproject.

1.2 Step-2: Collection of Information for IEE and Data for Impact Monitoring

15. Collection of field information on the questionnaire will be done through pre-arranged Group Discussions organized at environmentally important villages inside the subproject. Discussion sites will also be organized in the outside adjacent area focussing on possible adversely affected group of peoples, if any. Two to four discussion sites in a subproject will

usually be adequate; however, for larger and/or complicated subprojects, more discussion sites may be arranged.

16. The questions (from the questionnaire) will first be placed and explained to the group respondents so that they understand the implication of the asked issue. Then, the answers are asked and the responses are summarized and checked-in by ticks in the Yes/No/Unknown box of the questionnaire. After checking in the ticks, supplementing information on the question relevant to the answer will be obtained through further discussion. One question is to be finalized and then another question should be asked until information collection on all the IECs is completed. A separate set of questionnaire will be recorded for each discussion site.

17. Benchmark data for impact monitoring are to be collected in a later stage after the environmental analysis of the subproject is complete and the impacts to be monitored are identified and instructed. Impact monitoring is not likely to cover all the subprojects. The project area is first divided into several regions having differentiable environmental characteristics. Then 2-3 representative subprojects are usually selected for each of the regions for impact monitoring. Also specific items on which monitoring are to be done will be indicated. Thus, Benchmark data collection will be done when the subprojects and the items are specified.

1.3 Step-3: Analysis of Impacts and Preparation of IEE/EIA Report

18. Results from separate sets of filled in questionnaires will be reviewed and combined appropriately in two separate sheets - for subproject area and adjacent area, for use in assessment of impacts. A qualitative evaluation of the potential impacts of the subproject by individual IECs will be made based on field information from the combined questionnaire.

19. The environmental findings of PRA will be checked for additional and/or supplementary information, if any. Also, information available from secondary sources may be consulted. Thus, an objective assessment of environmental impacts in the subproject area and the adjacent area will be made on the basis of field observations, PRA findings, and available secondary source information, if any used.

20. If the assessment results indicate no significant adverse impact on any IEC, no mitigation plan will be required. In case of having only insignificant negative impact, an environmental management plan (EMP) will have to be developed taking into consideration the magnitude of adverse impacts and their possible mitigation measures. A list of ***Possible Mitigation Measures*** for Environmental Impacts of SSWRD Subprojects for a set of potential adverse impacts is given in ***Exhibit G5-E*** which should be consulted while formulating the EMP. Implementation of the EMP measures is likely to reduce the degree of adverse impact assessed and the remaining impact, if exists, is expected to be minimally insignificant and acceptable.

21. For adjacent area, following an objective assessment of the negative impacts based on the collected field information and PRA report, mitigation measures are also to be formulated consulting the ***Exhibit G5-E***.

22. With these overall results of impact assessment and mitigation measures, if any, the IEE report is to be concluded as a draft report for environmental feasibility of the proposed subproject. The standard ***IEE Report Format***, as recommended by ADB and followed in the ADB and JICA supported projects, is given in ***Exhibit G5-C*** which will be used in preparing the report. Upcoming new projects may review the format and incorporate updates as may be required by the development partner agencies.

23. The draft report will be reviewed by the PMO-Project Consultant's environmentalist for any correction or modification and will be finalized from environmental point of view as the completed IEE/EIA report for the subproject. This completed IEE/EIA Report will, upon recommendation from the PMO-Project Consultants, be approved by the IWRMU (P&D Section),LGED.

24. In cases where the above described assessment of environment indicates significant adverse impact, detail EIA study will be undertaken. The ***EIA Report Format*** as given in ***Exhibit G5-D*** will be followed in preparing the report. This EIA format is according to recommendation of ADB and has been followed in JICA supported project also. Upcoming new projects may review the format and incorporate updates as may be required by the development partner agencies.

IMPACTS MONITORING AND EVALUATION

1.4 Water Quality Impact Monitoring

25. The activities of SSWRD projects can have either positive or negative water quality impact. For example, in drainage type subprojects, quick disposal of stagnant and polluted water is likely to improve water quality. On the other hand, early drainage will create scope for one more crop production leading to increased use of fertilizer and pesticides thereby deteriorating water quality condition. So, monitoring of water quality impact and adoption of necessary protective measures against any adverse situation is necessary for sustainability of the subprojects.

26. The project area is first divided into several regions having differentiable hydrological, agricultural and/or ecological characteristics. Then 3-4 representative subprojects are to be selected in each of the regions preferably taking one subproject from each type of subprojects – Dr, TI, FMD, WC and CAD. Two monitoring sites in each subproject, one for surface water quality and the other for ground water quality will be selected. Water samples to be collected, tested and records maintained in registers both at the LGED laboratories and at the subproject Upazila regularly on a monthly basis.

27. The water quality parameters to be monitored are: pH, dissolved oxygen, salinity, electrical conductivity, nitrate, phosphate, arsenic, faecal coliform bacteria and total hardness. The program will be implemented in-house, by Upazila and District LGED offices under monitoring by IWRMU (O&M Section), LGED by using the resources and facilities of LGED environmental laboratories.

25. The scope of water quality impact monitoring will be as follows.

* Formulation of appropriate mitigation measures for the harmful water quality impact.
* Protection of water resources and aquatic habitat including fish from pollution effects
* Sustenance of development activities in agriculture sector
* Contribution to the national water quality database

1.5 Bio-diversity Impact Monitoring in Haor Areas

28. The Haor basins of greater Sylhet and Mymensingh areas are very rich in biodiversity and carry great ecological and commercial values, both nationally and internationally. But the resources of these wetlands are now under gradual degradation due to over exploitation of natural aquatic resources. Implementation of SSWR development project in these areas may accelerate this degradation process if mitigation measures are not taken properly. So, a biodiversity monitoring program especially fish bio-diversity, needs to be carried out to correlate any impact with the physical interventions of SSWR development and to formulate necessary protective-cum-mitigation measures.

29. Partial flood management subprojects with submersible embankments are the usual type of SSWRD interventions undertaken in the Haor areas. The submersible embankments provide flood protection to hyv Boro rice crop up to the 3rd week of May by which time harvesting of the crop is completed. After this time, throughout the whole monsoon season, the embankments remain submersed under deep water. Thus biodiversity impact of commonly used SSWRD subprojects is not likely to be significant. However, six representative subproject sites – one each in the Haor areas of Sylhet, Moulavibazar, Sunamganj, Kishoreganj, Netrakona and Mymensingh districts will be selected. The

monitoring program needs to be contracted out to an NGO experienced in wetland surveys and studies under the IWRMU, LGED. The detail program of monitoring and management will be developed by the contracted NGO and approved by IWRMU after review by appropriate experts.

30. The scopes of bio-diversity impact monitoring will be as follows.

* Identification of key indicator species for the local ecosystem at the selected sites
* Establishment of subproject impacts on wetland characteristics, specially, fish bio-diversity
* Selection of suitable sites for establishing fish sanctuary / conservation areas
* Inventory list of common, rare, endangered and threatened flora and fauna species in the survey sites.

EXHIBITS

EXHIBIT G5-A: COMMON PROGRAM FOR ENVIRONMENTAL SUSTAINABILITY OF SUBPROJECTS

1. Integrated Pest Management (IPM) Training

Rationale and Objective

Use of pesticides is very common in Bangladesh. Carcinogenic, bio-accumulative, and stable type of organochlorine pesticides such as aldrin, endrin, heptachlor, DDT, etc. are frequently used in HYV rice, potato, vegetables and sugar cane cultivation. These pesticide chemicals destroy natural habitats and create imbalance in the ecological system. The SSWR development projects aimed at increasing agricultural production are expected to intensify use of pest sensitive high yielding variety crops. So, it is likely that the project will have an adverse impact on the environment through increased application of pesticides. Therefore, mitigation measures are to be taken to minimize these negative impacts. Farmers can best achieve this mitigation through integrated pest management (IPM) training and practice. The IPM practice and awareness is already established through the implemented and ongoing SSWRD projects with support from DAE. However, efforts on awareness and training need to be continued for sustenance.

Scope

* Application of biological pest control method
* Conservation of beneficial predators and their habitats
* Protection of natural resources and their habitats from environmental degradation
* Cost effective agricultural production

Cooperation

Department of Agricultural Extension (DAE)

2. Environmental Laboratory

Rationale and Objective

LGED, mandated for SSWR development in the country, has implemented four SSWR development projects since 1995 with support from development partners – ADB and JICA. More than a thousand subprojects have been implemented and a lot more are in demand throughout the country. That is to say, more subprojects will be implemented in future. Water management interventions may impact water environment, particularly the water quality aspect, negatively. For example: keeping water conserved / confined in a closed stagnant condition for long time as in FMD and WC subprojects may alter the quality of water, increased crop production through improved water management involves increased use of chemical fertilizer and pesticide that deteriorate water quality, etc. Increased crop production and use of chemical fertilizers impact soil quality also.

To monitor and keep track of changes in water quality in such a large number of subprojects, a huge number of water samples need to be tested and time series records to be maintained. This justifies establishing environmental laboratories under management of LGED to meet water and soil sample testing requirement of its own subprojects. Based on this rationale, LGED established environmental laboratories drawing support from ADB's second SSWRD project (2002-2009). It is necessary that the environmental laboratories are

maintained in a well performing state and ongoing SSWRD projects may extend technical support to the laboratories for this purpose.

Locations of LGED Environmental Laboratories

LGED has 5 Regional Environmental Laboratories established at Barisal, Khulna. Rangpur, Mymensingh and Comilla. These Regional Laboratories provide facilities for a wide range of water and soil quality tests. Besides, 21 District LGED Laboratories have mobile Kits for performing selected water quality (Dissolved Oxygen, pH, Arsenic, etc) and soil quality (N-P-K) tests. The number of District Laboratories need to be increased.

Scope

* Enhancement of departmental capability in analytical laboratory works.
* Popularizing use of water and soil test data by both planers and users of projects.
* Skill development of engineers and material testing laboratory staff in analytical methods
* Income generation through providing on-payment service in testing and analyzing water and soil samples.

Co-operation

Department of Environment (DOE);
Department of Soil Science, University of Dhaka;
ICDDRB Laboratory, Dhaka

3. Soil Analysis and Soil Fertility Level

Rationale and Objective

Best management practices in agriculture depends on sustainable soil productivity, which can be achieved through extension services to the farmers for regular analysis of soil samples for nutrient levels, organic carbon, moisture, etc., and fixation of required fertilizer doses and pesticides.

Area

Twenty sample sites in each subproject

Scope

* Fertilizer dose recommendation for the farmers
* Balanced fertilizer use in agricultural lands
* Regular checking of soil nutrient level changes

Cooperation

Soil Resources Development Institute (SRDI) for soil sample analysis and Department of Soil, Water and Environment, University of Dhaka for training Agriculture Facilitators (Project staff) and Laboratory Technician (LGED Staff).

4. Environmental Education and Training

Rationale and Objective

Active participation of the stakeholders during all stages of planning, construction, operation, and maintenance is the key for sustaining SSWR development subprojects. The subprojects, of course along with their environment and ecosystem are handed over to stakeholders upon completion of construction for their subsequent operation, maintenance and management. This means that protection of environment and ecosystem of the subprojects also comes under purview of the subproject stakeholders i.e. the WMCAs. It is thus important that the WMCAs are not only trained in structure operation and maintenance but their knowledge and comprehension about the subproject's environment and ecosystem should also be enhanced through training.

Area

WMCA members and general beneficiaries in all subprojects

Scope

* Environmentally sustainable use of all natural resources
* Care taking of natural resources by resource users
* Protection of conserved forests, wetlands, rare/endangered species, etc.
* Enhancement of bio-diversity and maintenance of ecological balance
* Implementation of country's environmental safeguard policies and compliance with the environment conservation rules.

Co-operation

Department of Environment (DoE),
IUCN – The World Union for Conservation of Nature.

5. Tree Plantation Program

Rationale and Objective

Tree plantation is a popular countrywide program in Bangladesh. SSWRD subprojects create scope for tree plantation by the sides of embankments, khals, and at water control structure sites. So, all SSWRD subprojects should include compulsory tree plantation program with the objective of economic benefit for the WMCA, local landless people in particular the poor women as well as contribution to the national economy. Fortunately, tree plantation is already established in SSWR development subprojects through earlier projects.

Location

Berms of embankments, banks of khals, and water regulatory structure sites in all SSWRD subprojects

Scope

* Supply of food, medicine, fuel, and materials for house construction for the rural community
* Providing effective protection to the embankment, khal, and structure sites from air/wave erosion

* Enhancement of plant bio-diversity thereby providing shelter for birds as well as preservation of ecological balance
* Economic benefit to the poor and destitute women and WMCA members.

6. Fish Production Training

Rationale and Objective

In Dr and FMD subprojects there is possibility of partial loss in fish production within floodplain areas. So, people engaged in monsoon fishing are likely to be affected in these two types of subprojects. Training on rice-fish culture in floodplains, fish culture in ponds, fingerling production in ponds/borrow pits, establishment of fish hatchery, etc. will compensate this partial loss and at the same time will improve overall livelihood of both professional and subsistence fisher people.

Area

All SSWRD subprojects having potential for fish culture.

Scope

* Compensation for partial loss of fish catches from floodplain areas
* Development of skill among fisher/fish farmer people in fish production technology
* Availability of fingerlings for fish culture from local hatchery/nursery ponds
* Development of community based fishery extension agent.

Co-operation

Department of Fisheries (DOF) and Fisheries Research Institute (FRI) Mymensingh will conduct the training.

EXHIBIT G5-B: QUESTIONNAIRE FOR ENVIRONMENTAL FIELD DATA COLLECTION

(Use separate set of Questionnaire for each site of Data Collection)

Subproject Name & ID Nr:	……	Subproject Type	……
Location:		Gross Area (ha)	……
UP	……..	Benefit Area (ha)	……
Upazila	……..	Population (2011)	……
District	……..	Soil Type /Texture	……
Names of villages inside subproject	……..		
Names of villages outside subproject	……..		
Main Khal of SP Name, Length (km)	……..	Navigable Length	……
Outfall River / Khal Name	……..	Perennial/seasonl	……

Data Collection Place Nr: ……..

Village / Market Place ……..

Date:……

A.1 Sub-Project Area Information

A.1.1 Physical Environment

A1.1.1	**Flood Regime**	
Q.1	May the sub-project implementation bring any change in the high flow regime of any river/khal in and around the subproject area?	Yes/No/Unk
	If yes, name the river/khal and give peoples comment about the present situation and expected changes.	
A1.1.2	**Natural Flushing**	
Q.2	May the subproject implementation obstruct natural flushing of the subproject area or any area adjacent to it?	Yes/No/Unk
	If yes, describe the area likely to suffer with reason and give local people's suggestion of remedy.	
A1.1.3.	**Ground Water Table**	
Q.3	May the sub-project cause a fall or rise of ground water table inside and/or outside the subproject area?	Yes/No/Unk
	If yes, give your comments about the impact on drinking water well, STW, DTW, wetland, etc., and on water logging in low lying agricultural lands.	
A1.1.4	**Water Quality**	
Q.4	May the sub-project activity influence present water quality status either obstructing or creating flushing provision?	Yes/No/Unk
	Give peoples comment about present status and possible impact on water quality.	

A1.1.5	**Water logging and Siltation in Waterway**	
Q.5	May there be any water logging or siltation problem due to sub-project activities?	Yes/No/Unk
	If yes, describe the present situation and give ideas about possible water logged area in km^2 and/or possible length of silted water way/khal in km. Give local people's suggestion on possible remedial measures.	
A1.1.6	**Erosion and Siltation in Waterways**	
Q.6	May there be any erosion or siltation problem in any khal/river due to sub-project implementation?	Yes/No/Unk
	If yes, describe the present situation and indicate possible lengths of erosion/siltation in water way/khal in km. Give local people's suggestion on possible remedial measures.	
A1.1.7	**Soil Characteristics / Fertility**	
Q.7	May the sub-project implementation obstruct natural replenishment of flood plain agricultural soil or require topsoil cut from fertile land?	Yes/No/Unk
	If yes, give the present status of soil fertility and put local people's comments about the impact and mitigation suggestion, if any.	

A1.2 Biological Environment

A1.2.1	**Aquatic Habitat**	
Q.8	May the subproject bring any change to the wetlands (beel/haor/depression/ lake/ river/khal) in the subproject area?	Yes/No/Unk
	If yes, name the wetland and its present condition. Describe how it will change, and mitigation suggestion, if any, in case of adverse impact.	
Q.9	Is there any habitat for specific aquatic lives, which may be affected by the subproject?	Yes/No/Unk
	If yes, describe how it will be affected and give comments on possible impact on habitat species.	
A1.2.2	**Terrestrial Habitat**	
Q.10	May the subproject change ecosystem of any natural forest or significant terrestrial habitat for bird, animal etc.?	Yes/No/Unk
	If yes, name the terrestrial habitat. Describe how it will be affected and mitigation suggestion, if any, in case of adverse impact.	
A1.2.3	**Natural and Culture Fisheries**	
Q.11	May the subproject activities reduce natural fisheries production by preventing fish migration and/or disconnecting breeding ground for them?	Yes/No/Unk
	If yes, give an estimate of the loss of production compared to the present situation and include mitigation suggestions from the beneficiaries, if any.	
Q.12	May the subproject activities directly or indirectly change culture fisheries situation and its associated activities?	Yes/No/Unk

	If yes, describe present situation of aquaculture. Give an estimate of the loss of production and mitigation suggestions from the beneficiaries, if any.	
A1.2.4	**Biological Diversity**	
Q.13	May the subproject activities affect any rare, endangered, or threatened plant or wildlife species in and around the subproject area?	Yes/No/Unk
	If yes, name the species, describe present status and make suggestion how it may be preserved.	
A1.2.5	**Eutrophication**	
Q.14	May the subproject implementation create anaerobic condition or eutrophication, in any of the water pools, ditches, borrow pits, etc.?	Yes/No/Unk
	If yes, state local people's comment and suggestion about how it can be managed.	
A1.2.6	**Forest and Plantation**	
Q.15	May the subproject implementation affect any natural forest and/or plantation in and around the subproject area? If yes, describe the present condition and local suggestion about the remedies.	

A1.3 Social Environment

A1.3.1	**Land Acquisition**	
Q.16	May the subproject implementation require land acquisition?	Yes/No/Unk
	If yes, give the type and approximate area of land to be acquired as well as the number of landowners affected.	
A1.3.2	**Agricultural Development**	
Q.17	May the subproject implementation lead to more crop production with increased land for boro and rabi cultivation, crop diversification, etc.?	Yes/No/Unk
	If yes, describe the present situation and estimated production, area of land increase, and name of the crops.	
A1.3.3	**Accessibility- Waterway and Road Transport and Employment**	
Q.18	May navigation /boat communication system be interrupted by the subproject activities?	Yes/No/Unk
	If yes, give approximate length of present navigation route, expected changes and period of interruption.	
Q.19	May the subproject activity promote accessibility resulting in growth center development and employment opportunity in the area?	Yes/No/Unk
	If yes, describe the present situation and expected changes from the comments of beneficiaries.	
A1.3.2	**Employment Scope**	
Q.20	May the subproject implementation change the existing employment scope in the area?	
	If yes, describe present situation and indicate why and what kind of employment may	

	be generated.	
A1.3.4	**Health and Nutrition**	
Q.21	May there be any change in disease incidences in the area as a result of subproject implementation?	Yes/No/Unk
	If yes, describe the prevalent diseases, especially water related, in the area and mention the type and degree of change anticipated.	
Q.22	May the subproject implementation directly or indirectly affect nutrition in the area?	Yes/No/Unk
	If yes, give your comments about how it will be affected and to what extent.	
A1.3.5	**Community Impact**	
Q.24	May the subproject cause increase in unemployment in any professional community?	Yes/No/Unk
	If yes, name the community and their suggestion for mitigating the problem.	
A1.3.6	**Cultural / Heritage Values**	
Q.25	Is there any historical / archaeological site, or recreation / tourism spot which may be affected due to subproject implementation?	Yes/No/Unk
	If yes, name the site and provide suggestion for mitigation.	

A.2 Adjacent Area Information (use separate sheets for each village surveyed)

Name of Village: …… Population (2011) ……

Q.1	Is the village a flood prone area? If yes, mention the period of last flood, its source, and consequences.
Q.2	Is there any disaster shelter center in the area? If yes, where it is located, and did people take shelter during the last flood? Did they receive any flood disaster management training?
Q.3	Give local people's comment in respect of any risk, like flood, water scarcity, obstacle to boat movement, epidemics, etc., or any other type which can appear in their village as a result of sub-project implementation and their suggestions to mitigate any such problems.
Q.4	Give local people's comments in respect of any positive impact like, more agricultural and fisheries production, better accessibility, employment opportunity, agro-industrial development, etc., that may develop in their village as the result of subproject implementation.

EXHIBIT G5-C: FORMAT[1] FOR IEE REPORT OF SSWRD SUBPROJECTS

I Introduction

1. This section usually will include the followings:

   (i) Purpose of the report including (a) identification of the subproject and its Proponent; (b) brief description of the nature, size, and location of the subproject and of its importance to the country; and (c) any other pertinent background information.
   (ii) Extent of the IEE study: scope of study, magnitude of effort, person or agency performing the study, and acknowledgement.

II Description of the Project

2. Furnish sufficient details to give a brief but clear picture of the followings (include only applicable items):

   (i) Type of subproject
   (ii) Category of subproject
   (iii) Need for subproject
   (iv) Location (use maps showing general location, specific location, and site layout)
   (v) Size or magnitude of operation
   (vi) Proposed schedule for implementation
   (vii) Description of the subproject including drawings showing subproject layout, components of subproject, etc. (*This information should be of the same type and extent as is included in feasibility reports for the proposed subprojects in order to give a clear picture of the project and its operations).*

III Description of the Environment (in area affected by the subproject)

3. Furnish sufficient information to give a brief but clear picture of the existing environmental resources including the followings (to the extent applicable):

   (i) Physical resources (topography, soils, climate, surface water, ground water, geology/seismology).
   (ii) Ecological resources (fisheries, aquatic biology, wildlife, forests, rare or endangered species).
   (iii) Human and economic development including (as applicable) population and communities (numbers, locations, composition, employment, etc).; industries; infra-structural facilities (water supply, sewerage, flood control, drainage, etc.); institutions; transportation (roads, harbors, airports, navigation); land use planning (including dedicated area uses); power sources and transmission; agricultural development; and mineral development.
   (iv) Quality of life values including socio-economic values; public health; recreational resources and development; aesthetic values; archaeological or historical treasures; and cultural values.

[1] This report format, recommended by ADB, is being used in all SSWRD subprojects. It may be upgraded as required by specific development partners.

IV Screening of Potential Environmental Impacts and Mitigation Measures

4. This section will use appropriate checklist of environmental parameters for SSWRD subprojects and screen out the parameters that will have "no significant impacts" from those that will have “significant adverse impact” by reviewing each parameter according to the following factors or operational stages. The IECs used in Questionnaire for Environmental Field Data Collection (Exhibit G4-I.B) are based on the appropriate environmental parameters for SSWRD subprojects drawn from ADB’s Environmental Guidelines and those will be used in the screening. The exercise will be carried out by describing the present situation at the subproject and its surrounding adjacent areas in respect of the environmental parameter under consideration and a careful and intensive analysis of the impacts, either beneficial or adverse, the subproject will cause in the area along with an objective assessment of significance of the impacts. A tabular format with “present condition” and “possible impact” columns set side by side may be used for a better comprehension of the issues. The analysis will be done considering environmental issues at different phases of the subproject as given below. When significant adverse impact is indicated for a parameter, appropriate mitigation measures should be recommended.

- Environmental problems due to location of the subproject
- Environmental problems related to subproject plan and design
- Environmental problems associated with construction stage
- Environmental problems resulting from subproject operations
- Potential environmental enhancement measures
- Additional considerations.

V Institutional Requirement and Environmental Monitoring Program

5. This section will describe the required (a) monitoring or surveillance program, (b) institutional capability including software needs, and (c) submission of monitoring progress reports.

VI Findings and Recommendations

6. This section will include an evaluation of the screening process and recommendation will be provided whether significant environmental impacts exist needing a detailed EIA study. If impacts are not significant and the residual impacts after implementation of the recommended mitigation measures are minor and acceptable, there will be no need for further study and the IEE becomes the completed EIA for the subproject. In some cases, when IEE indicates significant impact but of a limited nature and consequence, the IEE study may need to be supplemented by a special study relating to the limited significant impact including a more elaborate mitigation plan and if the resulting residual impact becomes acceptable, the IEE with the Supplemental Study forms the completed EIA of the subproject.

VII Conclusions

7. This section will discuss the result of the IEE and justification if any of the need for additional study or EIA. If an IEE or an IEE supplemented by a special study is sufficient for the project, then the IEE with the recommended environmental management plan, institutional and monitoring program becomes the completed EIA.

EXHIBIT G5-D: FORMAT[2] FOR EIA REPORT OF SSWRD SUBPROJECTS

A. Introduction

This section usually will include the following:

(i) Purpose of the report (prepare an EIA), including (a) identification of the subproject and its Proponent; (b) brief description of the nature, size, and location of the subproject and of its importance to the country, (c) any other pertinent background information.
(ii) Stage of subproject preparation.
(iii) Extent of the EIA study: scope of study, magnitude of effort, person or agency performing the study, and acknowledgement.
(iv) Brief outline of the contents of the report including mention of any special techniques or methods used.

B. Description of the Project

1. Furnish sufficient details to give a brief but clear picture of the following (include only applicable items):

(i) Type of subproject.
(ii) Need for the subproject.
(iii) Location (use maps showing general location, specific location, subproject boundary and subproject site layout).
(iv) Size or magnitude of operation including any associated activities required by or for the subproject.
(v) Proposed schedule for approval and implementation.
(vi) Description of the subproject including drawings showing project layout, components of subproject, etc. (*This information should be of the same type and extent as is included in feasibility reports for the proposed subprojects in order to give a clear picture of the project and its operations).*

C. Description of the Environment (in area affected by the subproject)

2. Furnish sufficient information to give a brief but clear picture of the existing environmental resources and values including the following (to the extent applicable):

(i) *Physical resources* (topography, soils, climate, surface water, ground water, geology / seismology).
(ii) *Ecological resources* (fisheries, aquatic biology, wildlife, forests, rare or endangered species, wilderness or protected areas).
(iii) *Human and economic development* including (as applicable) population and communities (numbers, locations, composition, employment, etc).; industries; infra-structural facilities (water supply, sewerage, flood control, drainage, etc.); institutions; transportation (roads, harbors, airports, navigation); land use planning (including dedicated area uses); power sources and transmission; agricultural development; and mineral development; tourism resources, etc.

[2] This report format, recommended by ADB, is being used in all SSWRD subprojects. It may be upgraded as required by specific development partners.

(iv) *Quality of life values* including socioeconomic values; public health; recreational resources and development; aesthetic values; archaeological or historical treasures; and cultural values.

D. Alternatives

3. In the event serious losses of natural environmental resources and/or serious health effects are expected to result from the proposed subproject, the EIA report will justify the need for the subproject considering other alternative subprojects. In addition, various other alternative options regarding site, design and technology will be included in the investigation. This section will also cite the advantages / disadvantages of these alternatives from the point of view of environmental protection. The discussion will justify the need for the subproject and indicate that all feasible alternative options have been considered. Other than advantages and disadvantages, justification of the subproject will go beyond the least-cost option and touch upon a need to diversify by implementing different subproject subtypes to address the environmental protection issue.

4. Environmental impacts of the "with-project" and "without-project" alternatives will be examined and, in some cases, this may come out to be the only presentation in this section.

31. For each alternative considered, the environment specialist will: (i) summarize the probable adverse impacts, and (ii) relate the impacts to the proposed subproject and other alternatives. The best alternative will be selected from an environmental perspective and will be examined in the overall context of the subproject feasibility.

E. Anticipated Environmental Impacts and Mitigation Measures

5. Item by Item Review: This section of the report will evaluate the expected impact, in as quantified terms as possible, of the subproject on each resource or value and in the applicable sectoral environmental guidelines wherever any significant impact is expected[3]. Environmental impacts to be investigated will include those due to project location, those caused by possible accidents, those related to design, during construction, during regular operations and final decommissioning or rehabilitation of a completed project. Where adverse effects are indicated, discuss measures for minimizing and/or offsetting these, and opportunities for enhancing natural environmental values will be explored. Both direct and indirect effects will be considered, and the region of influence indicated. This analysis is the key presentation in the report and if not sufficiently completed it may be necessary to delay the project until the analysis can be completed. It is necessary to present a reasonably complete picture of both the human use and quality of life gains to result from the subproject at the cost of utilization, alteration, and impairment of the natural resources caused by the subproject, so that fair evaluation of the net worth of the subproject could be made.

6. Offsetting and Mitigating Adverse Effects: For each significant adverse environmental impact, the report will carefully explain how the plan/design of the subproject minimizes the adverse effects and in addition how the subproject plan/design, to the extent feasible, includes provision for offsetting or compensating of adverse effects and for positive enhancement of benefits or environmental quality. Where substantial cost of mitigation measures is involved, alternative measures and costs will be explored.

32. *Irreversible and Irretrievable Commitments of Resources:* The EIA report will identify the extent to which the proposed project would irreversibly curtail the potential use of environment. For example, highways that cut through stream corridors, wetlands, or a natural estuary can result in irretrievable damage to those sensitive ecosystems. Other

[3] This could include environmental risk assessment, where appropriate.

impacts that may be irreversible include alteration of historic sites, and expenditure of construction materials and fuels. Also, projects through estuaries, marshes, etc., may permanently impair the natural ecology of the area; or elimination of recreation areas and parklands can precipitate drastic changes in the social and economic character of the project area.

33. *Temporary Effects during Project Construction:* In the event the construction phase of the project involves special environmental impacts (to be terminated on completion of construction), these will be separately discussed including proposed remedial measures.

F. Economic Assessment[4]

7. This section will include: (a) costs and benefits of environmental impacts; (b) costs, benefits and cost effectiveness of mitigation measures; and (c) for environmental impacts that have not been expressed in monetary values, a discussion of such impacts, if possible in quantitative terms (e.g. weight or volume estimates of pollutants). This information should be integrated into the overall economic analysis of the project.[5]

G. Institutional Requirements and Environmental Monitoring Program

8. This section of the report will describe the required institutional capability including staff skills, tools and equipment, and monitoring or surveillance program, including periodic progress reports to be established and continued by the subproject proponent following granting of approval for the subproject to proceed. The objective of these reports is to assure the concerned government environment agency that all necessary environmental protection measures are being carried out on a continuing basis as envisioned in the approved subproject plan, and that proper special measures will be taken for containing any adverse impacts not envisioned in the subproject plan.

H. Public Involvement

9. This section will describe the process undertaken to involve the public in subproject design and recommended measures for continuing public participation; summarize major comments received from beneficiaries, local officials, community leaders, NGOs, and others, and describe how these comments were addressed; list milestones in public involvement such as dates, attendance, and topics of public meetings; list recipients of this document and other subproject related documents; describe compliance with relevant regulatory requirements for public participation; and summarize other related materials or activities, such as press releases and notifications.

I. Conclusions

10. The EIA report will present the conclusions of the study including: (a) gains which justify implementation of the subproject; (b) explanation of how adverse effects could be minimized or offset and compensated for to make these impacts acceptable; (c) explanation of use of any irreplaceable resources; and (d) provisions for follow-up surveillance and monitoring. Simple visual presentations of the type and magnitude of the impacts may aid the decision-maker.

[4] This section may draw from data /information as used in the economic analysis conducted for the feasibility study of the subproject and costs and benefits of the economic assessment, as applicable, will be used in economic analysis of the subproject.

[5] It is recognized that not all environmental benefits and costs could be quantified and presented in monetary terms.

EXHIBIT G5-E: MITIGATION MEASURES FOR ENVIRONMENTAL IMPACTS OF SSWRD SUBPROJECTS

Nr	Potential Negative Impact	Possible Mitigation Measure
1.	Changes in flood regime and water flow in river / khal	• Incorporation of adequate flow (1:10-yr Qmax) provision in the design criteria of regulators/sluices and khals • Avoidance of beel bypass during construction of embankment • Provision for adequate bridges / culverts for free drainage flow
2.	Fall of ground water table	• More recharge by increasing inundation area or water storage and period • Reduction of ground water abstraction volume • Increase of surface water irrigation facilities
3.	Deterioration of water quality	• Protection of water bodies from domestic and sanitary waste disposal, and agricultural field run-off • Providing for adequate natural flushing • Reduction of agro-chemical use by introducing IPM practice
4.	Water logging in low lying areas and silting of khals	• Installation and maintenance of adequate drainage system • Prevention of seepage from irrigation canal • Regular maintenance of re-excavated khals for removing deposited silt • Measures to minimize soil erosion from roads / embankments
5.	Loss of soil fertility	• Avoidance of top soil cut from fertile agricultural land • Provision for natural replenishment of flood plain soil by flood water inundation • Agricultural extension services for manure preparation training and motivational program for using organic fertilizer
6.	Change of eco-system of aquatic or terrestrial habitat	• Locating sub-project to minimize loss or avoid encroachment on sensitive areas • Conservation of valuable wetland sites and training of local beneficiaries on community based wetland management • Plantation on available lands with local suitable species
7.	Decline in fisheries production	• Construction of fish passage ways in structures and timely operation of gates to facilitate hatchling migration • Conservation of reproduction sites like beels, haors, etc.

Nr	Potential Negative Impact	Possible Mitigation Measure
		• Construction of fish shelters in re-excavated khals at regular intervals and protecting the shelters for mother fishes. • Incorporation of culture fishery including hatchery and restocking in sub-project Environmental Management Plan • Training pond owners and interested farmers on aquaculture • Introduction of IPM for crops and rice-fish farming in the paddy fields
8.	Effect on rare, endangered, or threatened biological species	• Restoration of suitable alternative habitat for rare, endangered, or threatened plant or wildlife species
9.	Eutrophication and spreading of nuisance plant	• Incorporation of nuisance plant destruction program in the sub-project mitigation plan • Agriculture extension services for training farmers on water hyacinth based compost preparation and motivational program for using compost fertilizer
10.	Dislocation of habitat due to siting (alignment) of infrastructure	• Relocation of affected people in suitable areas with proper compensation for resources lost, and scopes for employment opportunities
11.	Increase of water related diseases	• Measures for controlling disease vectors by destroying their habitats • Disease prophylaxis and treatment • Training for domestic water management and low cost water sanitation technology
12.	Unemployment of professional community	• Identification of affected professional group and incorporation of in-kind compensation for losses in the sub-project planning
13.	Enhanced flood risk in adjacent areas	• Construction of refuse shelter for flood affected people • Training on flood disaster management, specially for women
14.	Water and air pollution from construction activities	• Pollution control by careful location of waste disposal sites and construction camps
15.	Soil erosion in road, embankment, bank of river / khal	• Compliance with construction standards like, blanket cover, proper slope ratio, compaction, turfing, etc • Regular maintenance work to minimize erosion

EXHIBIT G5-F: PREPARATION OF ENVIRONMENTAL MITIGATION PLAN

All subprojects of SSWR development projects will undergo environmental assessment study in the form of IEE and/or EIA followed by preparation of an environmental mitigation plan (EMP) which is aimed at mitigating adverse environmental impacts due to the subprojects. The contracted FS firms will conduct IEE/EIA studies leading to preparation of the EMPs. The mitigation plan will be prepared in such a way that all adverse impacts found in the IEE/EIA reports are mitigated to the highest possible extent and the project-affected peoples (PAPs) are consulted in the process with their opinions, subject to technical soundness, incorporated in the EMP.

The following are the procedural steps to be followed in preparing the EMP which will be signed by LGED Executive Engineer and WMCA representatives. The EMP format currently in use incorporates the mitigation measures by implementation stages and responsible agents. It is recommended that this format be used in all SSWRD subprojects unless requirement for improvement is specifically established. The recommended EMP Format is given in ***Appendix G4-III.G.***

Steps for Preparing Environmental Mitigation Plan

Step 1: Finding of potential impacts and identification of adverse impact issues from environmental assessment study report (IEE/EIA).

Step 2: Cross checking of identified adverse impact issues with PRA findings.

Step 3: Identification of PAPs from both IEE/EIA and PRA reports.

Step 4: Primary formulation of EMP considering mitigation measures in *Appendix G4-I.E.*

Step 5: Presentation of identified impacts and their best possible mitigation options to the PAPs during Design Discussion Meeting (see ***G1 SSWR Development - Law, Policy and Process, Step-11, Para 48***) and selection of mitigation measures agreed at the meeting (concerned impacts and agreed mitigation measures must be included in the Minutes of DDM).

Step 6: Finalization of EMP in the specified format by incorporating the mitigation measures as agreed with the PAPs in DDM. The FS firm and PMO-Project Consultants will ensure incorporation of relevant mitigation measures into the detail engineering design of subprojects.

Step 7: The finalized EMP will be signed by Executive Engineer, LGED and WMCA representatives and will form part of the signed IA of the subproject. Implementation of EMP will have the same force as of any other physical infrastructure and/or institutional element of the subproject.

EXHIBIT G5-G: ENVIRONMENTAL MITIGATION PLAN (EMP) FOR SSWRD SUBPROJECTS

A. Subproject Information

Name : _____
Type : _____
Upazilla : _____
District : _____

B. Proposed Interventions

Khal re-excavation/excavation		….. km
Re-sectioning/Construction of embankment		..... km
Construction of:	Regulator/Sluice	….. no
	WRS	….. no
	Rubber Dam	… . no
Irrigation canals: Open (pucca/earthen)		….. km
	Buried Pipeline	….. km

C. EMP Implementation Schedule

Name of the work/activities	Date Start	Date End
1.		
2.		
3.		

D. Design Meeting including Discussion of Environmental Mitigation Measures with PAPs

Place: ..... Date: ..... Chaired by: .....
PAPs present: Number: ..... Communities/Groups: .....
Person to represent all PAPs: ..... Signature: .....

E. Signing of Environmental Mitigation Plan (along with signing of IA)

Place of Signing: ……... Date of Signing: ……

LGED	**WMCA**
(……..……..)	(……..……..)
Executive Engineer, LGED	Chairperson
.....	…… Subproject WMCA

Exhibit G5-G

Environmental Mitigation Plan (EMP) for SSWRD Subprojects

Name & ID of Subproject:
Union /Upazila/District:
Name of Village/Mouzas:
Gross Area of Subproject : ..... ha.

Nr.	Impact of Subproject Activities on IECs, Resources and Values	Mitigation Measures			Impacted PAPs		Responsible Entity / Party
		During design	During construction	During O&M	Nr	Community/ Group	
Physical Environment							
1.	Regional Flood Regime/Hydrology ☐ Increase flood intensity ☐ Increase/Decrease water flow in khal/river ☐ Enhanced flood risk in adjacent areas ☐ Fall of ground water table ☐	☐ Design to ensure no induced flooding ☐ Incorporation of adequate flow in design of hydraulic structures ☐ More recharge by increasing inundation area and period ☐ Increase of surface water irrigation facilities ☐	☐	☐ Proper and timely opening / closing of regulator gates, maintaining gates and hoisting gears/systems in good operable condition, etc ☐			Design : FSDD Firm, PMO-PC Constrn. : - O&M : WMCA, UE
2.	Drainage /Water-logging ☐ Create/increase drainage congestion ☐ Cause excessive/unwanted drainage (reducing permanent water body/affecting soil moisture) ☐ Water logging in low lying areas ☐	☐ Design to avoid drainage congestion : in any lower area either inside or outside the subproject by draining upper / inside areas, inside subproject area due to inadequate drainage path ☐ Design to ensure no excessive drainage reducing permanent water body significantly; ☐ Design to provide adequate drainage facilities ☐ Design to prevent significant seepage from irrigation canal ☐	☐ Providing diversion channel during construction;	☐ Maintaining drainage channels clear of fish bundhs, water weeds/hyacinths, ☐ Maintain rubber seal of gates property and close gates properly/timely to prevent loss of water required to be conserved, ☐			Design : FSDD Firm, PMO-PC Constrn. : - O&M : WMCA, UE

Instructions to Complete the EMP format: 1. Put Tick (✓) in appropriate Box/Measure to confirm the action to be taken.
2. Complete only the IECs that are identified in the IEE to have adverse impacts
3. Any action/measure to be taken other then the mentioned ones should be described against the empty boxes and the box should also be ticked (✓).

Sl.	Impact of Subproject Activities on IECs, Resources and Values	Mitigation Measures			Impacted PAPs		Responsible Entity / Party
		During design	During construction	During O&M	Nr	Community/ Group	
3.	Soil Characteristics / Soil Fertility ☐ Degradation of soil fertility due to: removal of top soil, intensive/ diversified agriculture (increased use of inorganic fertilizers, pesticides), preventing nutrient rich sediment deposition on lands ☐ Loss of soil fertility due to hindrance in natural replenishment of flood plain soil by flood water inundation. ☐	☐ Design with provision for natural replenishment of flood plain soil by flood water inundation ☐	☐ Ensure no top soil removal from fertile agricultural land (top soil to be excavated and kept reserved at one place, take soil for construction in shallow cutting from the land and spread the preserved top soil on land again; ☐	☐ Training to farmers on IPM / ICM through DAE/SRDI support ☐ Analysis of soil samples (base data) of subprojects cultivated land and use fertilizer application at SRDI/DAE recommended doses ☐ Enhance use of organic manure by farmers			Design : - Constrn. : Contractor, CS O&M : WMCA & Line Agency DAE
4.	Erosion and Siltation ☐ Increase sediment deposit on land outside embankment, ☐ Erosion of loose soil from new earthwork (embankment/spoil) and deposit ion on agricultural land ☐ Increased siltation of river/khal bed due to construction of WRS, Weir, Rubber Dam, etc. ☐ Increase siltation in tidal khal below regulators/sluices ☐	☐ Design to consider existing risk and cause no significant induced impact (provide close turf on top and side slopes of embankments, set sill levels of structures at lower levels or use other techniques to flush out most of sediment load; site regulators/sluices close to outfall channels to avoid stagnant flow at tides. ☐	☐ Adopt appropriate construction management to minimize erosion of soil from excavations, embankments/spoil deposits, etc during rains; ☐	☐ Include in the O & M program special care taking of new earthwork structures under both routine and periodic for the initial years to reduce erosion of soil during rain and deposition on nearby crop lands. ☐ Include in the O&M program removal of deposited silt from the channel bed upstream of weirs and elevated sill structures;			Design : FSDD Firm, PC Constrn. : - O&M : WMCA, UE
Biological/ Ecological Environment							
5.	Terrestrial Habitat: ☐ Removal /cutting of trees and vegetation ☐	☐ Design considering minimum removal / clearance of trees and vegetation ☐	☐ Do not undertake unnecessary clearance of vegetation/felling trees during construction	☐ Include social afforestation program on available land (roadside, khal bank, structure site,etc) ☐			Design : FSDD Firm, PC Constrn. : Contractor, CS, IWRMU O&M : WMCA, CO
6.	Wetland Habitat: ☐ Drying up or drastic reduction of permanent water bodies/areas ☐ Significant reduction of seasonal floodplain area ☐	☐ Design to avoid complete drying up of water bodies ☐ Design to minimize reduction of seasonal floodplain area ☐	☐	☐ Ensure compliance to the timely operation of gates of hydraulic structures (meant for water conservation) ☐			Design : FSDD Firm, PC Constrn. : - O&M : WMCA, CO

Instructions to Complete the EMP format: 1. Put Tick (✓) in appropriate Box/Measure to confirm the action to be taken.
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3. Any action/measure to be taken other then the mentioned ones should be described against the empty boxes and the box should also be ticked (✓).

Sl.	Impact of Subproject Activities on IECs, Resources and Values	Mitigation Measures			Impacted PAPs		Responsible Entity / Party
		During design	During construction	During O&M	Nr	Community/ Group	

Sl.	Impact of Subproject Activities on IECs, Resources and Values	Mitigation Measures			Impacted PAPs		Responsible Entity / Party
		During design	During construction	During O&M	Nr	Community/ Group	
7.	Fisheries: ☐ Decline in fisheries production ☐ Reduction of fish habitat ☐ Reduction of fish biodiversity ☐	☐ Consider provision of fish-pass fish friendly operation to facilitate hatchling migration; ☐ Design for provision of fish shelter in khals, fish sanctuary in the Beels and fixing of fish net at the drainage structure to restrict out-migration of fish ☐	☐	☐ Utilization of all subproject wetlands for fisheries production. ☐ Fish-friendly gate operation schedule to facilitate in-migration of fish for breeding and spawning ☐ Training on improved fisheries technology, community based culture fisheries in subproject water bodies including hatchery and restocking programme			Design : FSDD Firm, PC Constrn. : - O&M : WMCA, CO, line agency DoF
8.	Biodiversity: ☐ Loss of biodiversity (due to decrease of aquatic and terrestrial habitat) ☐	☐ Design to consider no drastic reduction in permanent water bodies, plant and forest area ☐	☐	☐ Include social afforestation program on available land (roadside, khal bank, structure site,etc)			Design : PC Constrn. : IWRMU O&M : WMCA, CO
Social Environment							
9.	Land Acquisition: ☐ Loss of agricultural land/homestead area ☐ Dislocation of habitat ☐ Economic livelihood disruption ☐	☐ Consider in the design avoidance/ minimization of land acquisition ☐ Provision for compensation and/or resettlement of dislocated persons (PAP's) ☐ Minimize disruption of livelihood and provide for compensation for alternate livelihood	☐	☐			Design : FSDD Firm, PC Constrn. : IWRMU O&M : -
10.	Unemployment ☐ Unemployment / reduction of scope of employment of professional community (i.e. fisher, boat men, etc.)	☐ Identification of affected professional group and incorporation of in-kind compensation for losses in the sub-project planning	☐ Employ local people, especially women in construction works. ☐	☐ Employ local people, especially women in O&M activities ☐			Design : FSDD Firm, PC Constrn. : Contractor, CS O&M : WMCA, CO
11.	Navigation / Boat Plying facilities ☐ Hindrance/obstruction to boat plying ☐	☐ Consider in the design boat-pass facility in hydraulic structure s, as for as possible. ☐	☐	☐ Ensure compliance to operation of hydraulic structures for boat pass ☐			Design : FSDD Firm, PC Constrn. : IWRMU O&M : WMCA, CO

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Sl.	Impact of Subproject Activities on IECs, Resources and Values	Mitigation Measures			Impacted PAPs		Responsible Entity / Party
		During design	During construction	During O&M	Nr	Community/ Group	
12.	Facilities for Workers: ☐ Water Supply and Sanitation Facilities for Workers ☐ Health and Safety Measures For Workers ☐	☐	☐ Provide adequate water supply and sanitation/toilet facilities to workers ☐ Adopt appropriate safety measures at work, and provide first aid services ☐ Make workers aware of health risks and how to avoid these ☐	☐			Design : - Constrn. : Contractor, CS O&M : WMCA, CO
Other Environmental Attributes							
13.	☐ Air pollution through dust generation due to subproject works ☐	☐	☐ Spray water regularly on dry work surfaces creating dust problems	☐			Design : - Constrn. : Contractor, CS O&M : WMCA,CO
14.	☐ Noise pollution from construction activities ☐	☐	☐ Avoid unnecessary noise near the vicinity of homestead areas	☐			Design : - Constrn. : Contractor, CS O&M : WMCA,CO
15.	☐ Pollution of water from application of high doses of inorganic fertilizers/ pesticides. ☐	☐		☐ Periodic analysis of representative water samples (surface & groundwater) of subproject area			Design : - Constrn. : IWRMU/Dist.XEN O&M : -
16.	☐ Environmentally sensitive area, Archaeological / Historical Sites ☐	☐ Avoid archaeological/ historical sites, environmentally sensitive areas (Ramsar Sites:Tanguar Haor and Hakaluki Haor; National Protected area: Laua Chhara Forest /other national reserve forest areas) ☐	☐	☐			Design : FSDD Firm, PC Constrn. : IWRMU O&M : WMCA, UE

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Executive Engineer, LGED

WMCA Chairperson

Date of signing:.....
Place of signing: .....