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GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

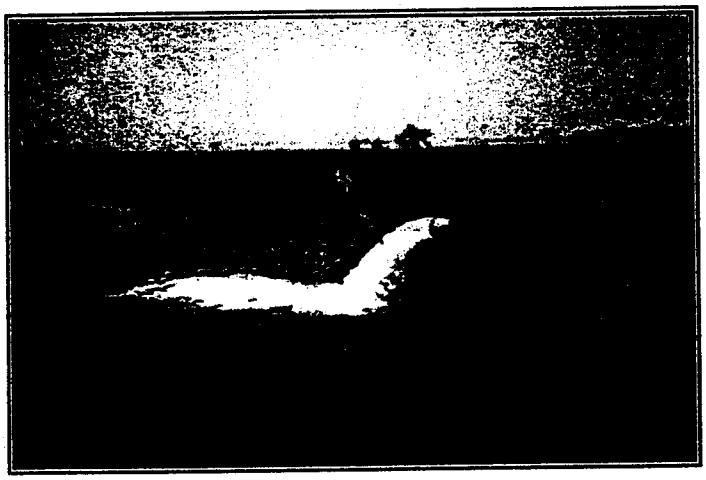
MINISTRY OF WATER RESOURCES

ENVIRONMENTAL MANAGEMENT FRAMEWORK

FOR

WATER MANAGEMENT IMPROVEMENT PROJECT

(WMIP)



BANGLADESH WATER DEVELOPMENT BOARD

Dhaka
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List of abbreviations

BWDB	Bangladesh Water Development Board
DAE	Department of Agricultural Extension
DoE	Department of Environment
DoF	Department of Fisheries
DoI	Department of Industries
ECA	Ecologically Critical Area / Environmental Conservation Act 1995
ECR	Environmental Conservation Rules 1997
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
FAP	Flood Action Plan
FCDI	Flood Control, Drainage and Irrigation
FD	Forest Department
IEE	Initial Environmental Examination
IUCN	World Conservation Union
IWM	Institute of Water Modeling
JRC	Joint Rivers Commission
LGED	Local Government and Engineering Department
LGI	Local Government Institution
MoEF	Ministry of Environment and Forest
MoWR	Ministry of Water Resources
NCS	National Conservation Strategy
NEMAP	National Environmental Management Action Plan 1995
NGO	Non-government organization
NWMP	National Water Management Plan
NWPo	National Water Policy
NWRC	National Water Resources Council
RRI	River Research Institute
WARPO	Water Resources Planning Organization
WMA	Water Management Association
WMF	Water Management Federation
WMG	Water Management Group
WMIP	Water Management Improvement Project

Introduction

The Water Management Improvement Project (WMIP) has been conceived as an instrument for carrying forward the momentum already generated by the Government on its own initiative. The project seeks to consolidate and build on the achievements made so far by introducing participatory approaches for rehabilitation and improvement at scheme level, strengthening operation and maintenance and institutionalizing these changes in the main organizations in the water sector.

The Environmental Management Framework (EMF) has been prepared to ensure sustainable development in the water sector with particular emphasis on involving the local people at all stages leading to the actual operation and maintenance of the rehabilitated schemes by the Water Management Organizations (WMOs) formed with the actual stakeholders. Environmental Assessment (EA) of water development projects are new in Bangladesh and the agencies involved are yet to appreciate the benefits of EA in respect of sustainable development. Therefore the EMF has been kept simple so that the agencies can understand and feel encouraged to put the EMF in practice.

The objective of WMIP is to alleviate poverty by creating better livelihood opportunities for the local people. This is sought to be achieved by enhancing the capacity of the local communities to improve the performance of the water management system. This will contribute to the sector goals of increasing agricultural and inland fisheries production and mitigating the adverse impacts on the environment by past interventions in the water regime. The objective of the EMF is to ensure sustainability of the WMIP specially the participation of the stakeholders at all stages and taking over of the O&M responsibilities by the WMOs. The details of the Participatory Scheme Management can be found in the PAD of the project.

WMIP activities for which the EMF has been prepared are the ones related to land acquisition; construction site activities; construction/rehabilitation/physical dismantling of structures/embankments; excavation/re-excavation of canals; agricultural extension; dredging; awareness programs; transfer of management to WMOs; and monitoring.

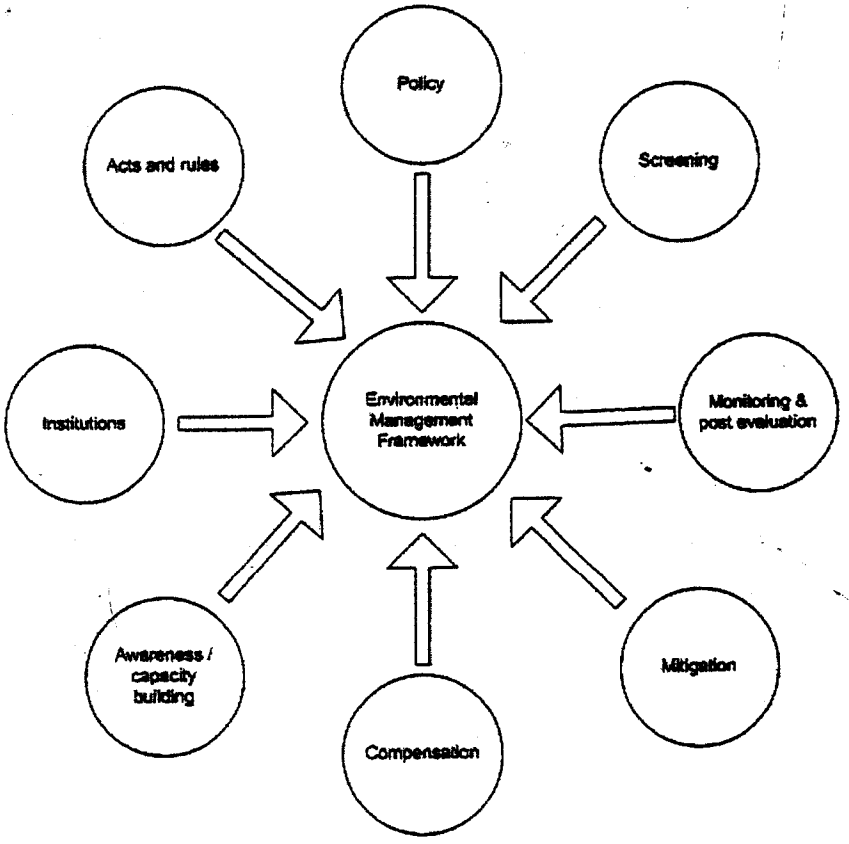
Reference is made to the "Guidelines on Environmental Audit of Completed Small and Medium Scale Water Projects of BWDB" prepared by IUCN in May 2002 for the predecessor Water Sector Improvement Project. The Guideline identified environmental issues in a water sector project and suggested a series of questions for environmental auditing. It also presented a list of items for collecting baseline information which would then be used for monitoring after the projects are handed over to the beneficiaries. The list of threatened mammals, amphibians and reptiles in Bangladesh has been annexed in the guidelines. This document will be used for the community level screening/auditing of water development projects.

Environmental Management Framework

Environmental Management Framework (EMF) is a set of policies, acts, rules, programs and institutions that collectively work towards protecting and enhancing the attributes of the environment that benefit human beings and other living organisms. EMF also strives to minimize the negative impacts on the environment, including human beings, through various mitigation measures. If an impact is unavoidable and cannot be mitigated fully, EMF ensures a fair compensation for any residual impact. Furthermore, EMF suggests screening, monitoring and post-evaluations schemes for a project so that any present or future impact could be identified and resolved as early and quickly as possible.

The EMF in the context of water resources projects strives for the same goals except that here the focus is on the potential or real impacts of various flood control, drainage and irrigation projects (FCDI in any combination). Figure 1 below shows the essential components of an EMF.

Figure 1. Components of the Environmental Management Framework.



Policies, acts and rules

The importance of assessing environmental impacts of water sector projects has been recognized in a number of national documents that set the legal and regulatory framework for management of the water resources environment:

i. Environmental Policy (EPo) of 1992;
ii. National Conservation Strategy (NCS) of 1992
iii. Environmental Conservation Act (ECA) of 1995;
iv. Environmental Conservation Rules (ECR) of 1997, including the Water Quality Standards (WQS);
v. The 1997 EIA (Environmental Impact Assessment) Guidelines for Industries, issued by the DoE (Department of Environment); and,
vi. Environmental Court Act of 1995.

These policies, particularly, EPo 1992, contain fairly comprehensive guidelines about preventing and minimizing environmental impacts of water sector projects. These policies have been incorporated in the National Environmental Management Action Plan (NEMAP) that was formed through extensive consultative process and was adopted by the government in 1995.

Due to the cross-cutting nature of environmental issues, several other national sector policies have bearing on the water sector and these have provided valuable insights and guidelines while developing the NWPo and NWMP. These documents include:

- National Forestry Policy, 1994
- National Energy Policy, 1996
- National Fisheries Policy, 1996
- National Policy for Safe Water Supply and Sanitation, 1998
- National Agricultural Policy, 1999
- Industrial Policy, 1999.

It is evident from the review of the above that the policy makers of Bangladesh are aware and concerned about environmental issues in the 1990s. Environmental impacts of water / FCDI projects were first acknowledged in the National Water Plan I & II (1986, 1991) and eventually, these have been given full recognition in the National Water Policy (1999), the Development Strategy (2001) and the (draft) National Water Management Plan (2001).

In this context, Bangladesh Water Development Board (BWDB), with the assistance from the World Bank, is planning to implement a project to improve the performance of water resources projects in Bangladesh. Mainstreaming the environment within BDWB and the water management groups is one of the primary objectives of this reform initiative. This report - the Environmental Management Framework (EMF) for the FCDI projects in Bangladesh - is an outcome of this reform initiative.

Environmental impacts of water projects

Water resources projects create impacts on the environment that are created during different phases of the project cycle such as construction, operation and maintenance (O&M), and decommissioning. Some of the impacts are small, local and can be mitigated. Some other impacts are big and may persist for a long time. Based on an extensive literature review, field visits and expert consultation, a list of major environmental impacts of FCDI projects has been compiled in Table 1.

Table 1 Activities, Impacts and Mitigation measures

Activity	Possible Impact	Mitigation measure
Land acquisition	Displacement of people	Resettlement Action Plan
	Loss of agricultural land/forest/wetland	Compensation/Aforestation/Sanctuaries
	Loss of biodiversity	Plantation programs
Construction site activity	Water and land pollution	Labor shed with sanitation facilities
	Crowd, noise, dust	Use of labor from the locality, watering
Rehabilitation of embankments/ roads/canals	Loss of natural connection between river and wetlands inside the project	Restore connectivity through regulators, excavation of connecting channels
	Impact on fish migration and navigation	Fish pass structures/Navigation gates
	Loss of flood plain habitat of aquatic species	Proper operation of regulators for retaining desired water level inside, establish sanctuaries
	Water logging in polder areas	Drainage channel with flushing facilities
	Loss of productive land	Compensation
Rehabilitation of irrigation canals	Local drainage pattern changed	Bridged/aqueducts/culverts
	Fisheries affected (Positive/negative)	Fish friendly structures Proper management of the water related infrastructure
Agricultural extension	Monoculture, loss of biodiversity, soil and water pollution due to agro-chemicals	IPM, organic farming, use of local improved varieties
	Potential social conflict with other occupational groups – farmers vs. fishers	Rice-fish farming, appropriate regulator operation considering different types of use
Dredging for maintaining navigational routes & canals	Dredged spoil dumped on agricultural land may destroy its fertility	Silt disposal plan developed and incorporated in the EMP Green manuring,
	If disposed in small stream, water quality may be seriously affected	Confine effluents for deposition of silt before discharging back into river
Physical dismantling of structures	Local inconvenience due to movement of labor and materials, dust, noise, crowd	Signposts, adequate watering, use of local labor
	Restoration of natural environment	Site clearing, soil management
Management transfer to the WMOs	Social conflicts	Form WMOs taking in representatives from all socio-economic communities
	Mismanagement	Gradual transfer of responsibilities, leasing of BWDB properties for income
		Walkthroughs/MOUs between WMOs and BWDB

Cumulative impacts in a hydrological region: The impacts listed above are "direct" and largely "internal" to the project area. These are relatively easy to identify, monitor and mitigate. However, some other impacts are felt outside the project area and the intensity of impact may increase over time. For example, closely spaced polders in the

coastal areas may not allow flood water to spread in the natural flood plains and force it to flow through the narrow confines of the embankments towards the sea. This may lead to higher water levels and bank erosion downstream as perceived by people living outside the project areas. Another example would be the risk of bio-accumulation of pesticide residues over time. FCDI projects increase cropping intensity leading to increased use of fertilizers and pesticides that find their way into the food web and food chain. Yet another example would be water quality deterioration caused by dumping of raw sewage, untreated industry effluent or runoff from shrimp farms, impact of which would be felt by people living downstream and outside the project area. Such impacts may be categorized as "external" and "cumulative" impacts, and should be identified, quantified and monitored separately in addition to the direct impacts listed in Table 1 above.

These external impacts usually are the outcome of multiple activities and projects often implemented by multiple organizations. Thus, BWDB would link up with LGED, DOE, DAE and any other relevant organization in order to identify and assess such impacts. Information collected on cumulative impacts should be recorded, stored and monitored by the Environment Cell of WARPO as they would be in charge of maintaining the national database on the environmental status of water projects.

Screening of FCDI projects

Two levels of screening will be conducted. First, before any rehabilitation activities are initiated, the overall cumulative impact on water flow of the group of schemes proposed to be rehabilitated will be determined through mapping and modeling of the potential impacts. The modeling will use the "regional environmental profiles"[1] prepared by WARPO. If any negative impact is found, those schemes will not be included within the project. Environmental Assessment (EA) for the large schemes (5000-15,000ha) will be conducted according to WARPO EA guidelines for FCDI schemes.

The schemes below 5000ha in size will follow the community based EA guidelines developed under this project.[2] Before rehabilitation and handing over the ownership and O&M responsibilities of FCDI projects to local government authorities and beneficiary groups, projects will have to be screened for environmental impacts. If impacts are detected, then appropriate mitigation measures and enhancements will be included in the individual Environmental Management Plans (EMP) and implemented so that during handover, the project performance could be considered as "acceptable" from environmental point of view. The mitigation activities to be implemented will be mutually agreed upon in an MoU through a joint walk through of the scheme site with BWDB and WMO representatives. At the same time, a baseline data survey will be conducted using the form provided in the EA guidelines.[3]

Since full mitigation of impacts takes time (e.g., construction of a fish pass may take several years even if fund is available), a project may be handed over to the beneficiaries before completely mitigating all the impacts based on mutually agreement between BWDB and WMOs. In such a case, it has to be contractually ensured that BWDB will complete the mitigation, enhancement and compensation related activities within a specified period of time as deemed reasonable.

No hard and fast rule such as "aggregate performance index" is suggested here because that will be difficult to implement due to the skill, manpower and resource requirements. The present state of knowledge about the environment is far from complete and "threshold" values for many of the impacts are yet to be established. As such, it will be very difficult and subjective to assign a specific "score" to the potential environmental impact commensurate to its severity. From the past experiences, it is suggested that a consensus based "qualitative" assessment (see Table 2 below) will be the most effective means of environmental assessment in the context of Bangladesh in the near future. The changes will be recorded and compared with the baseline.

The screening process will be initiated by BWDB by forming a screening team. The screening team will consist of officials from BWDB, LGIs and representatives from

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[1] August 2000. "Draft Development Strategy, Annex O: Regional Environmental Profiles, Volume No 11", National Water Management Plan Project, Water Resources Planning Organization, Ministry of Water Resources.

[2] May 2002. "Manual of Environmental Management Plan of Completed Small and Medium scale Water Projects of BWDB" and "Guidelines on Environmental Audit of Completed Small and Medium Scale Water Projects of BWDB". BWDB, MoWR & IUCN

[3] Ibid.

WMOs. Depending on the size of the project, one or more teams may have to be formed to complete the screening for the whole project. Note that the same process would be employed to monitor the environmental performance of the project as it goes through the process of "participatory scheme cycle" and afterwards when the project would operate under WMOs management. The following steps/methods would be employed to for screening/evaluation:

- collect baseline information as per the Section 4 of the "Guidelines on Environmental Audit" and relevant information incorporated into Table 2.
- joint walk-through and field visits to problem areas for verifications and signing of MoU between BWDB and WMO
- collect feedback from project affected people (PAP) through interview
- collect feedback from stakeholders through focus group discussion
- finalize the assessment through consensus during focus group discussion

In general, an FCDI project can be made acceptable for inclusion in the WMIP according to the environmental criteria once if appropriate mitigation measures can be implemented. Any sub-project found during the screening that may cause a major environmental damage of irreversible nature or may violate an existing environmental rule or regulation[4] and international treaties signed by Bangladesh[5], will be rejected. For example, any sub-project that may encroach into an ecologically critical area or a national/global heritage site will be rejected.

If any violations is detected during monitoring, associated activities will be stopped immediately and BWDB will initiate mitigation measures in association with relevant public/private agencies and NGOs to restore the disturbed the environment to a satisfactory state. Any cost incurred for such restoration will be borne by BWDB.

[4] Environmental Conservation Rules of 1997, The National policy of biodiversity conservation
[5] the Ramsar Convention and the Convention on Biodiversity, Any direct threat to one or more endemic species listed as endangered or threatened in the Red Book of IUCN.

Monitoring and evaluation

The objective of monitoring and post-evaluation is to detect any emerging environmental impact during O&M related activities so that it could be mitigated before causing any significant damage.

The literature on environmental monitoring cites numerous physical, chemical and biological indicators that can be used to assess the state of the environment. However, most of these are "scientific" indicators that require careful sampling and analysis. In other words, these methods are too sophisticated for a lay person and are also expensive and time consuming.

Since, BWDB owns and operates hundreds of projects all over the country, such elaborate and technically demanding approach is not suitable for monitoring the environmental impacts of FCDI projects. What is needed is a set of indicators that are easily observable and understandable by all, including the WMOs members.

Accordingly, a set of "macro indicators" have been identified and proposed in this EMF, which is appropriate for FCDI projects in Bangladesh. The macro indicators are essentially proxy variables that allow identifying a certain environmental impact without making direct measurement of the same. For example, instead of sampling and measuring the amount of pesticide residues in soil, which would be very expensive, difficult and time consuming exercise, the amount of pesticide use per hectare of land may be monitored as a good proxy indicator.

Some of these have been cited in an earlier study done by IUCN. Those indicators been further refined and streamlined in this report to keep the focus on the most significant environmental impacts.

Monitoring of these indicators will be conducted by a "Monitoring Team" comprising of the select WMOs members, officials from BWDB, DOE, DAE, DoF, and LGI representatives. Monitoring team will collect the required information annually by making field visits, consulting official sources, and interviewing key informants. Information so collected will be further discussed and verified in open forums such as a PRA session. BWDB will train the members of the monitoring teams as required.

The Department of Environment (DOE), with the authority of implementing environmental regulations, will act as the arbitrator in case of conflicts among the agencies involved in the monitoring team. An external third party environmental auditor will conduct frequent quality monitoring of the Environmental Assessments and environmental monitoring.

Table 2 provides the list of macro indicators that will be monitored and assessed once every year as long as the project remains in operation. These indicators cover seven most significant impact categories pertinent to the FCDI projects in Bangladesh. The same indicators are to be used for monitoring and evaluation of the FCDI projects before handing over the O&M responsibilities to the beneficiary groups.

Table 2 Environmental indicators

Criterion	Indicator / method	Impact		
		Base-line	Change	Degree of Impact (None, Positive, Small, Moderate, Large)*
Habitat loss	▪ Area of wetlands ▪ Area of swamp forest			
Biodiversity	▪ Number of fish species ▪ Number of amphibians ▪ Number of bird species ▪ Number of wild mammals ▪ Number of crop species grown ▪ Number of "life support plants" ▪ Number of medicinal plants			
Fish Migration route	▪ Visual inspection of closure ▪ Fish catch ▪ Number of fish species caught			
Water logging	▪ Area of inundation ▪ Duration of inundation			
Siltation	▪ Percent of silted up channels ▪ Percent of agricultural land affected by deposition of sand			
Impact on drinking water	▪ Number of dry tubewells ▪ Number of dried up ponds ▪ Number of households affected			
Water Pollution	▪ Amount of pesticide use per ha for HYV rice (average consensus) ▪ Percent of households with pit / sanitary latrines ▪ Area affected by salinity			

* Small is less than 25%, Moderate is between 20-50% and Large is more than 50%

The Monitoring Team will fill up this form and send three copies to the local BWDB office. BWDB will then send one copy to DOE and one copy to WARPO for storing the information in their environmental database for FCDI projects. Based on the assessment above, the following simple course of action is suggested :

1. If the impact is positive, promote further enhancements if possible.
2. If the impact is small, WMOs should initiate local actions to mitigate the impact. Seek help from BWDB and LGIs only if it is essential.
3. If the impact is moderate or major (this can only happen due to prolonged negligence), then the BWDB local office in charge of the project would initiate and coordinate the mitigation activities.
4. In all cases, owner of the project (LGI or BWDB) will be legally obligated to bear all mitigation, enhancement and compensation related costs.
5. Modifications will be made in the EMF to make it relevant to the existing situation.

Mitigation and enhancement

Different environmental impacts require different mitigation measures and approaches. The same impact may require multiple measures, and mitigation measures for one impact may help mitigate other negative impacts caused by FCDI projects.

A list of significant environmental impacts of FCDI projects and the corresponding mitigation measures are provided in Table 3. A "**Mitigation Manual**" and a "**Training Manual**" will be prepared for the WMOs at the very beginning of the project to ensure that the design of the water related infrastructure take into account the minimization of impacts and so that the mitigation measures are incorporated in the Environmental Management Plans of each of the rehabilitated schemes. The Mitigation manual will also differentiate the mitigation measures according to coastal, interior and riverine areas. This document will be written in Bangla so that WMO members can read the manual and implement the suggested mitigation measures.

The Manual for Environmental management Plan of completed Small and Medium Scale Water Projects of BWDB, prepared by the IUCN for BWDB in May 2002, will be followed in preparing the Mitigation Manual referred to in the preceding paragraph. The Manual contains suggestion of possible mitigation measures against the negative impacts of water development projects. Procedure of paying compensation in cash or kind for negative impacts that can not be mitigated and measures, procedures, equipment, training, responsibilities and resources required to adequately control, respond, and resolve potential project risks and emergencies have also been presented in the manual. These will form the basis of preparing the mitigation manual for WMIP.

The large size schemes (5000-15,000 ha) rehabilitation sub-projects will require EIA according to the WARPO FCDI Guidelines. BWDB and the communities will receive the required training for participatory screening and monitoring of these projects.

Table 3 Impacts, mitigations and enhancements

Potential direct Impacts	Mitigation
Overall Environmental Impacts due to rehabilitation activities undertaken during project implementation	▪ Cumulative impact assessment of hydrological regions through mathematical modeling and rejection of schemes with potentially high environmental impact; ▪ Consultation/Joint walk through and recording on map of actions to be taken, possible environmental impacts and mitigation measures, resulting in an MoU between BWDB and community representatives such as the WMO; ▪ Implementation of a participatory screening framework for schemes; ▪ Implementation participatory monitoring; ▪ Preparation of a community level environmental impact mitigation manual; ▪ Training of the community, BWDB and other agencies in environmental monitoring; and ▪ Implementation of a performance audit system.
Loss of habitat and biodiversity	*Encroachment into declared ECA* ▪ Reject any project that may affect ECA. ▪ If any impact is detected, seek help from DoF, FD and DAE to restore the natural environment to the extent possible. *Fish/aquatic species/amphibians*

Potential direct Impacts	Mitigation
	▪ Establish sanctuary ▪ Introduce restocking using natural fries ▪ Create sanctuaries for natural predators such as frog and snake (great for biological pest control) ▪ Protect crab, turtle and tortoise ▪ Fish pass for major routes ▪ Proper management and enhancement of sluice gate/regulator ▪ Restocking of wetlands inside the project with natural fries *Plants* ▪ Afforestation of swamp forest ▪ Protect and replant swamp reeds ▪ Protect and replant "life support plants" in and around wetlands ▪ Promote crop rotation and diversification ▪ Create nursery and promote gardening of medicinal plants ▪ Use local varieties of trees for social forestry to provide habitat for insects and birds *Birds/Mammals* ▪ Awareness campaign ▪ Monitoring and sanctioning against poaching ▪ Protect wintering grounds of migratory and local waterfowls
Water pollution	*Agrochemicals* ▪ Train farmer on the Integrated pest Management (IPM) ▪ Specially, promote non-chemical / biological pest control ▪ Introduce integrated farming where overall input requirement is less and environment is treated as a whole

Other related impacts	Mitigation
Water pollution	*Poor sanitation* ▪ Promote pit latrines ▪ Promote water sealed sanitary latrines when possible *Industrial / factory effluent* ▪ Seek help from DoE ▪ Involve LGIs in implementing effluent treatment and disposal regulations ▪ Try to treat locally in lagoons before dumping in open water ▪ Only dispose in a major stream with sufficient flow *Salinity* ▪ Salinity in soil can be partly dealt with by leaching if sufficient freshwater is available ▪ If it is created by shrimp farms, deal with the issues as part of conflict resolution ▪ Increased freshwater flow in the coastal belt through major projects (this is outside the scope of WMOs)
Navigation blocked	▪ If a major route is obstructed, say by a barrage or a dam, then add a lock or a diversion channel ▪ For minor routes, substitute it by a road network
Water logging	▪ Renovate the natural / manmade drainage canals

Other related impacts	Mitigation
	▪ Build sluice gate if needed ▪ Keep a mobile pumping unit ready to deal with heavy monsoon outpour or an emergency ▪ Provide sufficient number of culverts in rural roads
Siltation	▪ Re-excavation – employ local labor force and women ▪ Maintain earthen canals properly ▪ Ensure sufficient flow in silted up canals ▪ Manage dredged spoil and prevent it from filling up nearby canals and water bodies ▪ Provide silt-trap in major structures
Drying up of tubewells / arsenic	▪ Allow access to deep tubewells for collecting drinking water for free ▪ Provide fee-based piped water system from the deep tube wells ▪ Provide additional dug wells and deep set wells as needed ▪ Enforce minimum spacing requirement

The entire process of screening, monitoring, assessment and mitigation (the environmental components of the participatory scheme cycle management) is shown in Figure 2.

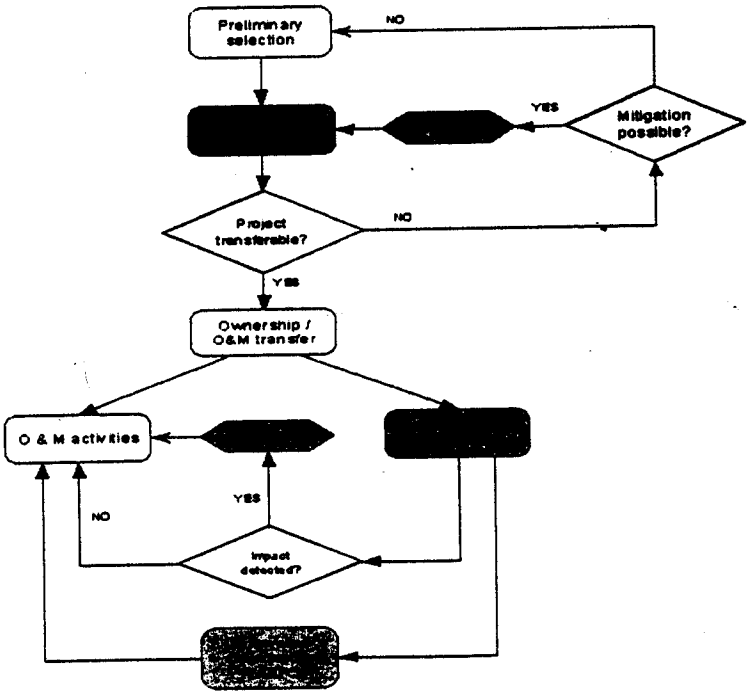


Figure 2. Environmental components of Participatory Scheme Cycle Management.

Compensation and contingency

Compensation becomes necessary when project impacts cannot be satisfactorily mitigated. This can be paid in cash or kind and the emphasis should be on ensuring fairness and causing minimum inconvenience to the affected party.

The most common cause of compensation payment is displacement of people and loss of productive land due to land acquisition. Such impacts can rarely be fully compensated. The compensation will be given as per provision of the Resettlement Action Framework as agreed upon under WMIP.

In addition to the compensation scheme, FCDI projects should also have a contingency plan to deal with emergencies and accidents. Such incidences encompass a whole range of situations from personal injury during operation of a machine to breaching of an embankment. Therefore, WMOs would prepare for the following emergency situations:

- Embankment failure during a flood – keep sufficient number of sand bags in reserve.
- Bank caving/erosion – keep sufficient number of concrete blocks and sand bags in reserve.
- Have an emergency evacuation plan for the people in the line of danger.
- Have a place designated as emergency shelter and ensure proper water supply, power supply and sanitation at this site.
- Accidental spill of pesticide or similar harmful chemicals – train some members on how to confine such a spill and minimize potential danger to humans and other animals.
- Fire – keep fire extinguisher or emergency water pump ready at WMOs office.
- Personal injury – keep a first aid box at the WMOs office. Have a plan for quickly transporting a seriously injured person to the nearest hospital.

LEGAL PROVISIONS IN CONTRACT DOCUMENTS

There are two types of legal provisions that would be specified in the contract documents. The aim of the first category is to ensure safety, security and interest of the people living around/at the construction sites of water management projects. These people must be protected from environmental impacts resulting from construction, expansion, maintenance, renovation and mitigation activities. Such impacts include noise, dust, solid and liquid waste, dredged spoil, water logging, and any accidental injury, death or loss of property. Except for the personal injury or death, such impacts are usually short term but some may persist for a longer period if not mitigated.

The second category includes the provisions which are to be incorporated in the contractual documents signed by the owners of water management projects and the WMO regarding their mutual environmental responsibilities. In other words, these provisions must specify who will be responsible for mitigation and/or compensation, and how that will be carried out once environmental impacts are detected. Such suggestions have already been made in the earlier sections of this report and those will have to be duly internalized in the contractual documents.

INTER-AGENCY COORDINATION

In addition to DoE, the activities of several other organizations, such as DAE and DoF, have a bearing on water management projects. BWDB will take initiative to sign a Memorandum of Understanding (MoU) with DAE and DoF that their officials, particularly at the field level, will work together to minimize negative environmental impacts and maximize benefits from their projects through collaboration and joint initiatives.

Officials of DAE, DoF and BWDB will assist WMOs. Experienced officials from all these agencies have indicated that initially the stakeholders will need a lot of help to carry out O&M responsibilities of water management projects. In fact, this has been prescribed in the Participatory Water Management Guidelines of 2001 brought out the MoWR.

The role of DoF, FD and the Haor & Wetland Development Board will be very important in protecting swamp forests and conserving wetland in the northeastern haor basins of Bangladesh. The haors perform many important functions including retention of flood waters and providing habitat for numerous species of fish, aquatic creatures and waterfowls. The reeds and swamp forests constitute a very unique ecosystem that must be protected from further degradation and encroachment due to expansion of agricultural activities and commercial fish culture.

In addition, the representatives of other LGIs will also be included in various tiers of water management groups. Inclusion of LGI representatives is particularly important for conflict resolution purposes as their participation will make implementation of the verdicts easier as well as legally and socially enforceable.

OPERATIONALISING THE FRAMEWORK

The previous sections have discussed the essential elements of the environmental management framework for water management projects. In order to implement this framework, a number of major modifications and enhancements will have to be introduced in the existing institutional set up and policies. These changes will set off new activities and programs that will eventually operationalise the proposed framework. These activities and programs have been summarized in Table 4.

Table 4: Activities and programs to operationalise EMF

[illegible]	[illegible]	[illegible]	[illegible]
BWDB	Open up higher level positions for E & F officials	▪ Official proclamation of the changes by the government	Immediate
	Sensitize BWDB staff about environmental impacts of water management projects	▪ In house workshop and seminar ▪ Field trips to impact sites	Twice a year for 2 years
	Horizontal and vertical integration of the E&F official with other BWDB staff	▪ In house workshop	Twice year for 2 years
	Train E&F and other staff on IEE, EIA, screening, monitoring and mitigation	▪ Conduct IEE/EIA of new projects ▪ Carry out screening ▪ Carry out monitoring ▪ Carry out mitigation and enhancements	Training twice a year for 2 years; other activities as required.
	Train WMO members on screening, monitoring and mitigation	▪ Conduct regular training of the select members of WMO	Four times a year for as long as necessary
WARPO	Capacity building of the Environmental Cell	▪ Play a EA quality monitoring role ▪ Create and maintain an environmental database of water management projects ▪ Liaison with DoE and other agencies	On regular basis
DoE	Issue the environmental clearance and renewal procedures for water management projects	▪ Issue environmental clearance ▪ Carry out random spot checks ▪ Work with DoI to minimize water pollution	On regular basis
WMO	Capacity building on environmental impacts, monitoring, assessment, mitigation, enhancements and Integrated Pest Management (IPM)	▪ Carry out monitoring, mitigation and enhancements	BWDB will arrange training 4 times a year

Organization	Reform/enhancement	Activity/program	Time frame
M&E Team	Capacity building on assessment of environmental impacts, environmental management and impact mitigation	• Carry out regular environmental monitoring activities and keep records of any environmental changes that may take place. • Implement a environmental performance audit system.	On regular basis as necessary

- **INSTITUTIONAL AND POLICY REFORMS**

Reforming institution and policy is probably the most challenging and difficult component of any environment management framework. In the context of FCDI projects in Bangladesh, the following reforms are suggested: reform within BDWB and WARPO, capacity building of BWDB, and WMOs.

Regarding reforming BWDB, its main weakness so far has been the lack of manpower for carrying out environmental assessment, monitoring and mitigation. In the 1999 "Re-organization" of BWDB, seven positions (Figure 3) have been created for the environmentalists, four at the entry level as Research Officers, and three at the Assistant Chief level. These and any future positions need to be filled in on priority basis. Moreover, these newly created positions should be made "career track" by "opening up" the career track for non-engineers to higher positions. This would attract qualified environmental professionals to join the environmental cadre in BWDB.

Successful implementation of the EMF will require capacity building of BWDB officials and WMOs members. BWDB would train its officials on the EMF and its implementation. These trained officers would then train the WMOs members, who would carry out most of the screening, monitoring and mitigation activities.

WARPO will create a national environmental database of FCDI projects based on the monitoring/evaluation reports. This database might help develop a "cumulative" measure of the environmental impacts of FCDI projects. This process could be initiated once sufficient information is gathered from the project areas.

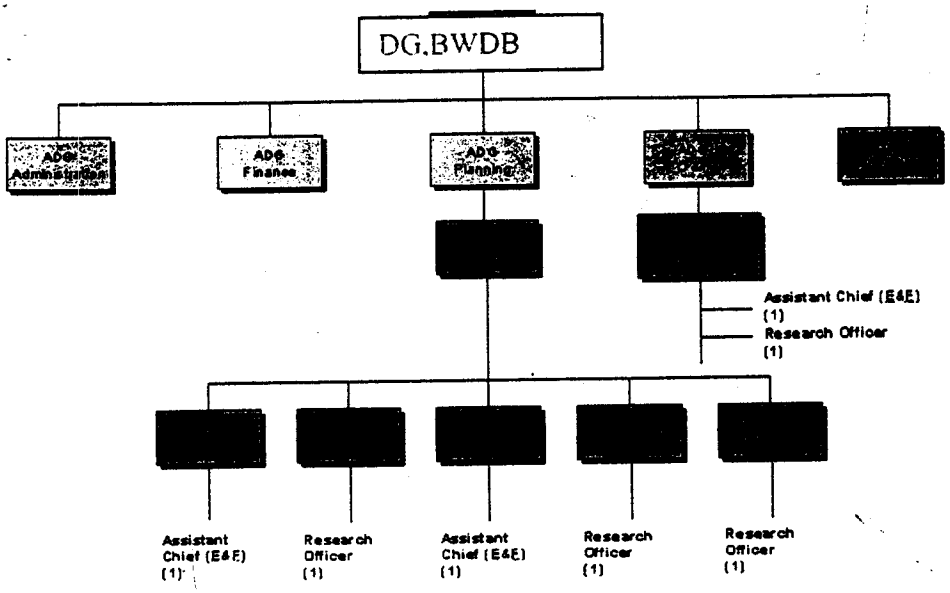
Both WARPO and BWDB will maintain close liaison with DoE and other government and non-government agencies regarding environmental management. The importance of such inter-agency coordination cannot be overemphasized.

Environmental clearance from the Department of Environment (DoE) is required under the Environment Conservation Act of 1995. The section 12 of the Act stipulates that 'no industrial unit or project shall be established or undertaken without obtaining Environmental Clearance from the Director General in the manner prescribed by the Rules.' The procedure for obtaining Environmental Clearance from the DoE is set out in the Environment Conservation Rules 1997. The Rules divide projects into four categories, namely Green, Orange A, Orange B, and Red, depending upon their nature, and hence perceived environmental impacts. The Environment Conservation Rules place Construction/reconstruction/expansion of flood control embankment, polder, dike etc into the Red category.

In order to obtain an Environmental Clearance Certificate for the water development project from DoE, the following are to be submitted with the application for environmental clearance in the form prescribed by the DOE:

- Feasibility Report for the project (where applicable)
- Environmental Impact Assessment (EIA) Report
- Environmental Management Plan (EMP)
- No Objection Certificate from relevant Local Authority (where applicable)
- Other necessary information, (where applicable)

Figure 3 Environmental (E&F) positions within BWDB



Implementing the framework within the PSM

The previous sections have discussed the essential elements of the environmental management framework for FCDI projects. In order to implement this framework, a number of major modifications and enhancements will have to be introduced in the existing institutional set up and policies. These changes will set off new activities and programs that will help implement the proposed framework. These activities and programs have been summarized in Table 6 as they fall into different parts of the "participatory scheme management" process.

Table 6 EMF activities and programs of PSM

Scheme Cycle	Environmental Tasks	Modality	Responsibility
1. Identification	a. Identify Zones and Prepare list of possible schemes b. Prepare inventories of stakeholder interest c. Pre-select Schemes	a. Prepare map of possible schemes with surrounding water development schemes, b. Establish hydrological connectivity for cumulative impact assessment c. Modeling for cumulative impact assessment d. Preparing Environmental Training manual e. CEGIS will draw training plans, need-based modules and arrange training programs for senior, mid-level and junior officials of BWDB, and for WMOs*.	BWDB's O&M Wing, Environmental Consultant, Modeling Consultant and stakeholders on a participatory basis.
2. Assessment of Schemes	a. Collection of social, institutional, environmental, technical and economic data through PRA b. Vulnerability Assessment	a. Collect Environmental Baseline Data as per Environmental guidelines prepared by IUCN and prepare database b. Develop data layers from secondary sources c. Collection of Primary data through PRA d. Conduct Public Consultation to assess rehabilitation requirement e. Preparation of Mitigation Manual	BWDB and Environmental Consultant and stakeholders on a participatory basis
3.Screening	a. Screen schemes on the basis of social, environmental, technical and economic criteria. b. Prepare prioritized short list of schemes	a. Finalize the maps prepared under cycle-1 b. Select IECs for environmental impact assessment c. Apply screening criteria outlined in the EMF	BWDB Divisions concerned, local stakeholders Environmental staff of BWDB's O&M wing and Environmental Consultant
4. Mobilization	a. Establish/Reorganize WMOs b. Strengthen WMOs	a. Share maps with WMOs b. Apprise WMOs about relevance of surrounding projects	BWDB Divisions concerned, WMOs, Environmental staff of BWDB's O&M wing and Environmental

Scheme Cycle	Environmental Tasks	Modality	Responsibility
			Consultant.
5. Planning	a. Formulate scheme improvement plan in consultation with WMOs b. Analyze feasibility of the plan c. Prepare outline management plan a. Sign agreement between BWDB, WMO and LGI	a. Assess impacts of interventions proposed jointly with WMOs b. Assess cumulative impacts c. Prepare plans for mitigation, enhancement, compensation, contingency, monitoring	BWDB' planning wing,, Environmental Consultant and stakeholders on a participatory basis
6. Design	a. Prepare detailed design for rehabilitation and improvement	a. Incorporate plans as outlined at scheme cycle-5 into designs of the scheme b. Prepare cost estimates and incorporate it in project implementation costs	BWDB Design wings, concerned Divisions, WMOs, Environmental staff of BWDB's O&M wing and Environmental Consultant.
7. Implementation	a. Prepare estimates and tender documents, with provisions for mitigation, improvement and enhancement b. Tendering and award of contract c. Construction and supervision of work	a. Monitor implementation of environmental management outline plan and contingency plans in the pre-construction and construction stages b. WARPO and BWDB will keep record of the EAs of every single scheme	BWDB's wing responsible for implementation of the scheme, Design wings, Divisions concerned, WMOs, professionals of Environmental staff of BWDB's O&M wing and Environmental Consultant.
8. Management Plan	a. Finalize Environmental Management Plan for the O&M stage and agree on transition period	Integrate plans for mitigation, enhancement, compensation, contingency and monitoring into the post-construction management plan with required financial provision	BWDB's wing responsible for implementation of the scheme, concerned Field Divisions, WMOs, Environmental Consultant
9. Operation and Maintenance	a. To conduct a trial operation to observe efficiency of environmental mitigation aspects as planned.	Implement O&M plan in full pursuance of environmental management plan as finalized	BWDB's O&M wing, Concerned divisions, WMOs.
10. Evaluation and Management Transfer	a. Joint evaluation of scheme operation b. Training of WMO/LGI for monitoring environmental impacts c. Handing over of responsibilities to WMO/LGI for sustainable O&M along with management of important	a. WMO/LGI/WDB takes respective responsibilities as per agreement a. Each party regularly and jointly pursue environmental mitigation plans.	a. Evaluation by BWDB's O&M wing, WMOs. b. Training will be imparted by Environmental Consultant and BWDB's Training Wing.

Scheme Cycle	Environmental Tasks	Modality	Responsibility
	environmental components as per guidelines.		

Concluding remarks

Implementing an EMF is not going to be an easy sailing. The very idea of incorporating environmental concerns in the decision making process is relatively new in Bangladesh. Recently in 1999, a few positions have been created in BWDB for the environmentalists. These positions are limited in "career opportunities" and higher positions may be opened up to attract qualified individuals. DoE's classification of FCDI projects as RED and requirements for annual clearance are unjustified and impractical. These should be relaxed and made more pragmatic.

In order to implement a participatory water and environmental management scheme for FCDI projects, the government must commit sufficient resources for capacity building of DoE, WARPO, BWDB and WMG/WMA. Fund will also be required for mitigating existing and potential future environmental impacts of FCDI projects, and for paying off compensation as per Resettlement Action Framework as agreed upon for WMIP when mitigation is not possible.

Inter-agency coordination is very crucial for environmental management as this can help eliminate duplication of efforts and potential conflicts. In the long run, implementing the EMF will ensure sustainable management of the country's water and aquatic resources.