

**CHAR DEVELOPMENT AND SETTLEMENT PROJECT II**

**চর উন্নয়ন ও বসতি স্থাপন প্রকল্প ২**

BANGLADESH

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**Guidelines for Environmental Impact  
Assessment (EIA) of CDSP Activities**

**Technical Report No. 19**

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## **SUMMARY OF CDSP-II TECHNICAL REPORT NO. 18 (DEC. 2004): GUIDELINES FOR ENVIRONMENTAL IMPACT ASSESSMENT (EIA) OF CDSP ACTIVITIES**

### **Introduction**

The positive impacts of the Char Development and Settlement Project are obvious. However, a project of this size involving embankment, other infrastructural works and social activities always has negative impacts as well. The expected negative consequences need to be assessed. An Environmental Impact Assessment is the tool to do is, but if properly executed, it forces project staff also to critically review the project components in all stages from environmental perspective. This report describes in brief all aspects of an EIA and highlights some of the known and expected environmental issues.

### **CDSP: components and activities**

CDSP focuses on (i) settlement of (landless) households on government (khas) land, (ii) the creation and improvement of the infrastructure like water management works (embankments, sluices, drainage *khas*), houses, roads and cyclone shelters, (iii) the development of agriculture (and to a lesser extent aqua-culture), and (iv) institutional and community development, like polder and water management committees, tube-well user groups and NGO support. They have been grouped under three themes: 'strengthening of institutions', 'accumulation and dissemination of knowledge' and 'direct improvement of the economic and social situation'.

### **Environmental Impact Assessment in CDSP context**

An EIA is only required by national legislation when the impacts are expected to be considerable. As CDSP involves embankments, the project fall in the category 'Red', which means an EIA is compulsory. The Department of Environment (Environmental Clearance Committee) reviews the EIA and, if all impacts are properly dealt with, issues the Environmental Clearance (after which the project can start).

World Bank (WB) or Asian Development Bank (ADB) guidelines, supported by national documents, can be followed for all EIA aspects. The main steps in an EIA are:

- Project data collection
- Baseline data collection
- Scoping and bounding
- Additional data collection
- Assessment of impacts
- Impact mitigation and project revision
- Environmental Management Plan (EMP) including monitoring
- The EIA report
- Governmental review and clearance
- Stakeholders' participation

### **Environmental issues, CDSP impacts and mitigation**

Based on field observations, interviews with local people and thematic experts, existing documents and project experience some key environmental issues in the CDSP activities have been deduced. A properly executed EIA must complete this list:

- Abiotic environment: Climate change and sea level rise, Erosion/ sedimentation, Water logging and drainage, Char level and start of embankment, Groundwater;
- Biological environment: Habitat destruction and species loss, Loss of breeding, spawning and feeding grounds, Increased pressure on adjacent natural areas;
- Socio-economic environment: Resettlement, False perception of safety, Unequal land distribution/ tenancy, Potential social conflicts, Boat access, Agricultural issues.

### **The contents of an EIA Report**

The ADB guidelines (2003) give a structure for an EIA report and describe the content; this has been adjusted based on the WARPO guidelines (2001):

- |  |  |
|--|--|
| - Section A. Introduction  | - Section F. Economic assessment               |
| - Section B. Description of the project                                | - Section G. Environmental Management Plan     |
| - Section C. Description of the environment                            | - Section H. Public involvement and disclosure |
| - Section D. Alternatives  | - Section I. Conclusions                       |
| - Section E. Anticipated environmental impacts and mitigation measures |  |

### **Conclusions and recommendations**

The conclusions summarise the main environmental issues that should be dealt with by the CDSP, followed by recommendations on the path to follow. In brief they are:

- Embedding 'environment' in the CDSP, a.o. by assigning this task to a project member and by properly implementing EIA's;
- The importance of some environmental issues is not clear: use of chars by aquatic species, the use of the boats in *chars* for transport and fishing, and the importance of Steamer Ghat (Boyer Char). Embankment and damming impacts can only be established when these issues are clarified;
- As the dike and other infrastructure occupy space, people have to be resettled. People also live in the foreshore areas, outside the embankment. Resettlement and land tenancy are issues here. In both cases a resettlement/ tenancy plan is needed;
- Climate change, sea level rise, river bed rise, and coastal erosion and sedimentation is affecting or will affect the project. Options to counteract the negative impacts on the project have to be studied;
- Chars should not be embanked too early, as it will impede drainage. A clear methodology and criteria are needed to decide on the moment embankment is appropriate;
- In the CDSP components 'Strengthening of institutions' and 'Dissemination of knowledge' the project should include the environment, as soon as CDSP staff masters the subject;
- The *khals* (streams) have a high ecological potential. Options for the creation of protected zones along some *khals* may be considered.
- An environmental baseline survey will provide reference data for the assessment of impacts of future interventions. Such a survey is recommended to start soon (before works begin) for Boyer Char, but only for the key environmental elements that are expected to be affected.

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## 1 INTRODUCTION

Environmental Impact Assessments have become more than just a study to the impacts of activities or a project on the environment. It forces project planners to think thoroughly about all steps in the project process and the interaction of the project components with their environment. A properly planned and executed EIA forms an integral part of a project. Unfortunately in many cases it is seen as an inevitable obligation in order to obtain clearance for project execution and is treated as a separate component.

An EIA involves many steps and activities; elaborate manuals exist describing these all in detail (see references and Section 3.2). This report only summarises the EIA process and steps (in Chapter 3), using the Char Development and Settlement Project (CDSP). The CDSP will be introduced in Chapter 2. Although this report is not an EIA, the main environmental issues will be briefly discussed in Chapter 4: their main impacts and options for mitigation. As the CDSP is focussed currently on Boyer Char, soon to be embanked and developed with the latest vision on *char* development, issues in this area will be exemplified. Chapter 5 gives the outline of an EIA report, but also here more elaborate documents should be consulted.

## **2 CDSP: COMPONENTS AND ACTIVITIES**

### **2.1 Introduction**

Char lands are accreted lands formed from deltaic and estuarine sediments transported by the rivers Ganges, Brahmaputra and Meghna. These sediments settle under non-turbulent conditions. The newly formed *char* lands consists of silt and clay of low bulk density (<1.0 g/cm<sup>3</sup>). Gradually these sediments mature and flora, fauna and people occupy the new lands. Pressure on *char* lands is high. Thousands of people, in particular landless farmers, move to the new lands that appear above the sea. These areas just above sea level are very vulnerable for floods, cyclones and erosion by rivers shifting continuously their path.

To address the problems of flooding and to coordinate land settlement and development, the GoN and GoB launched the Land Reclamation Project (LRP) in 1978. At the end of the LRP in 1991, the GoB and GoN recognized two distinct approaches and the LRP project continued under two separate projects: the Char Development and Settlement Project (CDSP), a land-oriented project, and the Meghna Estuary Study (MES), a water-oriented project. CDSP-I commenced in 1994 and was completed successfully in October 1999. Then CDSP-II started with a target for completion in September 2004. Currently the project is in a transition phase, extension (2005 - 2009).

Initially CDSP focussed on (i) settlement of (landless) households on government (khas) land, (ii) the creation and improvement of the infrastructure like water management works (embankments, sluices, drainage *khas*), houses, roads and cyclone shelters, (iii) the development of agriculture (and to a lesser extent aqua-culture), and (iv) institutional and community development, like polder and water committees, tube-well user groups and NGO support. Today the activities have shifted slightly but are basically similar. They have been grouped under three themes: 'strengthening of institutions', 'accumulation and dissemination of knowledge' and 'direct improvement of the economic and social situation', as described hereafter.

### **2.2 Boyer Char**

Boyer Char is an accreted area that has extended strongly in the past twenty-five years. The new land has been occupied quickly and currently the CDSP is working on the issues described above and hereafter. As Boyer Char is in the centre of current CDSP activities and will be so for the coming years, this report will highlight some of the environmental issues that play a role in this project area and are likely relevant for upcoming CDSP activities in other areas as well.



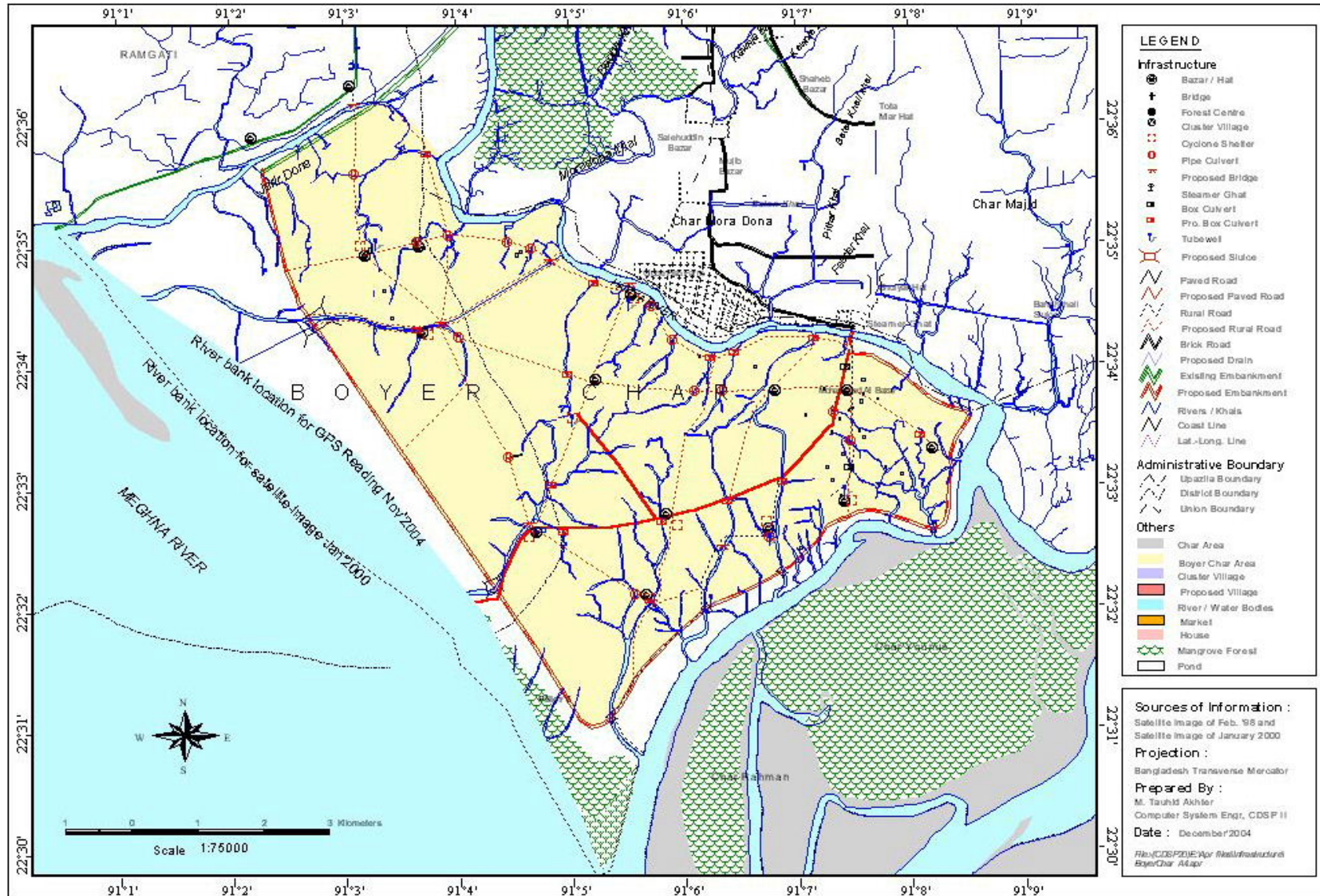


Figure 2.1 The envisaged infrastructure for Boyer Char; the dike alignment has been changed

### **2.3 Component 'Strengthening of institutions'**

This objective addresses the need to give the project concepts and activities a sustained footing in the governmental and non-governmental institutions and in the development management practises for the coastal *char* areas. It not only concerns the continuing review and application of lessons learnt and experience gained, but also concerns the transfer of responsibility for developing and managing such interventions in future to (local) institutions. Here included are the formulation and implementation of people's participation and sustainable operation and management practises. [CDSP-II Project Formulation Document, 1999]

### **2.4 Component 'Accumulation and dissemination of knowledge'**

Knowledge should not get lost, should be duly reported and should lead to an improved methodology for *char* development. In a higher sense it contributes to sustainability of practises, development of an approach to ICZM and effectiveness of interventions.

During CDSP-I the experience gained was reported in methodology reports. Gradually a kind of coastal *char* land development methodology is developing and accepted. This methodology is further elaborated under CDSP-II. Baseline surveys and a monitoring programme form the basis of this activity. Optimising drainage sluices are another important subject of this component. [CDSP-II Project Formulation Document, 1999]

### **2.5 Component 'Direct improvement of the economic and social situation'**

This component concerns the implementation activities in the selected areas where infrastructure is provided and support to social, economic and institutional development is given. Main issues are the distribution of *khas* land, prevention of the intrusion of saline water and the provision of protection against flooding. [CDSP-II Project Formulation Document, 1999]

### 3 ENVIRONMENTAL IMPACT ASSESSMENT IN CDSP CONTEXT

#### 3.1 National requirements and procedures

The Government of Bangladesh enacted the Environment Conservation Act in 1995 (amended in 2000) and the Environment Conservation Rules in 1997. This legislation prescribes the execution of an Initial Environmental Examination or an Environmental Impact Assessment in case of intended activities that may harm the environment. The Department of Environment (DoE) of the Ministry of Environment and Forestry is responsible for the review of an IEE/ EIA and the issue of an environmental clearance, required to start the envisaged activities.

A new project needs to apply in a prescribed form of the DoE (available on [www.doe-bd.org](http://www.doe-bd.org)) for environmental clearance. The form has been developed in line with Environment Conservation Act and Environment Conservation Rules. With the application form an IEE and the Terms of Reference (ToR) for the EIA need to be submitted. Following the submission of the application the DoE reviews the IEE and the ToR ('screening'). The DoE may also visit the project sites if necessary to review the field situation. During the screening the nature and magnitude of the expected impacts are estimated based on the activities:

- If the impacts are expected to be negligible, than no environmental assessment is required (Green and Amber-A Category);
- Are some negative impacts expected, than an IEE is requested (Amber-B Category). Appears during an IEE that the impacts are more serious than initially thought, than also an EIA may be required;
- If serious negative impacts are foreseen, than an EIA is deemed necessary (Red Category), preceded by an IEE.

After approval of the IEE and ToR the project carries out the EIA following the ToR. The EIA report is submitted to the DoE who forms an Environmental Clearance Committee that reviews it for clearance.

There exists also the option for a 'post-EIA', as EIA regulations are relatively new in Bangladesh. If a project applies for environmental clearance halfway of its implementation, then it needs to submit a 'post-EIA report' for getting the clearance from the DoE.

The CDSP involves a.o. the embankment of *char* areas and the Red Category includes (point 66, Annex A of the Environment Conservation Rules) the '*construction/ reconstruction/ expansion/ of flood control embankment, polder, dike etc.*'. This means that due to (at least) the embankment component of CDSP the project must, according to Bangladesh legislation, be subject to an EIA. Considering also the World Bank (WB) and Asian Development Bank (ADB) guidelines, the CDSP would definitively be in the category of projects that require a full EIA, in particular as (re)settlement is involved.

An IEE can be considered as a preliminary EIA. It will not be discussed in this report; the format depends strongly on whether the WB or ADB guidelines (see following section) are followed. IEE details can be found in these guidelines.

### 3.2 Existing guidelines and relevant documents

There exist many guidelines, policies, plans etc. in Bangladesh that concerns the environment, as environment touches many fields (a.o. biology, water, fisheries, agriculture, industry, population, forestry, land settlement). Only the most relevant ones for CDSP will be mentioned here; a more elaborate list can be found in the References (Chapter 7). However, no guidelines exist yet that are legally binding. The DoE advises to use the World Bank or Asian Development Bank guidelines, supported by the national ones.

National guidelines and documents:

- Department of Environment (DoE; Ministry of Environment and Forest); 1997 (June)  
*EIA Guidelines for Industries*. Dhaka.  
Although the focus of these guidelines is on industries, they also apply to flood control works. The procedures for obtaining environmental clearance from the DoE are described in this document.
- Water Resources Planning Organization (WARPO) of the Ministry of Water Resources; 2001 (November)  
*Guidelines for Environmental Assessment of Flood Control, Drainage and Irrigation Projects* (Draft Final). National Water Management Plan Project (NWMPP); Halcrow; Mott MacDonald. Dhaka.  
This document gives a thorough and near-complete overview of the environmental issues and procedures related to a.o. embankments and is very useful for use within the CDSP. It replaces the *Guidelines for Environmental Impact Assessment* (FAP 16 Environmental Study) from 1992.
- Ministry of Water Resources (Bangladesh); 2001 (December)  
*National Water Management Plan*. Approved by the NWRC on 31 March 2004. WARPO. Bangladesh.  
Outlines the national plans in the field of water management.
- ISPAN, 1995  
*Manual for Environmental Assessment*. FPCO, Ministry of Water Resources. Dhaka.  
Explains how to execute EIA's, but irrigation is the main focus.
- Ministry of Water Resources (Bangladesh); 2001 (February)  
*Guidelines for Participatory Water Management*. Bangladesh.  
Outlines how the stakeholders should be involved in project activities and their responsibilities, organisation, training etc. are discussed. The set-up and implementation of an Environmental Management Plan (guided by the project) is one of the tasks of a Water Management Organisation.

International guidelines:

- Asian Development Bank; 2003  
*Environmental Assessment Guidelines*. Manila.  
These guidelines are used in many projects for EIA and are compulsory for ADB projects. They give a complete and well-structured overview and guidance in EIA in general, but do not focus on water. Underlying report will be submitted on a CD-ROM that also include these ADB guidelines.

- World Bank; 1991 to date  
*Environmental Assessment Sourcebook and updates*. World Bank website.  
Like the ADB guidelines, they give an overview and guidance in EIA in general. Update nr. 7 of March 1994 highlights some environmental issues in coastal zone management, but this information is too general for CDSP.

### **3.3 Process and components**

#### **3.3.1 Overview**

An EIA involves numerous steps: from collection of data on the project objectives and activities, up to the environmental clearance by the DoE (if the outcome of the EIA was satisfactory). Figure 3.1 shows all steps schematically. The following subsections describe briefly each step. Some aspects are elaborated in Sections 3.4 to 3.6. For a detailed description of an EIA, consult the documents mentioned in the previous section.

#### **3.3.2 Project data collection**

An EIA starts with the collection of information on the project objectives, activities, components, alternatives, phasing, duration etc. From this information the main areas of concerns can be deducted.

#### **3.3.3 Baseline data collection**

The baseline data collection should focus on the issues of major concern (see 3.3.2). The objective of the data collection is to be able to establish (ideally) the type, magnitude, extend and duration of the impacts, to be used as reference data in the monitoring programme. Also some general environmental data should be included to characterise the impact area for a better understanding by the readers of the EIA report.

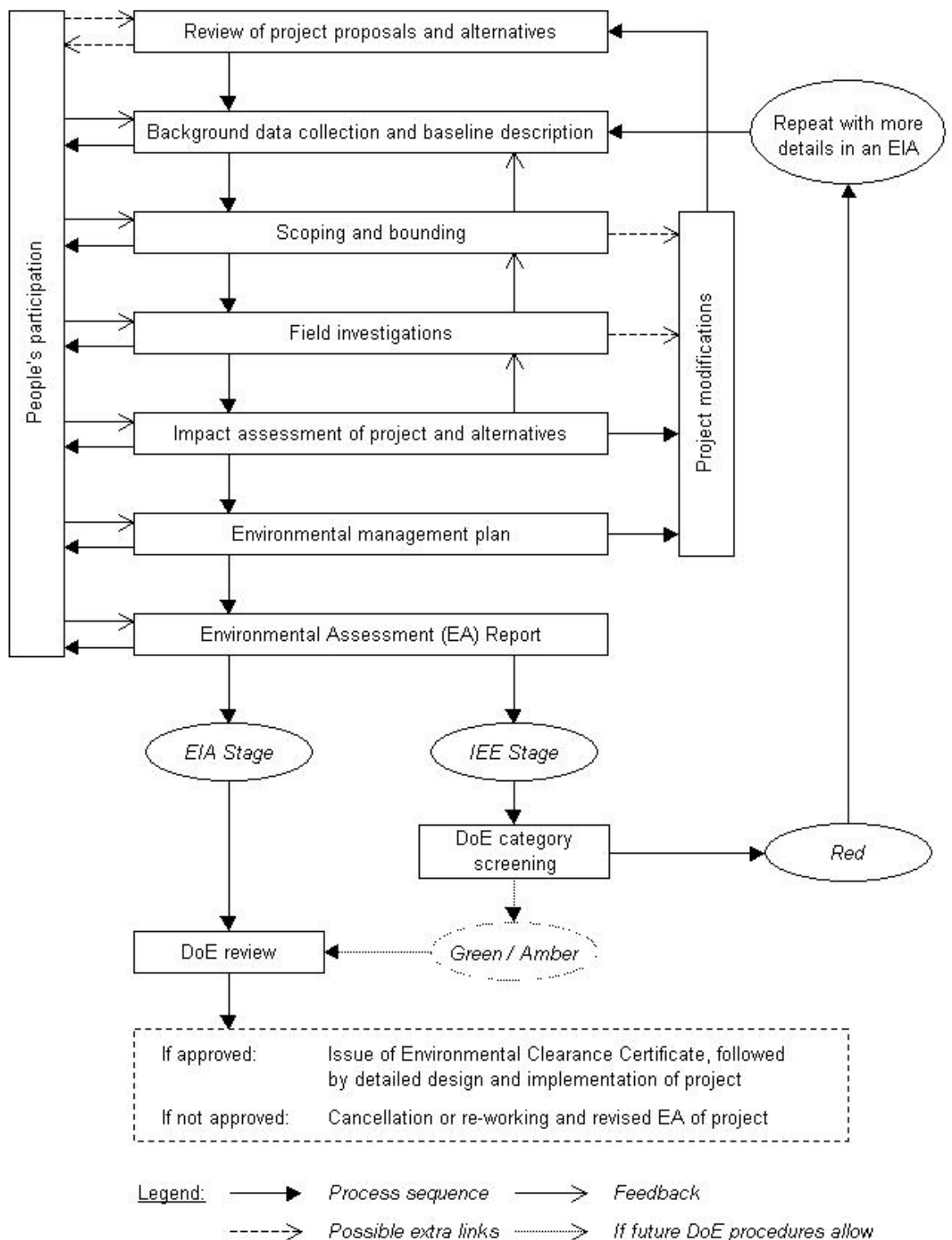
The WARPO guidelines from 2001 give a list of data requirements for an EIA of flood control projects (Annex E, WARPO). Although all should be checked, only the relevant need elaboration. The inventory starts with the delineation of the affected area(s). The subjects within this (these) area(s) to include are:

- |  |  |
|--|--|
| - Climate  | - Archaeological, cultural, historical and religious sites |
| - Surface and groundwater: physical and chemical characteristics (arsenic !) | - Socio-economy  |
| - Physiography/ topography   | - Ethnicity, socio-cultural issues                         |
| - Geomorphology and soils  | - Administrative boundaries, relevant legislation          |
| - Land use and agriculture   |  |
| - Flora, fauna and habitats  |  |

Data will come from field investigations/ observations, local people, specialists' knowledge, organisations active in the area, existing documents, satellite images/ aerial photos, maps, databases etc.

For the baseline data trends on the short and long term have to be estimated. This will allow comparison between the autonomous developments in the area versus develop-

ments during and after project implementation. Some of the baseline data may also be used as reference for the polders that have been developed in the past.



**Figure 3.1** The process of assessing the environmental impacts of a project, options for mitigation and project rejection or clearance

### 3.3.4 Scoping and bounding

Scoping is meant to select the subjects or issues that are involved in the most serious impacts. The scoping will result in the 'Important Environmental Components' (IEC's) who will receive most attention in the EIA. They will require preservation and the mitigation measures will focus on the IEC's to minimise the impacts. Chapter 4 lists the major IEC's for the CDSP areas.

Bounding is meant to delineate more accurately than in the previous steps the area(s) and the duration (periods, frequency) of impact(s). The impact area may vary from the project site up to e.g. offshore fishery grounds or downstream sedimentation areas. Concerning the duration (periods, frequency) of impact(s), the different project stages need to be considered: preparation, construction, operation and decommissioning. In embankment projects as the CDSP, the construction phase will cover over one year, while for the 'operation' up to 30 years will have to be described in the EIA (the project assumes a 'lifecycle' of 20 years). Decommissioning is in CDSP context only relevant for the activities other than embankment.

### 3.3.5 Additional data collection

After the scoping and bounding it will be clearer what information is still missing. The missing data needs to be collected at this stage. Annex E of the WARPO guidelines from 2001 may be helpful in this respect.

### 3.3.6 Assessment of impacts

#### *A) Impacts assessment*

The project components and IEC's identified in the previous steps are subject to the assessment.

The situation with project impacts need to be compared with the situation without project (impacts) over the period that impacts are expected (up to 30 years for the operation phase). So with and without project the foreseen developments have to be estimated, i.e. development under project implementation and autonomous development.

As already mentioned in Section 3.3.4, the impacts during the different project stages need to be considered: preparation, construction, operation and decommissioning stage.

If a project includes alternatives or options, each of the options will have to be studied. Quantification of the impacts may facilitate comparison between impacts.

The EIA should look at the cumulative impacts of this and other projects in the same area or region; while an individual project may pose no threat, the sum of impacts may be unacceptable.

The above points will result in a list of impacts, qualitatively or quantitatively expressed, for all mentioned combinations. To get a good overview of all impacts, often matrices are used to present the results. Section 3.6 will elaborate on the data transformation (to be able to compare), organisation and presentation.



### *B) Risks assessment*

Risk assessment is important in the case of CDSP. As cyclones and swift river level rise are common in the area, the breach of a dike may cause a sudden flooding of the polder area. Capacity and location of cyclone shelters play also a role in this respect. If planned project interventions are not properly executed, the (risk of) the consequences need to be estimated. For example if sluices are not managed properly or malfunction, the consequences for fish migration and polder drainage have to be established. The Environmental Management Plan (see Section 3.3.8) should take these into account. Risks, like impacts, can also be presented in a matrix.

### *C) Economic assessment*

All EIA's require an economic assessment section that includes (i) costs and benefits of environmental impacts; (ii) costs, benefits, and cost effectiveness of mitigation measures; and (iii) for environmental impacts that have not been expressed in monetary values, a discussion of such impacts, if possible in quantitative terms. Economic analysis can assist in evaluating the significance of potential environmental changes, in assessing the incidence of environmental costs and benefits, and in identifying the least cost environmental mitigation measures. The WARPO guidelines (2001), the Guidelines for Project Assessment issued by FPCO (1994) and the EIA Manual by ISPAN (1995) elaborate on the economic assessment.

#### 3.3.7 Impact mitigation and project revision

Based on the impact, risk and economic assessments the project components that cause the biggest impacts/ risks/ costs have to be reviewed. Improvements, alternatives, mitigating and compensation measures should be considered. If there are changes in project design or implementation, the previous steps in the EIA need to be repeated.

#### 3.3.8 Environmental Management Plan (EMP) including monitoring

An important objective of an environmental assessment is to develop procedures and plans to ensure that the mitigation measures and monitoring requirements will actually be carried out in subsequent stages of the project. This is covered by an EMP. An EMP should contain the following (ADB guidelines, 2003, and WARPO guidelines, 2001):

1. Summary of potential impacts and risks
2. Description of planned mitigation measures
3. Description of planned environmental monitoring
4. Description of disaster management (contingency planning)
5. Description of planned public consultation process
6. Description of the responsibilities and authorities for implementation of mitigation measures, monitoring requirements and contingency plans
7. Description of responsibilities for reporting and review
8. Work plan including staffing, schedules of participation by the members of the project team, and activities and inputs of government agencies
9. Environmental responsible procurement plan
10. Detailed cost estimates
11. Mechanisms for feedback and adjustment

The ADB guidelines give useful templates for summarising part of the above points in tables. Both the ADB and WARPO guidelines detail the EMP.

Environmental monitoring is an important component of an EMP. It involves (i) planning a survey and sampling program for systematic collection of data/ information relevant to environmental assessment and project environmental management; (ii) conduct of the survey and sampling program; (iii) analysis and interpretation of samples and data/ information collected; (iv) preparation of reports to support environmental management.

Monitoring is normally carried out before and during planning to establish baseline data needed for environmental assessment and evaluating environmental impacts during project implementation. It continues through project operation to detect changes in the key environmental quality parameters, which can be attributed to the project.

The results of the monitoring program are used to evaluate the following: (i) extent and severity of the environmental impacts against the predicted impacts; (ii) performance of the environmental protection measures or compliance with pertinent rules and regulations; (iii) trends in impacts; and (iv) overall effectiveness of the project EMP.

### 3.3.9 The EIA report

The EIA report presents all relevant study materials and results. The report, and in particular the summary, should be clearly written so it can be understood by representatives of the stakeholders. Chapter 5 describes briefly the report sections.

### 3.3.10 Governmental review and clearance

The DoE reviews the EIA report. They will verify whether the quality, content, EMP and conclusions are correct and adequate. If not, they may reject the report and require revision of some study aspects or even a whole new EIA study. If the (revised) report is approved and the impacts, mitigation measures and EMP are acceptable, environmental clearance will be given and the project may start. Without clearance a project is not allowed to start.

## 3.4 **Stakeholders' participation**

The National Water Policy (1999) prescribes the involvement of stakeholders in water resources planning and management. Also an EIA requires active participation of stakeholders in most of the EIA steps (see Figure 3.1). The objective of stakeholders' participation is to improve the project set-up and execution by taking their views and local knowledge into account. Project cancellation may even be an option. Without the feedback from the stakeholders a project is likely to fail. Participation will raise environmental awareness and stimulate involvement in project implementation.

Stakeholders in the case of the CDSP are:

- People in the project area
- Water management organisations
- Local government institutions
- Non-governmental organisations, including private sector service providers
- The implementing agencies (a.o. BWBD, LGED, DAE, DoF, DPHE, Ministry of Land)
- The financing agencies (GoB, RNE)

The details of participation are given by the Guidelines for Participatory Water Management (Ministry of Water Resources, 2001).



**Figure 3.2 Stakeholders meeting on Boyer Char**

### **3.5 Alternatives**

The consideration of alternatives is one of the more pro-active sides of environmental assessment: enhancing the project design through examining options instead of only focussing on the more defensive task of reducing adverse impacts of a single design. This calls for the systematic comparison of feasible alternatives for the proposed project site delineation, technology, and operational alternatives. Alternatives should be compared in terms of their potential environmental impacts, capital and recurrent costs, suitability under local conditions, and institutional, training and monitoring requirements. For each alternative, the environmental costs and benefits should be quantified to the extent possible, economic values should be attached where feasible, and the basis for the selected alternative should be stated.

Examining alternative means of carrying out a project involves answering the following three questions: (i) what are the alternatives ?, (ii) what are the environmental impacts associated with each alternative ?, and (iii) what is the rationale for selecting the preferred alternative ? For example, a dike alignment can follow a number of different routes. In this case, the EIA report must describe the process taken to select the most appropriate route based on a set of pre-determined criteria. The consideration of alternatives and the selection criteria used to identify the preferred alternatives must include environmental factors.

One alternative always has to be investigated in an EIA: the autonomous development, meaning no project implementation. This alternative is the base for comparison with project implementation (see also Section 3.3.3: Baseline data collection). Within the autonomous development different scenarios may be studied, e.g. for expected population growth within the project area, or for the expected sea level rise (minimum, average, maximum).

If a project is not accepted by the DoE, i.e. environmental clearance is not given based on severe environmental impacts, alternatives for the whole project may have to be considered.

### **3.6 Weighing, quantifying and comparing impacts**

A project like the CDSP with several components involving many stakeholders and covering big areas will result in a long list of impacts, positive and negative. Some impacts may be quantifiable, but probably most can only be described in qualitative terms. To keep an overview, an often used method is organising the project components and affected biota, stakeholders, IEC's etc. in a matrix. Not only for project impacts, but also for risk assessment, economic analysis, project alternatives and autonomous development ('no project') a matrix format can be applied. This way of data analysis is a form of Multi Criteria Analysis (MCA); much literature is available on this subject.

Setting up a sound matrix is quite complex and many variants are possible. In case of a project impact matrix, in fact several matrices are needed; one for each phase. Common is to create one for the construction phase, one for the operation & maintenance phase and one for the dismantlement phase (if applicable). In Figure 3.3 an example is given of an impact matrix, with a brief description in the textbox below.

The use of matrices has several advantages. It helps the assessors to structure clearly the project components, affected environment and identify the impacts. A matrix will indicate which project components give the worst impacts and which biota are affected most. On that basis mitigation and compensation measures can be proposed. However, most values in a matrix are subjective, i.e. the point of perspective determines to a great extent the value. For that reason it is important to describe the content of a matrix, explaining how the values have been established.

### *Example of an EIA impact matrix methodology*

#### Project phases

A project has various stages: feasibility, design, preparation, construction, operation & maintenance and dismantling phase are normally distinguished. An impact matrix makes most sense for the phases with many impacts: the construction and operation & maintenance phase. For both of these a matrix with the same set-up should be created.

#### Project components and affected environment

The project components and sub-components need to be separated clearly from each other on one side of the table, preferably the left side (rows). The affected environment comes then on the top of the table (columns). One can argue that impacts on the abiotic environment are only relevant when they affect also biota (humans, flora, fauna), as they can actually 'perceive' positive and negative. The abiotic environment is then only a transmitter or path between project and biota. This can be represented in a matrix by an extra column that implicitly or explicitly involves the abiotic IEC's (see Figure 3.3, column 'Impact type & path'). The accompanying text to the matrix can explain further the 'type' and 'path'. The affected biota should be subdivided in relevant categories.

#### Impact area and duration/ frequency

The impact of a project component is higher when the affected area is bigger and when the duration of the impact is longer. This is reflected in the matrix by a column for each. These may be quantifiable for most project components.

#### Impact importance and impact values

Each impact can be expressed up to a certain minimum and maximum; e.g. all fish can pass the sluice or none, noise causes extreme stress or none at all. However, one impact type may not be considered as important as the other; e.g. obtaining a land title may be more important than distance to a health centre. This difference in importance can be incorporated in a matrix in two ways:

- 1) The impact values for each project component have their unique range, e.g. obtaining a land title has a range of 0 to 10 (giving for a farmer the maximum value of 10), while the health centre distance has a range of 0 to 5 (giving for a local woman the maximum value of 5);
- 2) All impact values are standardised (e.g. -2 for most negative up to 2 for most positive impact) and a separate column gives the relative value or 'weight' between the project components' impacts (e.g. 4 for the land title and 2 for the health centre distance).

The second option clarifies better the considerations and makes the matrix more transparent.

#### Matrix calculations

Calculating the total impact for each project component (row-wise) gives insight in which components have the most negative impact. Calculating the total impact for each 'biota' (column-wise) gives insight in who are most affected by the project (for the presented project phase). Calculation method: 1) Each biota cell has to be multiplied by impact area, impact duration and impact weight (in hidden columns). 2) Row-wise and column-wise the resulting values are summed ('total impact value') and ranked ('impact rank').

#### Notes

There is a high risk that impacts are counted double in a matrix, as some project components will be strongly related to each other. It is important to try avoiding this so total impact values can be compared. A project component may have more than one impact on a species/ human. The cell value should reflect the sum of these. Each matrix should be accompanied by a descriptive text explaining the values.

Project impact matrix: operation & maintenance phase		Impact area	Impact duration/ frequency	Impact importance/ weight	Flora		Fauna		Humans/ Stakeholders					Total impact value	Impact rank
Project component	Impact type & path				Terrestrial	Aquatic	Terrestrial	Aquatic	Local women	Local farmers	Local fishermen	Governmental agencies	NGO's		
<b>Physical infrastructure creation</b>															
	Embankment/ dike + sluices														
	Roads														
	Cyclone shelter														
	Deep wells														
	...														
<b>Land settlement</b>															
	Land titles assignment														
	Resettlement														
	...														
<b>Agricultural programmes</b>															
	Cropping practises														
	Soil improvement														
	Training														
	...														
<b>Social &amp; health care programmes</b>															
	Creation of health centres														
	Sanitation programme														
	Gender programme														
	...														
<b>Institutional strenghtening</b>															
	Training														
	Equipment supply														
	...														
					Total impact value										
					Impact rank										

Figure 3.3 Example of the set-up of an impact matrix (in this case for the o & m phase)

## **4 ENVIRONMENTAL ISSUES, CDSP IMPACTS AND MITIGATION**

### **4.1 Introduction**

It is obvious that the CDSP has an important positive impact on a large number of landless people in the *char* areas, but like all big infrastructural projects, it has consequences for the environment.

A proper EIA has never been realised during CDSP-I or CDSP-II, although the activities justify it and the national legislation requires it. Experience gained during previous CDSP missions, field visits, reports and studies by CDSP and similar projects (in particular FAP 5, Annex IV, Appendix I, 1992; but also see the reference list in Chapter 7), and the CDSP staff have given insight in the environmental issues related to the project. However, only a full EIA would give a complete overview, especially social and cultural impacts that are more difficult to identify.

Part of the CDSP impacts is affecting the 'pre-project' environment, i.e. the environment as it was before the project started, but also part is within the project intervention context, i.e. unwanted secondary results, side effects or poor implementation.

The comparison reference for project impacts is the situation under autonomous development. If a project activity has a result that would be 'achieved' by autonomous development as well after some time, there is only a project impact on the short term.

Not only impacts by the CDSP on the environment are described, but also the impacts of the environment on CDSP, i.e. climate change, sea level rise and erosion/ sedimentation. These have to be dealt with by the project as aspects of the 'autonomous development' of the project area.

This chapter highlights the main environmental issues (as far as could be identified) and the potential negative impacts that may result from the CDSP, and indicates for some impacts options for mitigation or compensation.

### **4.2 Construction phase**

The works associated with embankment and char development may take several years and involve the use of heavy equipment, causing disturbances for humans, flora and fauna (e.g. noise, vibrations, fumes, pollution). Debris, garbage, lubricants, fuel, chemicals etc. may pollute the environment when not handled and discarded properly. Work-related risks (e.g. traffic accidents) may involve both workers and the local population. The influx of a large number of labourers requires housing and sanitary facilities. Social tension between the labourers and the local population may arise.

All these issues during the construction phase should be covered by an Occupational Health and Safety Plan (OH&SP), which is the responsibility of the Contractor, but the CDSP must assure that one is actually implemented.

## 4.3 Abiotic environment

### 4.3.1 Climate change and sea level rise

The Intergovernmental Panel on Climate Change (IPCC), established by the WMO and UNEP, give in their 'Third Assessment Report 2001' some conclusions relevant to Bangladesh concerning sea level rise and climate change. Projections of components contributing to sea level change from 1990 to 2090, using a range of models give:

- Thermal expansion of +0.11 to +0.43 m; accelerating through the 21<sup>st</sup> century;
- Contribution from the melt of glaciers of +0.01 to +0.23 m;
- Melt of ice on Greenland: -0.02 to +0.09 m;
- Contribution from the Antarctic: -0.17 to +0.02 m.

Including the thaw of permafrost, deposition of sediments, a range of global average sea level rise from +0.11 to +0.77 m is obtained, with regional differences. It would cause large-scale inundations along the Asian coastline. For Bangladesh it is estimated that a sea level rise of 45 cm would cause a loss of land of 15,700 km<sup>2</sup> (or about 11% of Bangladesh's land surface, assuming no embankments exist), directly affecting 5.5 million people.

For a country like Bangladesh the change in climatic is predicted to result in:

- For the areas affected by the annual monsoon cycle there is a high uncertainty in future projections of winter and summer rainfall;
- Glacial melt is expected to increase under changed climate conditions, which would lead to increased summer flows in some river systems for a few decades, followed by a reduction in flow as the glaciers get smaller;
- The monsoons in tropical Asia could become more variable if the El Niño - Southern Oscillation events become stronger and more frequent in a warmer atmosphere. Countries in temperate and tropical Asia are likely to have increased exposure to extreme events, including forest die-back, increased fire risk, typhoons and tropical storms, and floods.

A rise of sea level, increment in cyclones occurrences and more extreme river levels may have big impacts on the char areas. The CDSP dikes have been designed for tidal surges and cyclone classes that occur once every 10, 15 or 20 years (depending on the embankment design). However, under the new circumstances they will give less protection than originally designed for.

### 4.3.2 Erosion/ sedimentation

The river Meghna brings large amounts of sediments from upstream. Near the coast, in the delta, where flow speeds reduce, the river deposits most of its load. That results in 1) the fast formation of new land (*chars*), 2) a river pattern that changes rapidly, and 3) a gradual rise in time of the river bed. People that have settled in the *chars* close to the river Meghna can never be sure on the long term whether their land will disappear through erosion. The northern side of Hatiya island has shown this. Boyer Char is now also threatened by coastal erosion and the alignment of the dike, planned by CDSP, had to be adjusted. With climate change and sea level rise forecasts will become even more unpredictable.



Infrastructural works to limit the movement of the Meghna are considered unrealistic because of the extreme forces exerted by the river. Dredging to divert the river is also not an option, as the sediment quantities are too high. Reduction of the sediment load could be effectuated by large-scale forestation and soil conservation measures upstream, which is not likely to be realised on short terms. It looks like that the only option is to accept the natural process.

Artificial changes in the drainage pattern (straightening, creation of new channels, narrowing of *khals*), the embankment itself, the borrow pits for the embankment material, logging of mangrove forest or changes in activities in the area may cause erosion. Erosion may affect infrastructural works, agricultural land, built-up areas or natural habitat. From case to case measures have to be studied to solve erosion-related problems.



**Figure 4.1 Rapid coastal erosion by the Meghna river of Boyer Char (L) and a *khal* in Boyer Char (R)**

#### 4.3.3 Water logging and drainage

The *chars* without embankments experience regular flooding, in particular during the monsoon when river discharges are high. During flooding the relative quiet water layer on top of a *char* deposits a large part of the high sediment load, making the *chars* grow rapidly in height. Embankment prevents (on higher areas) or slows down (in the *khals*) this process by limiting the water influx. This way the land level in the embanked *chars* will stay always close to the water level outside, giving water logging and drainage problems. If new *chars* develop adjacent to the embanked *char*, this problem is enhanced. On the long term the gradual rise of the riverbed of the Meghna river and sea level rise will worsen the situation. The water logging is mainly a problem for agriculture and health (waterborne diseases), but favours amphibians and waterfowl. To minimise water logging problems, the drainage network inside the embankment needs to be kept open and ample sluices must secure the outflow.

#### 4.3.4 Char level and start of embankment

To reduce water logging problems, the embankment should be started only when the land level is of sufficient height compared to the water level outside the embankment, in particular considering sea level rise, climate change, river bed rise and sedimentation in foreshore areas. In Technical Report No. 13 ('Polder design and development', May 2004) it is argued that if the *char* level has reached the local (near the *char*!) Mean High

Water monsoon level, further accretion will be minimal. This report also discusses the important issue of how and where to measure char levels. A sound methodology prevents a start too early and prevents problems at a later stage. However, later embankment involves more risks for population, animals and infrastructure.

#### 4.3.5 Groundwater

One CDSP component is the installation of deep wells for drinking water. Deep groundwater is free of arsenic. However size, capacity, location, seasonal fluctuations etc. of the groundwater reserves is unknown. Study is required.

### 4.4 **Biological environment**

#### 4.4.1 Habitat destruction and species loss

For many aquatic species, amphibians, reptiles, waterfowl and migrating birds the *chars* (and associated wetlands and *khals* with mangroves, creeks, natural ponds etc.) are their habitat. Under 'autonomous development' these will be strongly affected by growing population pressure. When an embankment prevents flooding, the population pressure will increase further and agricultural land use will intensify, and the *chars* will become unsuitable for many species or their numbers will reduce.



**Figure 4.2 Mating snakes in a *khal* on Boyer Char (L) and the remnant of a mangrove plantation on Boyer Char (R)**

#### 4.4.2 Loss of breeding, spawning and feeding grounds

The *char* areas where CDSP is active are in between the freshwater riverine areas and the saltwater marine areas. In the monsoon the waters surrounding the *chars* are mainly fresh (July – October), while in the periods of low river discharge saltwater dominates.

No thorough studies have been done on the permanent or temporary use of the *char* areas by aquatic species. Youssouf Ali (1997) mentions the areas as being important for spawning, breeding and feeding for both freshwater migratory fish and resident species, but without giving details. The Fisheries Sector Review (June 2003) also indicates the importance of floodplains for fish (see Figure 4.5), but without specifying locations.

Inventories of fishing boats and fishermen households in Muhuri, South Hatiya and Boyer Char show that between 10 and 20% of the households have a boat unsuitable for offshore fishing, i.e. used for fishing inside the *chars* and only outside the *char* under quiet circumstances. It is also known that many bigger boats enter the *khals* in the monsoon season for harbouring, so it is clear that the *chars* in the regions are used by fish.

The presence of fish, in particular fry, attracts predators like waterfowl, amphibians and reptiles. Figure 4.4 shows the relationship between the periods of *char* flooding, fish migration and breeding, fishing, conditions for natural vegetation and cropping calendar.

When the *chars* get higher because of sediment deposits, the importance for aquatic species will reduce. The invasion of people and the conversion of the natural land into agriculture reduce their habitat further. An embankment with sluices limits migration options almost completely.

Research on the use of *khals* by aquatic species, preferably through local fishermen and related to the land level of the *char*, could give better insight in its importance. Based on the outcome, measures can be taken or omitted.

If a *char* still plays an important role when the embankment starts, measures that could be taken are: the construction of fish-friendly sluices (see Figure 4.6), sluice management by the Water Management Committees that allows fish migration in the crucial periods (early and late monsoon, around June and November), and maintenance as much as possible of the natural conditions of the *khals*.

#### 4.4.3 Increased pressure on adjacent natural areas

After embankment and creation of other infrastructure and facilities inside the polder more people will move to the area. The natural areas outside the embankment, adjacent to the polder, will experience increased pressure, as people will exploit these areas for various purposes (wood, grazing, fishing etc.). Social forestry could counteract this development partly.



**Figure 4.3** Wood taken from a mangrove forest plantation (L) and ‘fuel sticks’ made from cow dung, by lack of firewood (R); Boyer Char

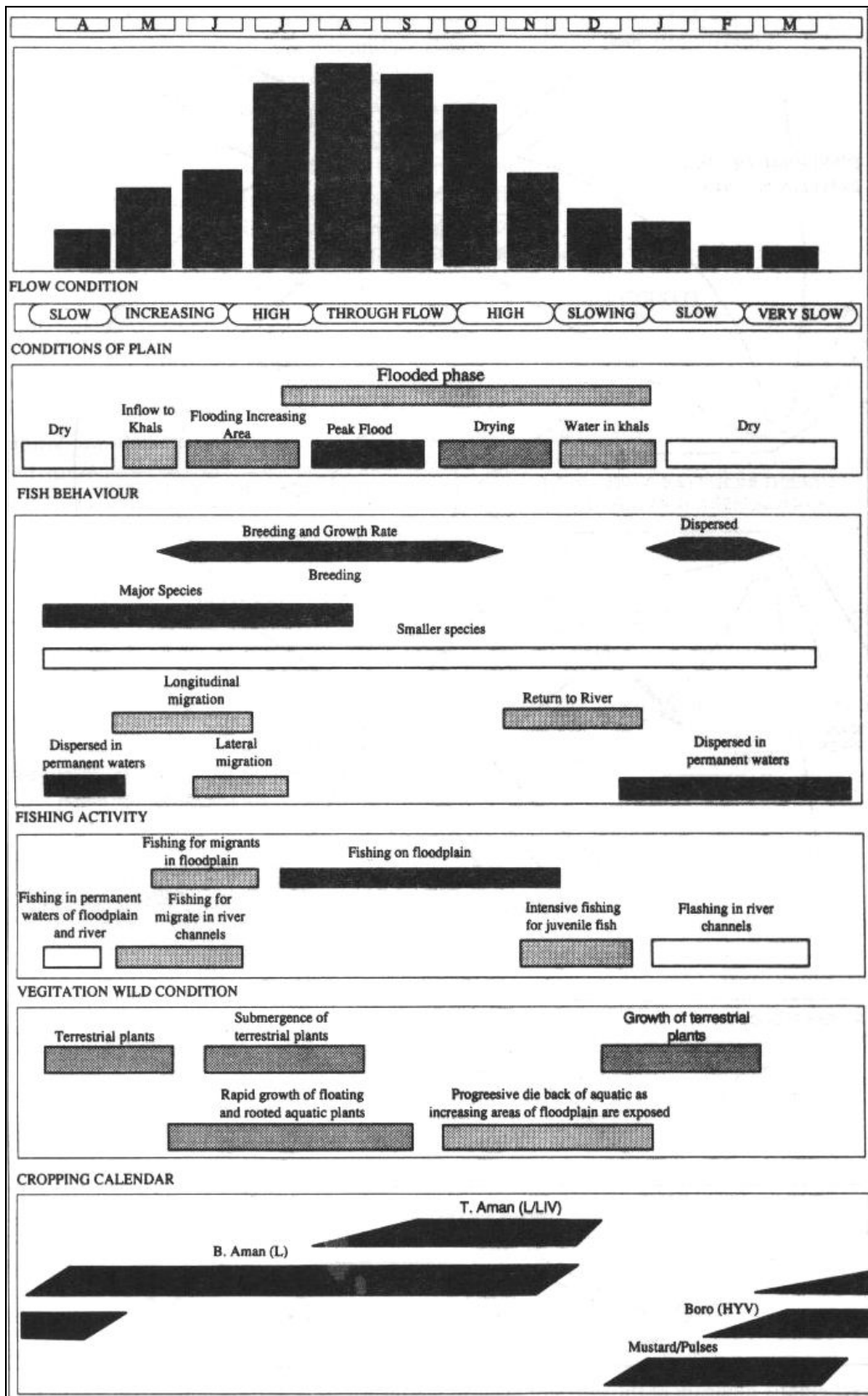


Figure 4.4 The relation between floodplain flooding, fish migration, fishing and agriculture (FAP 5.2, 1993)

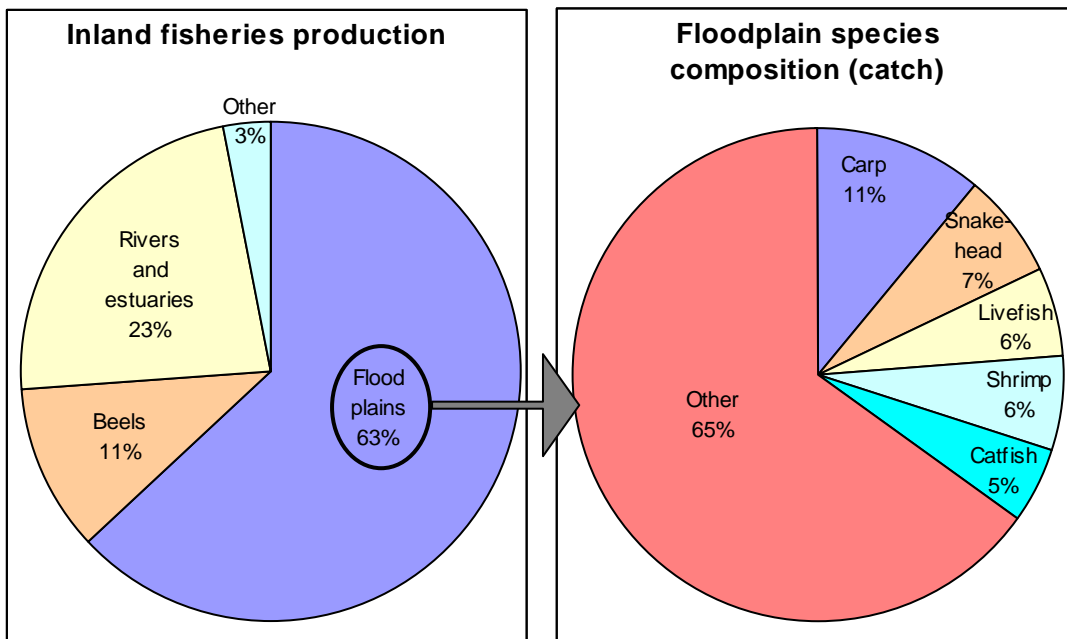


Figure 4.5 The percentage of inland fish caption from floodplains (including chars) and their composition (Fisheries Sector Review, June 2003)

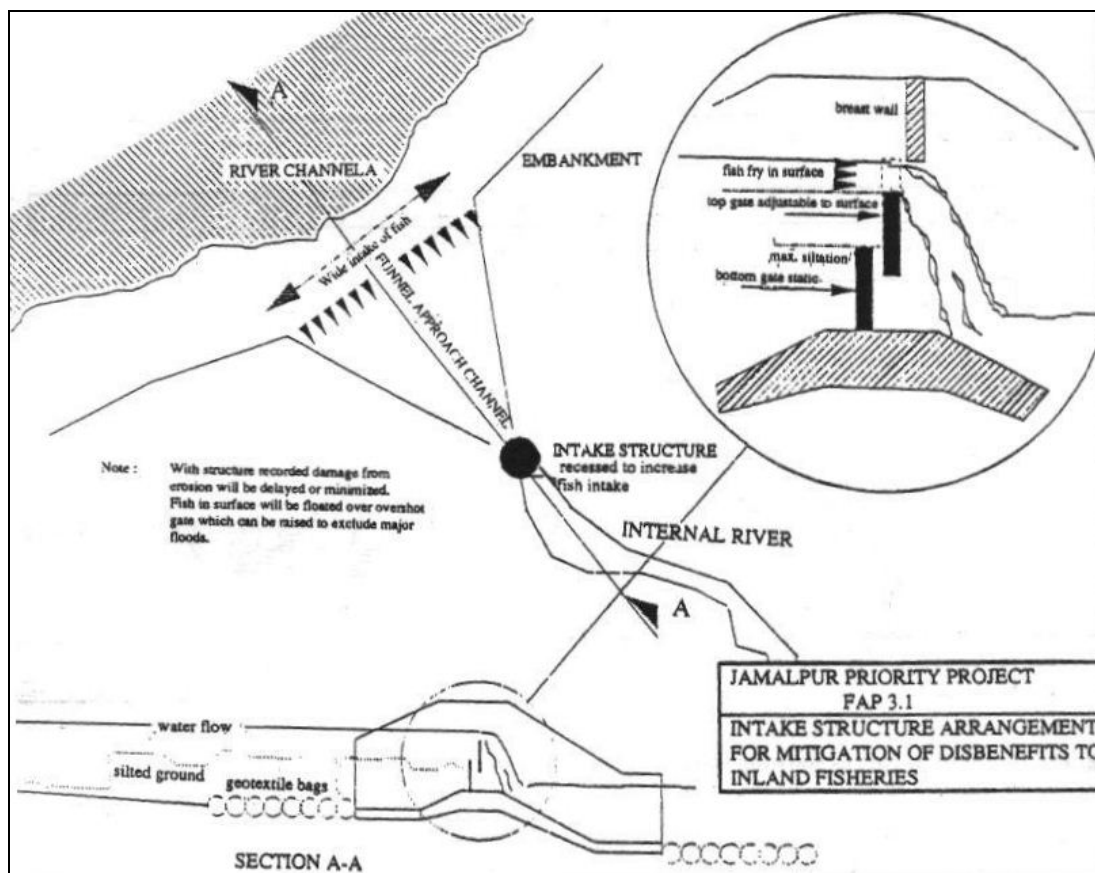


Figure 4.6 Design for a fish-friendly sluice (FAP 3.1 in: Youssouf Ali, 1997)

## 4.5 Socio-economic environment

### 4.5.1 Resettlement

The moment CDSP starts with the infrastructural works, the *char* is already completely occupied by people. The embankment, roads, canals etc. will cover a considerable area from where people need to be moved. Also households will be located outside the embanked area, managed by the Forestry Department. A sound resettlement plan is required for these people.

### 4.5.2 False perception of safety

The embankment gives protection up to a certain level of tidal surges and cyclone classes (the ones that occur once every 10, 15 or 20 years, depending on the embankment design). They do not protect against the worst cases. The presence of the embankment suggests to many polder inhabitants however full protection, diminishing the urgency for them to evacuate when necessary.

The space available in the cyclone shelters appears to be insufficient for all *char* inhabitants. Alternatives for the excluded people should be provided.

### 4.5.3 Unequal land distribution/ tenancy

Char land becomes more valuable after embankment, stimulating people with influence and/ or money to obtain land at the expense of the socially and economically weakest. Follow-up on the issuing of land titles and resale after issuing is important.

### 4.5.4 Potential social conflicts

People that settle on *chars* originate from different areas; e.g. the settlers on Boyer Char come mainly from Hatiya and Ramgati. As the land is new, jurisdictional limits of different administrative units (such as District, Upazila and Union boundaries) need to be established and physically demarcated on the spots. The origin of the people in relation to the jurisdictional unit has to be considered when assigning land titles.

Law and order will only gradually be established in the area. Conflicts on e.g. parcel boundaries may arise without representatives of the law being nearby.

### 4.5.5 Boat access

Fishing inside and outside the *char* is an important activity for the people living in the *char* (see Section 4.4.2). Of the households with boats, between 10 and 20% have a boat mainly used for fishing; in the *khals* during the monsoon and in the foreshore waters/ river in the dry season. Bigger fishing boats come into the *khals* during the monsoon season for protection during bad weather and as harbouring base. Transport by boat, between the accessible villages in the *chars* to other areas, is the cheapest way of transport. The embankment, including sluices without boat passage options, will isolate the *char* area for boats.

In the Hatiya river between Boyer Char and Char Majid a dam is planned, while on the northern side of Boyer Char a dam with a sluice is foreseen. These dams will stop the

shipping activities at Steamer Ghat (small harbour, boat crossing) between Boyer Char and the mainland. The boats will need to move to another location. Without project, access to Steamer Ghat would be blocked as well by sedimentation, but gradually.

The embankment and dams will affect the livelihood of many full-time and part-time fishermen and businessmen. The development of a road network and bridges will only partly compensate. Alternatives or compensation measures should be investigated.



**Figure 4.7** Boats next to Tunkir Bazar inside Boyer Char, used for fishing and transport (L), and the section of Hatiya river that will be closed by a dam (R)

#### 4.5.6 Agricultural issues

The water logging (drainage) problem inside the polders was described in Section 4.3.3. This affects primarily agriculture, i.e. lowers the production.

Agriculture will intensify after embankment (in the areas not faced with water logging), mainly due to reducing salinity levels in the soil, and the use of agricultural chemicals as fertilisers and pesticides as well, leading to an increased pollution of soils and water. The use of chemicals should be guided in the polder areas, including training.

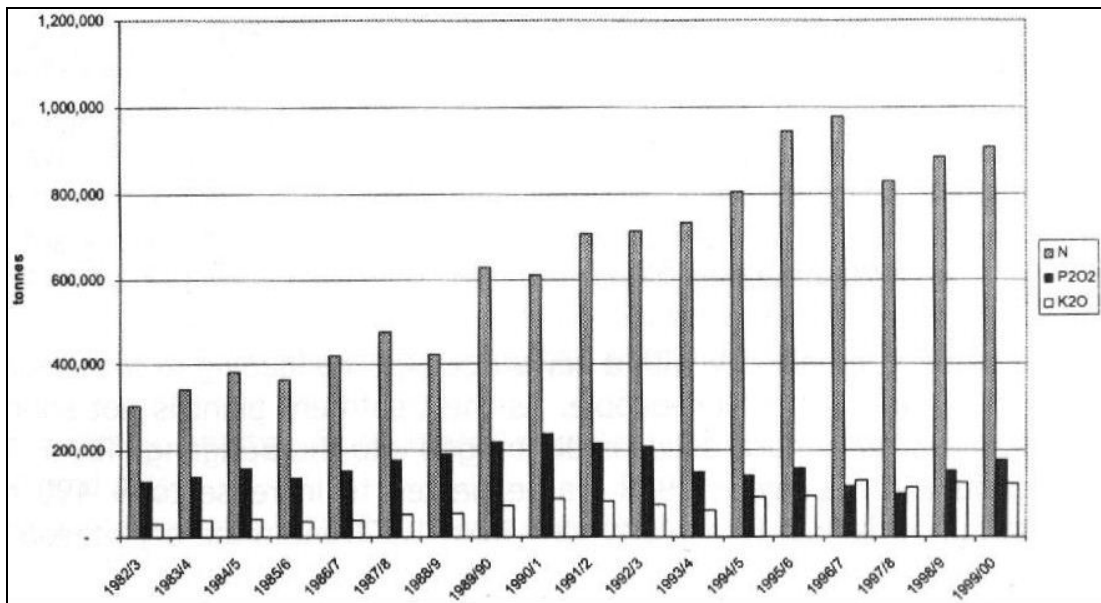


Figure 4.8 Nutrient (N, P<sub>2</sub>O<sub>2</sub>, K<sub>2</sub>O) application to crops in Bangladesh between 1982 and 2000 (Fisheries Sector Review, June 2003)

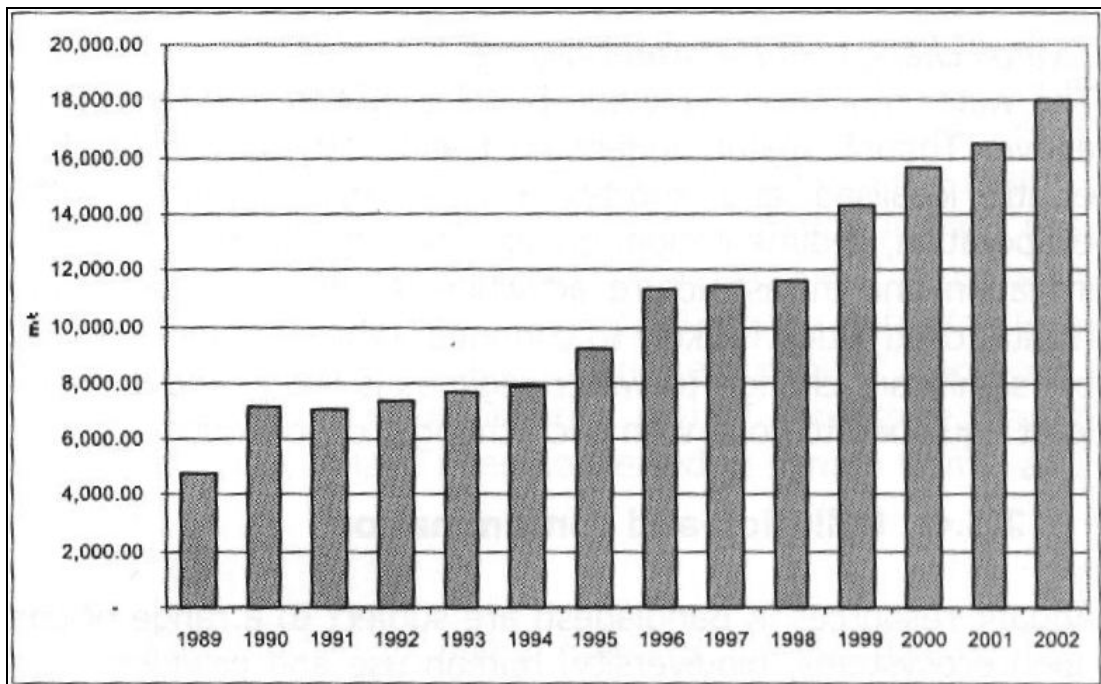


Figure 4.9 Pesticide application in Bangladesh between 1989 and 2002 (Fisheries Sector Review, June 2003)



## **5 THE CONTENTS OF AN EIA REPORT**

### **5.1 Introduction**

The EIA report basically contains the information described in Chapter 3 and has roughly the same structure as the EIA process given in Figure 3.1. The following sections describe what the content should be of each chapter or section of the EIA report. The structure is the same as prescribed by the ADB guidelines (2003), but based on the WARPO guidelines (2001) some adjustments have been made. When of additional value, CDSP examples are given. Background information or long lists of data should be included in annexes.

### **5.2 Section A. Introduction**

This section usually includes the following:

1. Purpose of the report, including (a) identification of the project and its proponent, (b) brief description of the nature, size, and location of the project and its importance to the country, and (c) any other pertinent background information;
2. Stage of project preparation (i.e., pre-feasibility study, feasibility study, detailed engineering design preparation);
3. Extent of the EIA study, including the scope of the study, magnitude of effort, and persons/ expertise or agency performing the study and corresponding person-months;
4. Brief outline of the contents of the report, including any special techniques or methods used for identifying issues, assessing impacts, and designing environmental protection measures.

### **5.3 Section B. Description of the project**

The project should be described in terms of its basic activities, location, layout, and schedule (in terms of the project cycle). This section of the EIA report should provide sufficient details on the following:

1. Type of project;
2. Need for project;
3. Location (use maps showing general location, specific location, project boundary and project site layout);
4. Size or magnitude of operation including any associated activities required by or for the project;
5. Proposed schedule for approval and implementation;
6. Description of the project including drawings showing project layout, components of project, etc. This information should be of the same type and extent as is included in feasibility reports for proposed projects, in order to give a clear picture of the project and its operations.

### **5.4 Section C. Description of the environment**

This section contains a description of the study (impact) area to provide a clear picture of the existing environmental resources and values within the impacts must be considered. Methodology to gather information, including data sources, should also be briefly

described. As much as possible, the baseline information should be presented in maps, figures, and tables.

The baseline environmental information should include details of the following subjects (for the details: see WARPO guidelines 2001, Annex E):

- Climate
- Surface and groundwater: physical and chemical characteristics (arsenic !)
- Physiography/ topography
- Geomorphology and soils
- Land use and agriculture
- Flora, fauna and habitats
- Archaeological, cultural, historical and religious sites
- Socio-economy
- Ethnicity, socio-cultural issues

## **5.5 Section D. Alternatives**

This section gives the systematic comparison of feasible alternatives for the proposed project site delineation, design, technology, and operational alternatives. The consideration of alternatives and the selection criteria used to identify the preferred alternatives must include environmental factors. Impacts, costs, suitability under local conditions, and institutional, training and monitoring requirements must be described for each alternative. Autonomous development, i.e. no project, is always one of the alternatives used for comparison. Section 0 outlines various aspects of project alternatives.

The information going into the decision and the decision-making process must be documented in the EIA report. For example, if 'alternative means' refers to site selection (e.g. of the dike alignment), the location of each alternative would have to be described, the environmental impacts of each alternative defined and the criteria and analysis of site selection presented.

Since the selection of alternatives can involve detailed technical analysis that includes more than just environmental factors, it may be preferable to present the details of this analysis as an appendix and include only the results and summary of this selection process in the body of the report. For example, a table listing the alternatives on one axis, and the criteria, such as reliability, cost, performance, inherent environmental effects and necessary mitigation measures, on the other axis may provide an effective summary.

The process and arguments used for selection of an alternative needs to be documented.

## **5.6 Section E. Anticipated environmental impacts and mitigation measures**

This section will evaluate the project's expected impacts (in as quantified terms as possible) on each resource or value, the risks and the economic evaluation. Environmental impacts to be reported will include those due to (i) project location; (ii) caused by possible accidents; (iii) related to design; and (iv) during construction, regular operations, and final decommissioning or rehabilitation of a completed project. Both direct and indirect, temporal and permanent effects will be considered, and the region of influence indicated. This analysis is the key presentation in the report.

It is necessary to present a reasonably complete picture of both the human use and quality of life gains to result from the project due to the utilization, alteration, and impairment of the natural resources affected by the project, so that fair evaluation of the net worth of the project could be made.

For each significant adverse environmental impact, the report will explain how the project plan/ design minimizes the adverse effects and in addition how the project plan/ design includes provision for offsetting or compensating of adverse effects, and for positive enhancement of benefits. Where substantial cost of mitigation measures is involved, alternative measures and costs will be explored.

The EIA report will identify the extent to which the proposed project would irreversibly curtail the potential uses of the environment. For example, an embankment that cuts off *khals*, wetlands, or a natural estuary can result in irretrievable damage to those sensitive ecosystems.

## **5.7 Section F. Economic assessment**

This section may be drawn from the economic analysis conducted as part of the project feasibility study. It should include the following elements (which should be integrated into the overall economic analysis of the project):

1. Costs and benefits of environmental impacts;
2. Costs, benefits, and cost-effectiveness of mitigation measures;
3. Discussion of impacts that have not been expressed in monetary values, in quantitative terms where possible.

## **5.8 Section G. Environmental Management Plan**

The EMP describes how the mitigation and other measures to enhance the benefits of environmental protection will be implemented. It explains how the measures will be managed, who will implement them, and when and where they will be implemented. The following elements should be described in the EMP:

1. Implementation of mitigation measures during project design;
2. Implementation of mitigation measures by contractors, and how impacts prevention will be incorporated in the materials procurement;
3. Social development program (e.g. resettlement plan, community training);
4. Contingency response plan for disasters, including project contingencies;
5. Environmental monitoring plan (see below);
6. Environmental management and monitoring costs, including mitigation costs.

The environmental monitoring plan describes the monitoring activities to ensure that adverse environmental impacts will be minimized, and the EMP implemented. The environmental monitoring plan will cover selected parameters to indicate the level of environmental impacts. It also describes how, when and where the monitoring activities will be undertaken; who will carry them out; and who should receive the monitoring report. More importantly, it includes a proposal to carry out environmental compliance monitoring activities.

The present capacity of the executing agency to implement the EMP should be described and implementation costs clearly identified.

## **5.9 Section H. Public involvement and disclosure**

This section will:

1. Describe the process undertaken to involve the public in project design and recommended measures for continuing public participation;
2. Summarize major comments received from beneficiaries, local officials, community leaders, NGOs, and other stakeholders, and describe how these comments were addressed;
3. List milestones in public involvement (dates, attendance, topics of public meetings), and recipients of the report and other project-related documents;
4. Describe compliance with relevant regulatory requirements for public participation (Bangladesh: National Water Policy, 1999; Guidelines for Participatory Water Management, 2001);
5. If possible summarize public acceptance or opinion on the proposed project;
6. Describe other related materials or activities (e.g. press releases, notifications) as part of the effort to gain public participation.

This section will provide of summary of information disclosed to date and procedures for future disclosure.

## **5.10 Section I. Conclusions**

The EIA report will present the conclusions of the study including:

1. Gains which justify project implementation;
2. Explanation of how adverse effects could be minimized, offset or compensated to make these impacts acceptable;
3. Explanation of use of any irreplaceable resources;
4. Provisions for follow-up surveillance and monitoring.

Simple visual presentations of the type and magnitude of the impacts may aid the decision-maker.

## **5.11 Report summary**

The summary EIA report describes the critical facts and significant findings of the EIA report and their resolutions. The reader should be able to understand the issues' importance and scope, and the appropriateness of the approach taken to resolve them. The report should be presented clearly and concisely as a stand-alone document for submission to the stakeholders including the public.

The ADB proposes the following format and size (indicative) of the summary:

- A. Introduction: ½ page
- B. Description of the project: ½ page
- C. Description of the environment: 2 to 3 pages
- D. Alternatives: 1 to 2 pages
- E. Anticipated environmental impacts and mitigation measures: 4 to 6 pages
- F. Economic assessment: 1 to 2 pages
- G. Environmental management plan: 1 to 2 pages
- H. Public consultation and disclosure: 1 to 3 pages
- I. Conclusions: 1 page

## 6 CONCLUSIONS AND RECOMMENDATIONS

- Conclusion 1

The positive impacts of the CDSP are obvious. However, a project of this size involving embankment, other infrastructural works and social activities always has negative impacts as well. In its current form the CDSP pays little attention to the 'environment' (biology, culture, socio-economy ...), except for some socio-economic aspects that are explicitly part of the project's activities. The suspected negative consequences need to be assessed. An Environmental Impact Assessment is the tool to do so. If properly executed, it forces project staff to critically review the project components in all stages from environmental perspective.

Recommendation 1

Assign a person that will be responsible for environmental review of the project components in each project stage. Mr. Nazrul Islam, Social Forestry Advisor, would suit this (part-time) task, preferably assisted by the senior Socio-Economic Advisor Mr. M.A. Latif.

- Conclusion 2

The Department of Environment issues an Environmental Clearance when the impacts by a project are considered acceptable based on the EIA. Only after obtaining the Clearance a project can start. The EIA guidelines to follow can be either the World Bank or Asian Development Bank (ADB) guidelines, supported by national guidelines.

Recommendation 2

Execute a proper EIA for Boyer Char, following the ADB guidelines and the national guidelines and documents referred to in underlying document.

- Conclusion 3

Three environmental issues have been identified in this mission that need clarification; 1 and 2 are general issues, 3 is a specific case:

1. Marine and riverine fish and other aquatic species use the *chars* part of the year or permanently, and fishermen catch them. But the importance of *chars* and adjacent streams for fish and the importance of char fishing for fishermen is unclear. What will be the impact of embankment with sluices ?
2. People living on the *chars* use boats for fishing and transport of goods. Also people from outside the area frequent *chars* and adjacent waters with bigger boats. Again, the importance of *chars* and adjacent streams for these people is not known. How will they be affected by embankment ?
3. Steamer Ghat, the small harbour in the Hatiya river on the north-eastern side of Boyer Char, shows a lot of activities involving boats. Steamer Ghat will become isolated by a dam on one side and a dam with sluice on the other side. Are alternatives for the boat owners/ users easy to find or will there be economic victims ?

Recommendation 3

Clarify the three issues by consulting local people, experts, existing documents and by field visits (e.g. fish markets) and look for mitigation measures if the issue is important. Staff capacity is needed to execute the mentioned studies.

- Conclusion 4

The embankment and the other physical infrastructure occupy space. People already living there need to resettle. Also people live in the foreshore area that will fall outside the embankment. Land tenancy in the foreshore area and options to obtain land inside the polder are currently under investigation by an NGO linked with the project.

Recommendation 4

A sound resettlement plan and a plan that deals with land occupation in the foreshore need to be elaborated (the project is dealing already with this subject).

- Conclusion 5

The project not only affects the environment, the environment also influences the project. Climate change, sea level rise, river bed rise, and coastal erosion and sedimentation are playing or will play an important role in the project. Infrastructure and drainage will need adjustment in the future otherwise these factors will endanger unacceptably the population and their income sources.

Recommendation 5

Investigate measures (e.g. changes in dike design, more cyclone shelters) that may counteract or mitigate the expected impacts.

- Conclusion 6

If a char is embanked too early, drainage problems can be expected and aquatic species are likely to be affected.

Recommendation 6

Use an appropriate method to establish whether a *char* is ready for embankment.

Other recommendations

- For CDSP component 'Strengthening of institutions': environmental friendly measures and practises that can be as identified (e.g. in an EIA) have to be included in the knowledge transfer to the institutions.
- For CDSP component 'Accumulation and dissemination of knowledge': the environmental friendly measures and practises that can be as identified should be embedded in the *char* land development methodology.
- The *khals* (streams) have a high ecological potential. Options for the creation of protected zones along some *khals* may be considered (with local Water Management Committees taking care of their management).
- An environmental baseline survey will provide reference data for the assessment of impacts of future interventions and is included in an EIA. Such a survey is recommended to start soon (before works begin) for Boyer Char. However, only those data should be collected that describe the key environmental elements that are expected to be affected.

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ANNEX 1 TOR FOR THE ENVIRONMENTAL SPECIALIST

**Terms Of Reference**  
**for**  
**Environmental Specialist**  
**For Short Term Mission to**  
**CDSP-II, Noakhali, Bangladesh**

**Title of Mission/Activity –**

General EIA of the CDSP-II Char Areas-2004

**Planned commencement and conclusion dates -**

A two weeks mission to be started in early December 2004

**Member(s) of Mission/ Activity -**

Mr. Frank Keukelaar, Environmental Specialist

**Other CDSP-II project members concerned -**

(Co)- Team Leader CDSP-II, SEA, SLA and all CDSP-II consultants and staff as required.

**Date of previous Mission/Activity {if any} -**

October 2000 and November 2002

**Previous Report(s)/Reference(s) {if any} -**

1) CDSP-II reports: Mission Reports 7 and 26, Joint Formulation Mission Report 2004, Mid Term Review Mission 2002, Progress Report No. 10, Mission Report 44, Annual Workplan (draft) 2005.

2) General guidelines on EIA aspects:

- EIA Guidelines for Industries (Min. of Environment and Forest; Bangladesh 1997);
- Guidelines for Environmental Assessment of Flood Control, Drainage and Irrigation Projects (Halcrow, Mott Mc Donald et al, Bangladesh, draft 2001)
- Preparation report for the Proposed Coastal Zone Water Management programme, Volume III, Annex K (BWDB, Min. of Water Resources, Bangladesh, 2000);
- The Asian Development Bank and the World Bank Guidelines for EIA's.

**Principal objective of Mission/Activity -**

The Environmental Specialist will produce a generic Technical Report on EIA for Char Areas of CDSP-II. The report will include in brief the EIA methodology as prescribed by internal funding agencies (ADB, WB), will follow the structure of the guidelines by these same agencies, but elaborated and adjusted for the key environmental issues in the *char* areas. The set-up of an Environmental Management Plan (incl. Monitoring Plan) and a summary which highlights the main points will be included. The EIA of South Hatiya (Mission Report 7), the other documents mentioned above and more recent relevant studies that may be available will be used, as well the knowledge of available experts will be provide the essentials for the report.

**Secondary objectives of Mission/Activity -**

1. To guide and contribute the TA team on the EIA section of the Final Report to be published at the end of this year.
2. Identify the key issues, which will be subject for investigation in future EIAs in char areas

**Expected outcomes and/or reporting format -**

Documentation upon conclusion of the mission to be:-

1. A Mission Report, which is in fact a Technical Report, will be produced at the end of the mission.
2. The Mission Report which will be presented in draft form on the conclusion of the Mission at a debriefing at RNE if such a meeting is required by RNE.

**Additional comments -**

None

*Signature*

Team Leader / Co Team Leader

CDSP-II

*Date*

## **ANNEX 2      MISSION DIARY**

### December 7 (Tuesday)

Departure from the Netherlands (A'dam > Bangkok > Dhaka) with Egger Topper, a Social Forestry Specialist. Overnight in airplane.

### December 8 (Wednesday)

Arrival in Dhaka. Briefing with Team Leader (Stewart Pearson) in project office. Overnight in Civic Hotel.

### December 9 (Thursday)

Meeting with Team Leader in project office in Dhaka. Travel to Nouakhali with Forestry Specialist.

### December 10 (Friday)

Nouakhali, project guest house. Report set-up. Discussions with Forestry Specialist.

### December 11 (Saturday)

Nouakhali, project guest house. Arrival of Team Leader. Nouakhali, project office. Meeting with Co-Team Leader (Mr. Sekendar), Team Leader, counterpart Mr. M.A. Latif and others. Lunch with State Secretary for Water. Report writing.

### December 12 (Sunday)

Boyer Char field visit: by boat from Steamer Ghat over the Hatiya River around the southern corner of Boyer Char to the coast close to Tunkir Bazar. Walk to Tunkir Bazar. 'Focus Group' meeting with population and NGO. Walk to Hatiya Bazar, rickshaw to Hatiya River and crossing to Steamer Ghat. Visit to CDSP office in Char Majid and back to Nouakhali. Visit in guest house from Mr. Harvey, fishery project Danida, and discussions on importance of *chars* for fish.

### December 13 (Monday)

General CDSP meeting. Visit to Danida fishery project office. Report writing.

### December 14 (Tuesday)

Report writing in CDSP office in Nouakhali.

### December 15 (Wednesday)

Report writing in CDSP office in Nouakhali.

### December 16 (Thursday)

Report writing in the CDSP guesthouse in Nouakhali.

### December 17 (Friday)

Report writing in the CDSP guesthouse in Nouakhali. Travel from Nouakhali to Dhaka in the afternoon. Report writing in the Dutch Club guesthouse in Dhaka.

### December 18 (Saturday)

CDSP office Dhaka. Visit DoE regarding EIA procedures and guidelines. Report writing at CDSP office.

December 19 (Sunday)

Report writing, printing and review (hotel, CDSP office Dhaka). Visit ICZM in the afternoon. Submission of report.

December 20 (Monday)

Debriefing at RNE. Return to Holland via Bangkok.

