Government of the People's Republic of Bangladesh
Ministry of Communications
Roads and Highways Department

ENVIRONMENTAL MANAGEMENT IN THE ROADS AND HIGHWAYS DEPARTMENT

VOLUME 1 - ENVIRONMENTAL GUIDELINES

AUGUST 2004

FOREWORD

The Land Transport Policy of the Government of Bangladesh (GoB) identified the crucial role that an efficient and safe transport system will play in the future development of Bangladesh, in reducing poverty, encouraging industry, commerce and agriculture and improving the people's overall quality of life. However, the Government is aware of the potential adverse environmental consequences of road construction and recognizes the need to develop roads and highways in a sustainable manner. It is, therefore, the policy of the GoB that environmental considerations are given higher priority in the planning, design and implementation of all road and bridge projects. The Roads and Highways Department (RHD), as the key organization in the development of the nation's strategic road communications, have a key role to play in implementing this policy and in setting and ensuring high environmental standards in the national and regional road sector.

Roads and Highways Department (RHD) is very conscious of the importance of environmental issues as they relate to its activities and the need to strengthen its capacity to handle these effectively. RHD has, therefore, developed these Environmental Guidelines with support from the DFID-funded CIDC-3 project. This document (Volume 1) is the first of two companion volumes that provide a broad picture of *what* procedures should be followed for environmental assessment and management. Volume 2: Environmental Manual will give details of *how* to implement the Guidelines. This document provides straightforward guidance as to how the highest possible environmental standards can be achieved in all RHD road and bridge projects. The Guidelines focus specifically on the activities and requirements of RHD and do not necessarily represent sector guidelines. In addition, they set a framework for the development of associated social guidance documents such as social and resettlement action plans.

In course of time, this document will need updating and amendment, incorporating the experience of RHD staff. Indeed, updating should be a regular process to ensure that the lessons learned from past experience in Bangladesh and elsewhere are used to benefit the environment during preparation and execution of road and bridge projects.

The urgent need now is to setup an effective system to ensure compliance by all project departments with these guidelines and to make sure that the concerned field level staffs of RHD are trained accordingly.

I wish to thank all involved in the preparation of this important document. Supervision provided by Mr. Abed Uddin Ahmed, ACE, Mr Muzammel Haque, SE, Social & Environment Circle; Mr. Md. Saidul Hoque, EE Environment Division; Mr. Nigel Rabbetts, Team Leader, High-Point Rendel. Written and verbal suggestions were provided by the Department of Environment; Mr. Peregrine Swann, Senior Infrastructure and Livelihoods Adviser, DFID-B; Mr. Bill Hodgkinson, former Programme Director, CIDC-3, WSP*imc*; Mr. Jelle van Gijn, Programme Director, CIDC-3, WSP*imc*. Special thanks to the consultants, Mr. Steve Crawhurst, and Dr. Syed M. Latif.

21/8/04

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ENVIRONMENTAL GUIDELINES FOR THE ROADS AND HIGHWAYS DEPARTMENT

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GLOSSARY OF ENVIRONMENTAL TERMS

Cumulative Impact. An environmental impact that results from actions that are added to others of the past, present, and the foreseeable future, caused by road construction or related activities or natural events that are either repeated or occur in combination.

Direct or Indirect Impacts. Most physical and hydrological impacts are direct; ecological and social impacts are often indirect or secondary in nature.

Duration of Impacts. Impacts are classified as permanent or temporary, and long or short term. Short term impacts are those lasting one or two seasons, while long term impacts would last for most of the project's life.

Environment. Environment is the totality of the natural and human surroundings and includes biophysical components of the natural environment of land, water, air, inorganic and organic matter both living and dead; and socio-economic components of the human environment including social, economic, administrative, cultural, historical, archaeological, land and associated resources, structures, sites, human health, nutrition and safety.

Environmental Conservation Act (ECA). Environmental Conservation Act of 1995 consists of Laws enacted for conservation, improvement of quality standard and control and mitigation of pollution of the environment. According to the Environmental Conservation Act (ECA), the DoE is the agency responsible for enforcing environmental legislation.

Environmental Conservation Rules (ECR). The Environmental Conservation Rules of 1997 give the criteria for grading different types of proposed developments by likely severity of impact and the steps required for granting of Environmental Clearance Certificates. Different types of proposed developments are classified into Green, Amber and Red Categories in increasing order of the likely severity of the impacts.

Environmental Planning. Planning activities with the objective of preserving or enhancing environmental value.

Environmental Impact. Environmental impact is a change in the state or functioning of an environmental resource or component caused by the actions of a project or intervention. It should be distinguished from the impact to resources or components caused by natural factors, e.g. floods, cyclones.

Environmental Impact Assessment (EIA). Environmental Impact Assessment is the systematic study, assessment and reporting of the impacts of a proposed programme, plan or project, including a plan for dealing with negative impacts.

Environmental Management Plan (EMP). An Environmental Management Plan is a programme or plan to undertake an array of follow-up activities to provide for the mitigation of adverse

environmental impacts and enhancement of beneficial effects. It is also sometimes called an Environmental Protection Plan.

Environmental Management System (EMS). An Environmental Management System is designed to provide a structured and systematic approach to overall environmental management. It covers policy, procedures, stakeholders, responsibilities and audit mechanisms.

Encroachment. Encroachment is occupation, temporarily or permanently, of Government land by private individuals. It includes erection of buildings or other structures and the intrusion of balconies, porches or other projections. It also includes occupation of Government land beyond the prescribed period.

Environmental Standards (ES). An environmental standard is defined here as an environmental threshold value establishing maximum or minimum limits for the criteria by which key parameters are measured.

Erosion. Removal of soil particles by the movement of water.

Environmental Auditing (EA). Environmental Auditing is a systematic, documented and verifiable process designed to ascertain whether the EMS helps the organisation to meet the required standards of environmental performance, fulfil its legal obligations and achieve what it claims to be achieving.

Habitat. Division of the environment having a certain combination of physical (drainage, soil type, slope) and biological factors necessary for sustained animal, plant or human use and survival.

Important Environmental Components (IECs). Important Environmental Components are components which, by virtue of their importance to ecosystem functioning, production of food or maintenance of livelihoods and quality of life, are considered essential and worthy of sustaining at existing or enhanced levels under the proposed new project regime.

Initial Environmental Examination (IEE). Environmental assessment undertaken for a regional or pre-feasibility level study for identifying and assessing possible environmental impacts.

Mitigation. Mitigation is any action taken to reduce unacceptable negative impacts. It includes both design changes to the project and operational strategies (i.e. compensation).

Residual Impacts. Residual impacts are those impacts that remain after application of mitigation measures and that cannot be overcome.

Reversible Impact. An environmental impact that recovers either through natural process or with human assistance.

Stakeholders. Stakeholders are all persons and groups having a justifiable concern and interest in the project and its impacts. Stakeholders include local people of different professions, representatives of the Government, overseas donor agencies and NGOs.

Scoping. Scoping is a process whereby the Important Environmental Components, project development issues and concerns of local communities are determined.

Sustainable Development. Development that ensures preservation and enhancement of environmental quality and resource abundance to meet the needs of the present without compromising the ability of future generations to meet their own needs. (Adapted from the Brundtland Commission, 1987).

Sediments. Unconsolidated materials derived mostly from pre-existing rock through erosion, weathering, etc.

Topography. A detailed description or representation of the features, both natural and artificial, of an area.

LIST OF ABBREVIATIONS

ADB	Asian Development Bank
BBS	Bangladesh Bureau of Statistics
BWDB	Bangladesh Water Development Board
CARE	Cooperative American Relief Everywhere
CEGIS	Centre for Environment and Geographic Information System
DoE	Department of Environment
DFID	Department For International Development
DCC	Dhaka City Corporation
EA	Environmental Assessment
ECA	Environmental Conservation Act
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EU	European Union
EMS	Environmental Management System
FD	Forest Department
GoB	Government of Bangladesh
GAM	Goals Achievement Matrices
GAD	Gender and Development
IEE	Initial Environmental Examination
IEC	Important Environmental Component
IUCN	International Union for Conservation of Nature
JBIC	Japan Bank for International Cooperation
JICA	Japanese International Cooperation Agency
LGED	Local Government Engineering Department

NEMAP	National Environmental Management Action Plan
NGO	Non-Government Organisation
NCS	National Conservation Strategy
NOC	No-Objection Certificate
PAP	Project Affected People
$PM_{2.5}$, PM_{10}	Particulate size fractions
RAP	Resettlement Action Plan
RHD	Roads and Highways Department
SEA	Strategic Environmental Assessment
S&PWD	Settlement and Public Works Department
SPARRSO	Space Research and Remote Sensing Organisation
SEMP	Sustainable Environment Management Programme
SMP	Social Management Plan
SLA	Sustainable Livelihoods Approach
UNESCO	United Nations Education, Scientific and Cultural Organization
WB	World Bank

1. INTRODUCTION

1.1 The Purpose of These Guidelines

This document is the first of two companion volumes that provide advice on environmental assessment and management and outline the procedural steps that should be followed by RHD in carrying out its activities in an environmentally sound and sustainable manner. Volume 1 : Environmental Guidelines (this volume) provides a broad picture of **what** procedures should be followed. Volume 2 : Environmental Manual will follow this document and will give details of **how** to implement the Guidelines.

The Guidelines are focused specifically upon the activities and requirements of RHD and are not intended to be sector guidelines. However, the guidance has been developed in close consultation with other government departments, notably the Department of the Environment (DoE) and the major development agencies, including The World Bank (WB), the Asian Development Bank (ADB), and the UK Department for International Development (DFID). It is considered that the Guidelines are compatible with the requirements of these organisations for environmental assessment and management.

In developing these Guidelines, careful note has been taken of the existing guidance and handbooks that have been prepared by other organisations concerned with the roads sector in Bangladesh, notably the guidelines prepared by the Local Government Engineering Department (LGED) and CARE Bangladesh and the draft guidelines prepared as part of the Sustainable Environment Management Programme (SEMP) project. A list of useful references, including other relevant guidance documents, is given in Appendix A.

It is intended that the Guidelines should be consistent, as far as is practically possible, with the policies and procedures of other organisations working in the roads sector, and in other parallel sectors. Such organisations include the Bangladesh Water Development Board (BWDB), Dhaka City Corporation (DCC), International Union for the Conservation of Nature (IUCN), the Centre for Environmental and Geographic Information System (CEGIS), the Settlement and Public Works Department (S&PWD) and the Forest Department (FD).

1.2 The Scope of These Guidelines

The Guidelines set out the procedures that should be followed by RHD for sound environmental assessment and management and will provide the framework for best practice. They cover all RHD activities, from policy development to day to day maintenance and, in addition to the development and maintenance of roads and bridges, the guidance also includes RHD depots and ferry ghats.

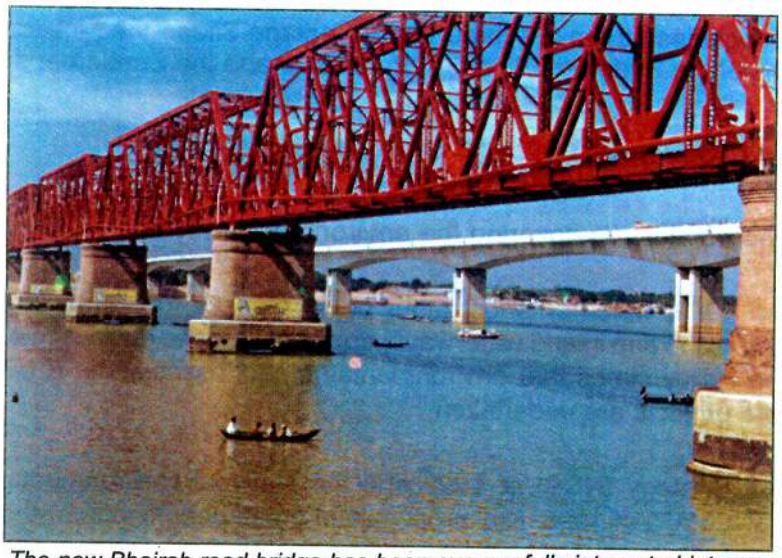
Environmental assessment should deal with impacts upon humans as well as impacts on the natural environment. One of the key potential impacts on humans of road building and related RHD activities is involuntary resettlement. Procedures for land acquisition, compensation and resettlement are particularly complex and are primarily the responsibilities of the Ministry of Land operating through the Deputy Commissioners. However it is intended that RHD will prepare its own guidelines to meet the specific conditions in the roads sector and to cover current practice on resettlement on major transport projects such as the Jamuna Bridge.

1.3 How to Use These Guidelines

This document has been designed to help RHD implement sound environmental management and assessment procedures. It seeks to do this by setting out straightforward advice in four broad areas which are covered in Chapters 2 - 8. In the first instance it is suggested that the chapters are read in sequence as follows:

- the principal **environmental legislation** relevant to RHD operations - Chapter 2
- adopting **good environmental practice** in RHD design - Chapter 3
- the **environmental assessment** process - Chapters 4 to 7
- **environmental management** of day to day activities - Chapter 8.

Additional information is included in appendices. Technical terms used in the environmental field can be very confusing and it is recommended that readers familiarise themselves with the **Glossary of Environmental Terms** given at the front of this document before reading the main sections of the document.



The new Bhairab road-bridge has been successfully integrated into an existing urban environment.

2. ENVIRONMENTAL LEGISLATION AND INSTITUTIONAL PROCEDURES

2.1 International Obligations

Bangladesh is a signatory to a number of international conventions of environmental importance, including:

- Agenda 21 of the Rio Convention that commits the country to carrying out environmentally sound and sustainable development. Under Principle 17 of the Rio Convention all significant new developments are to be subjected to an environmental impact assessment. The basis of such assessments is that no person is to be worse off as a result of the project and all negative impacts have to be mitigated with provision of equivalent replacement livelihoods.

- The Convention on Biodiversity, providing a commitment to protect biodiversity through funding and management.

- The 1972 World Heritage Convention of the United Nations Education, Scientific, and Cultural Organization (UNESCO), which seeks to protect sites of international cultural and natural heritage. In Bangladesh there are three World Heritage Sites - the Mosque City of Bagerhat, the Ruins of the Buddhists Vihara of Paharapur and the Sundarbans.

2.2 National Environmental Legislation

Key national policy regulations and documents covering the environment are:

- The Environment Policy of 1992, which amongst other policies seeks to ensure that transport systems, including roads and inland waterways, do not pollute the environment or degrade resources. The Policy states that environmental impact assessment (EIA) should be conducted before projects are undertaken.

- The National Conservation Strategy (NCS) of 1992 and the National Environmental Management Action Plan (NEMAP) of 1995. Key proposals of these documents for the roads and highways sector recommend that highways provision should be planned with public participation, that new roads should include adequate facilities for fish passes and waterway transport and that the existing road network design should be reviewed to improve floodwater drainage.

- The Environmental Conservation Act of 1995 empowered the Department of Environment (DoE) to enforce environmental legislation and establish the necessary rules and regulations to achieve this. DoE determines the required level of environmental assessment based upon a number of categories, namely Green, Amber A, Amber B and Red. The degree or level of environmental investigations increase from the Green Category (project description only) through to the Red Category (comprehensive environmental assessment). The construction, reconstruction, and

extension of regional, national and international roads and the construction, reconstruction and extension of bridges over 100m length fall within the Red Category. Feeder roads, local streets and bridge construction and reconstruction less than 100m in length are covered by Category Amber B. The differing documentation requirements for each category of assessment are discussed later in Chapter 4.

- The regulations for environmental management and assessment are the Environmental Conservation Rules of 1997. Although designed for industrial development they are applied to all sectors, including the activities of RHD.

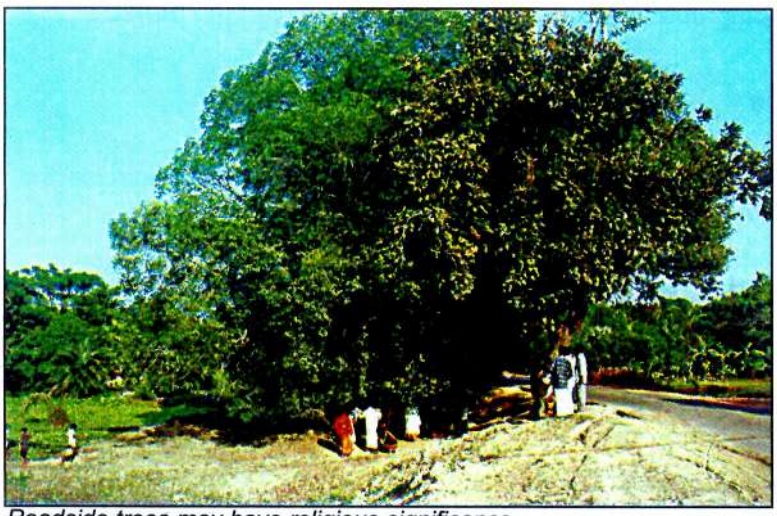
- Ecologically Critical Areas (ECAs) are sites located throughout the country where the ecosystem has been degraded to a critical extent. They comprise Wildlife Sanctuaries, Game Reserves, Reserved Forests and Natural Reserved Forests and are protected through a series of environmental regulations. The Forest Department is responsible for the protection of these gazetted sensitive areas.

- The Urban Open-fields, Garden and Natural Water-bodies Protection Act 2000 is intended to preserve areas of open space from encroachment or conversion to other uses.

2.3 Donor Requirements

Overseas donor agencies such as WB , ADB, European Union, DFID, JBIC, JICA and CARE have their own guidelines for environmental assessment. These organisations all follow broadly similar procedures and approaches towards carrying out environmental assessment, although there are often minor differences in detailed requirements. In Bangladesh, projects generally follow the procedures set out by the concerned donor or lending agency. For locally funded projects, the DoE procedures, which broadly follow international practice, are usually applied.

These Environmental Guidelines for RHD have been prepared to maintain consistency with the international guidelines and the DoE procedures but have been especially tuned to meet the specific activities of the Department and the environmental conditions particular to Bangladesh.



Roadside trees may have religious significance.

2.4 RHD and the Environment

The National Land Transport Policy of 2004 sets out the strategic policy framework for the activities of RHD. It identifies the need for Bangladesh to develop a sustainable environment and acknowledges the environmental disadvantages of road development. The Government has resolved to give environmental considerations a higher priority and in this regard the draft policy states that:

- all new roads and major improvements will be subjected to an Environmental Impact Assessment.
- funding will be provided for mitigation measures.
- the Government will publish environmental standards for new roads and new design standards addressing environmental issues.

RHD is very conscious of the importance of environmental issues as they relate to its activities. In particular it seeks to ensure that it maintains the highest possible environmental standards, in addition to its commitment to provide fair, effective and consistent resettlement and to minimize the adverse social impacts of all RHD works and projects.

A draft statement setting out departmental environmental goals and objectives is given below.

2.5 Draft Statement of RHD Environmental Goals and Objectives

RHD will seek to minimize the impact of its activities on the environment, including those activities of its consultants, contractors and agents. The Department's specific environmental goals and objectives are:

To Protect Air Quality

- Minimize air pollution, including dust, from all RHD activities and planned projects.

To Reduce Noise Pollution

- Reduce noise emanating from vehicles and plant operated by RHD and minimise the potential effects of noise from new roads and traffic.

To Protect Water and Land Resources

- Avoid water sedimentation and minimize the pollution of surface water from road run-off, maintenance and construction activities, site camps and depots.
- Protect river banks from erosion, especially at ferry ghats.

- Avoid impeding the free flow of surface waters and make all bridges and culverts 'fish friendly' by allowing the free movement and migration of all aquatic species.

To Improve Socio-Economic Conditions

- Improve access for all to local markets, jobs, and social and community facilities.

- Encourage the involvement of local people, especially women and disadvantaged groups, in the construction and maintenance of all road projects. Ensure that work conditions for those employed directly or indirectly by RHD are in accordance with national labour regulations and international obligations.

- Avoid disrupting businesses and agricultural, fishing and social activities, including minimizing delays to traffic during road maintenance and construction.

- Minimize the need to resettle people in any road building or widening activities by avoiding existing housing areas and homesteads, industries and businesses.

To Protect Wildlife, Landscape and Cultural Heritage Resources

- Avoid impacting upon ecological resources, especially notified and proposed national parks, game reserves and wildlife sanctuaries and endangered and threatened species.

- Minimize the impacts of new construction upon the landscape and townscape, especially taking care to avoid the loss or damage to trees or buildings of architectural or historic importance.

- Protect areas and places of cultural heritage.

To Conserve Natural Resources

- Avoid the waste of material and energy, and recycle materials, including road scrapings materials, wood, metal, oil, paper and other products.

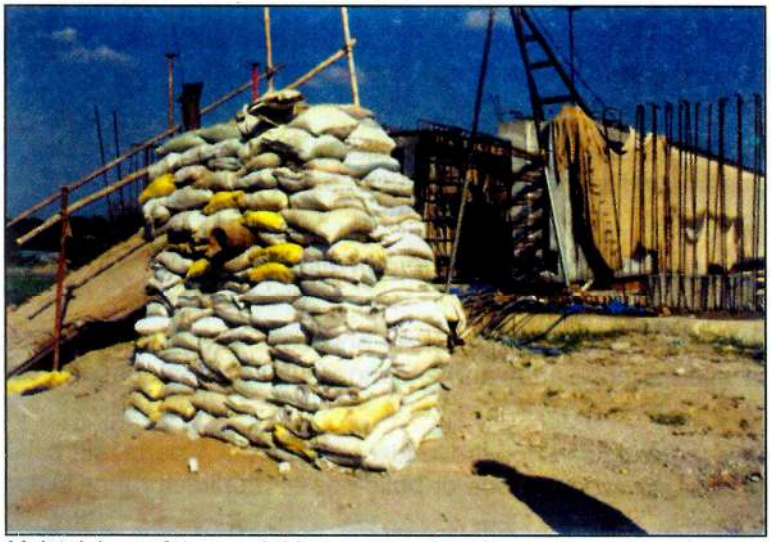
- Minimize land acquisition when planning and constructing new roads, especially land in productive use for agriculture, fishing, or forestry.

To Protect Human Health

- Reduce dangers from accidents for all road users, especially pedestrians, through the design of safe roads, bridges and ferry ghats.

- Dispose of all waste materials in a safe and hygienic manner.

- Ensure that adequate drinking water is available for all employees and contractor's staff.
- Ensure that sewage and waste disposal facilities are provided for employees and contractor's staff and that they are sited an adequate distance away from sources of human and animal water supplies.
- Control pests in all temporary and permanent sites, including those of contractors.
- Ensure that RHD workers and their contractors are educated regarding health care, including issues such as sexually transmitted diseases.



Maintaining safety on a bridge construction site.

3. GOOD ENVIRONMENTAL PRACTICE IN RHD

3.1 Principles of Environmental Management

A wide range of RHD activities has potential to cause environmental harm but much can be done to avoid or significantly reduce adverse impacts through good **Environmental Management.**[1]

> **Environmental Management:**
>
> "Organizing and controlling all activities so as to minimize their impact on the environment as far as is possible"

The concept of Environmental Management recognises that human actions damage the environment but seeks mechanisms to manage or control these negative impacts within acceptable or sustainable limits. There is a range of mechanisms or techniques used to manage environmental impacts and these can be used as appropriate to cover all of the activities of RHD.

The approach that is taken to minimize adverse impacts is called ***Mitigation*** and the way this is done is through the application of ***Mitigation Measures***. There are a number of ways in which mitigation measures can reduce the negative impact of a project. These range from fundamental design or route changes, through to compensation of affected persons.

In all instances there is a preferred order or hierarchy for addressing the potentially negative impacts, as follows:

First	→	Avoid or Prevent
If avoidance is impossible	→	Minimize and/or Alleviate
Lastly also consider	→	Enhancement

Avoidance or Prevention

This is by far the best environmental option, since it is technically and financially the most effective response.

Typical project mitigation measures that can help to avoid or prevent environmental problems arising in the first place are to cancel all or part of the project or to find an alternative solution to the problem, for example to move the route of the road to a location where it will not have a significant environmental impact. Changes in project design and construction method or materials can also be very effective, for example, changing a bridge design to a single span so as to avoid

[1]The term **'Environmental Management'** is used throughout this document in its broadest sense, that is, the organization or control of activities so as to minimise their impact on the environment. The phrase is also commonly used to refer to that part of an Environment Impact Assessment that deals with the implementation phase of a project, as proposed in an Environmental Management Plan (EMP). A full glossary of environmental terms is given at the beginning of this document.

obstructing a river, or avoiding vibration damage to property by using bored piles instead of precast driven piles.

For day to day operations, a typical avoidance mitigation measure would be to store toxic materials in sealed containers so as to avoid water and air pollution.

Minimization

This is the second most favoured environmental option, and involves reducing any negative impacts by engineering or other practical actions.

Such mitigation measures would include the planting of new roadside trees to replace those lost in the road works and the provision of road safety barriers and pedestrian refuges to help minimize the risks of accidents.

Alleviation

Where it is not possible to avoid or minimize environmental impacts it will be necessary to put in place alternative alleviation measures. A frequently used alleviation measure in the road and bridge construction sector is the cash compensation paid to those who lose their farmland or homesteads to make way for the new highway works.

Enhancement

In some instances it is possible to introduce additional measures into a project that will provide added benefits or improve existing conditions. These benefits may not be a direct concern of the project but would help offset other disbenefits.

An enhancement measure added to a rehabilitated road passing through a large village could be the introduction of a pedestrian refuge in the middle of the road in order to help people cross the street more safely.

3.2 Environmental Impacts and Mitigation of Roads and Highways Activities

3.2.1 Overview

This section gives a very brief overview of the types of impacts that can arise from RHD activities, including a general indication as to the seriousness or significance of potential impacts. It also discusses the possible mitigation measures that can be put in place to help mitigate any negative impacts. A summary checklist of potential impacts and mitigation measures is given at the end of the Chapter.

When considering the interaction between engineering operations and activities and the environment, it is common practice to consider impacts occurring in three different phases or stages as follows:

- Planning and Design (also referred to as the Pre-Construction Phase)
- Construction
- Operation & Maintenance (also referred to as Day to Day Operations).

However it is important to point out that the division of RHD activities into these separate categories is rather misleading, since it can be easily argued that nearly all impacts should be anticipated at the Planning and Design Phase and that good environmental practice at this stage will prevent many impacts arising at a later date. Indeed it is arguable that **more environmental damage is caused by poor planning and design than during the actual construction works or day to day operations.**

As a general principle, therefore, it is important to **undertake planning and design work in an environmentally sensitive manner** so as to prevent or reduce negative impacts happening during the later phases of the project. This will also be **the most cost effective way of mitigating adverse impacts.**

The activities in each of these phases can affect the environment both adversely and positively, although naturally the emphasis of most environmental management is on minimizing the negative impacts. Attention is drawn particularly to those impacts that are potentially the most significant or serious. A discussion on the scaling and evaluation of impacts is given in Chapters 5 and 6, Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA).

Mitigation measures are only discussed here in outline and more detailed recommendations will be included in Volume 2 : Environmental Manual. Nevertheless it is important to note that the mitigation measures proposed here are given in order of priority, that is in the preferred sequence of consideration, in each case.

3.2.2 Planning and Design

Choice of Road Alignment, Bridge or Ferry Ghat Location

Issue 1 : Impacts upon Environmentally Sensitive Areas

The routing of a new road, or the widening of an existing road or bridge in an environmentally sensitive area such as a wildlife sanctuary, game reserve, protected wetland, forest or area of cultural heritage importance has the potential to cause **major adverse impacts.**

Mitigation Measures: Roads, bridges and ghats should not be located in or close to sites or areas of conservation importance. In environmentally sensitive areas, only complete avoidance is a viable mitigation option. No other method of mitigation is considered adequate or reliable enough to prevent unacceptable adverse environmental impacts from occurring.

Issue 2 : Uncertainty Regarding Land Acquisition

Reconnaissance surveys and visits by RHD or their consultants may give rise to local worries about land acquisition.

Mitigation Measures: Uncertainty can be overcome to a certain degree by providing as much information to local people as possible with regard to a project that might affect them, especially about land acquisition and compensation procedures. Establishing points of contact for local people will be a major priority, as will setting in motion the resettlement activities at an early date. However it is inevitable that some degree of uncertainty will remain because progress to construction is dependent upon many factors, including many outside the control of RHD.

Issue 3 : Land Speculation

Once the possibility of a project has become known in an area, there may be a flurry of construction activities with the intention of obtaining compensation. This was particularly evident in the case of the Jamuna Bridge, where a sizable new settlement grew up on the line of the eastern approach road even before construction work had started. This speculation often has the potential to cause an adverse impact.

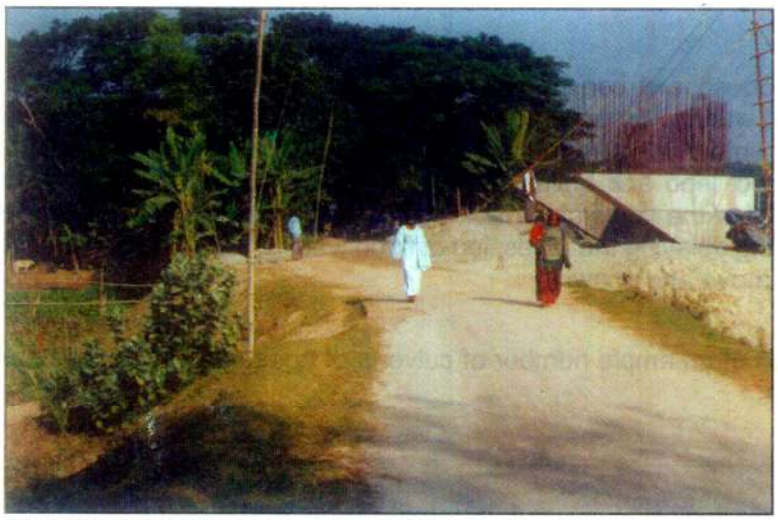
Mitigation Measures: There are many techniques for reducing the potential for land speculation, amongst the most effective being the accurate recording of the pre-project situation without prior notification, for example by video camera in the presence of the DC's representative, elected local representatives and RHD.

Road Design

Issue 4 : Severance

The alignments of new roads and bridges often cut across existing roads and paths, divide farmland from homesteads and villages and sever links between facilities such as schools and the community. Severance can cause **major adverse impacts.**

Mitigation Measures: Particular care is needed in the design of a road or bridge to ensure that existing vehicular and pedestrian links are noted and that they are kept open or are accommodated in some way in the new project. For example, where new bridge approach roads sever existing cross routes, underpasses should be provided to permit existing movements to continue. Where there is no change in level, junctions should be designed to allow the safe crossing of the new road.



Care should be taken not to sever existing roads.

Issue 5 : Road Safety

The incidence of traffic accidents in Bangladesh is extremely high, causing substantial numbers of injuries and loss of life and considerable losses to the national and local economies. New and improved roads can greatly increase vehicle movements and speeds and thus further increase the potential for road accidents, leading to **major adverse impacts.**

Mitigation Measures: RHD has established a road safety division and this division should be asked to audit all new road projects and to give advice on detailed engineering mitigation measures to ensure, for example, safe highway alignments, road cross-sections and junction layouts.

The design of the recently completed Hatikumrul - Bonpara road in Rajshahi Division includes separate carriageways for motorized and non-motorized traffic. The effectiveness of this measure in reducing accidents will need to be monitored, but, if it is successful, it will represent an important road safety measure.

Separate rickshaw lanes can aid road safety and reduce traffic delays.

Issue 6 : Hydrology

Virtually all new roads in Bangladesh are constructed on raised embankments in order to maintain the highway above flood waters. Embankments are also commonly widened by RHD when roads are improved. Other authorities and farmers have also built extensive systems of bunds and dykes in order to protect land and buildings from floodwaters. This proliferation of embankments has profoundly affected the flows of surface waters in the country, with a number of **major adverse impacts**, including delaying the recession of flood waters, water logging of land and impeding the ability of fish to move and spawn.

Mitigation Measures: The provision of an ample number of culverts of adequate dimensions can help the free movement of water.

Culverts should be adequately sized to cater for flood water flows.

Issue 7 : River Navigation

Transport by boat is still an important form of communication in Bangladesh, particularly in rural areas. The building of new road embankments can impede the movement of boats, particularly if bridges are not built high enough to allow the passage of boats in conditions of high water. This can have a **major adverse impact** on river traffic in the wet season.

Mitigation Measures: Where waterways are commonly used for transport, bridge heights should be raised to allow local boats to pass underneath even during the monsoon season.

Acquisition of Land and Property

Issue 8 : Land Acquisition

Mitigation Measures: Road alignments and designs should seek to keep the acquisition of land, especially agricultural land, to the absolute minimum. The opportunity should always be taken to utilize low grade or less productive land in preference to taking good farmland, although it is

acknowledged that this is often not feasible. Nevertheless it may occasionally be possible to re-use previously despoiled land such as borrow areas, for at least part of a route. (The issue of acquiring land for borrow purposes is discussed later.)

The building of a new road or the widening or improvement of an existing road will inevitably lead to the loss of land, whether directly through acquisition for right of way or base camps, or indirectly through land requirements for borrow and brick production. The loss of any productive land in Bangladesh is a major constraint to achieving sustainable development, whether it is in agricultural use, a homestead or industrial or commercial premises. Agricultural land is the most commonly affected and since farming is the lifeblood of the country, the loss of productive agricultural land can have a **major adverse impact.**

Borrow pits can take large areas of land.

Where highly productive land is taken, adequate compensation needs to be paid to ensure that those affected are able to buy equivalent to that which they have lost. The compensation payment should be based on present market values, but care must be taken to ensure that PAP are able to maintain their present status or higher following the project.

People who lose their land or businesses should be allowed to salvage any crops, trees, building materials or assets from the affected land and the value of these products should not be deducted from any compensation payments.

Arrangements for resettlement will need to be put in place for those not entitled to adequate compensation.

Resettlement should be started, and if possible completed, before construction work commences. Compensation payments should be paid promptly and, if possible, before the start of construction.

Losses incurred by businesses through disruption, and earnings lost by employees on account of the project, should also be adequately compensated.

Much of the land acquired for contractors' camps and stockpiles can be returned to other uses on completion of the project. In such cases, restoration of the sites so that they can be re-used should be made part of the project contract conditions.

3.2.3 Construction

All Construction Works

Issue 9 : Employment Opportunities

Construction, rehabilitation and maintenance of roads, bridges and ferry ghats are labour intensive activities and generate considerable employment, both directly on site and in contractors camps, yards and brickfields, and indirectly in the provision of local services such as tea stalls. This employment, even when temporary, is valuable, particularly in remote, rural areas, where such work can have **major beneficial impacts** on the local economy.

Mitigation Measures: As a beneficial effect, the only significant mitigation required is to ensure that jobs are given on an equitable basis and particularly targeted at women and vulnerable groups such as people whose livelihood has been adversely affected by the project.

Turf laying provides temporary employment.

Site Clearance

Issue 10 : Loss of Roadside Trees

Most road embankments in Bangladesh are well planted with trees, which provide a well shaded environment for people, a very attractive landscape feature, a habitat for wildlife, and a source of fruit and, eventually, timber. Road construction and reconstruction often result in the extensive loss of trees, which can have a **major adverse impact** locally.

Mitigation Measures: It is GoB policy that all trees lost in road works are replaced by new planting. This will eventually mitigate the loss, although it will take many years for new planting to match the quality and beneficial effects that mature trees bring to the environment.

Current practice is for timber from cut trees to be auctioned by RHD. The sale of timber needs to be carried out quickly and efficiently, otherwise stored timber will deteriorate and valuable natural resources wasted.

Mature roadside trees.

Establishment of Contractors' Camps and Material Stockpiles

Issue 11 : Waste Disposal

A variety of waste materials will be generated during construction works and will need to be disposed of in a safe and environmentally sound manner, otherwise adverse impacts, ranging from the pollution of air, watercourses and groundwater to land contamination, will occur.

Mitigation Measures: Good site management can prevent negative impacts happening. The preferred measures in all instances will be the recycling of materials, especially oil, grease, hydraulic fluids, metals and plastics. Where materials cannot be re-cycled, inert wastes should be buried and covered with soil and toxic wastes disposed of in an officially authorised site.

Septic tanks should be properly constructed to deal with sewage effluents.

Sourcing and Manufacturing Construction Materials

Issue 12 : Earthworks Materials

Embankments are constructed from either borrow material or dredged sand from local rivers. Use of either source of materials can have both positive and negative impacts.

Use of borrow can lead to a significant loss of farmland and homesteads, reducing both the local and national stock of land. The resulting borrow pits can also become breeding grounds for nuisance plants such as water hyacinth, which often spread onto adjoining farmland. Furthermore, access to borrow material is often restricted in the monsoon because of high water levels, thus causing project delays.

However borrow pits can become valuable fish ponds if they are managed properly, for example maintaining access to all, especially the poor, preference should be given to the PAP community where possible. The ponds also act as water reservoirs for irrigation purposes in the dry season and as bathing and washing places.

The benefits of dredging for fill material are that dredging can be carried out all year long and can often be delivered by pipeline directly to the place of use, thus reducing the negative impacts from truck movements. However dredging may cause problems of river sedimentation, which can cause short term negative effects upon aquatic life and adversely effect fish resources.

Mitigation Measures: It is normal to leave the decision as to the sourcing of borrow to the contractor. There is no clear 'best' environmental solution to the sourcing of borrow, and any decision will need to be based upon local circumstances.

The benefits of borrow pits can be maximised by establishing proper access and use, in close consultation with local people. Topsoil taken from borrow pits should not be used as fill material because of its high organic content but should be stored for later re-use as the final planting medium on the embankment slopes.

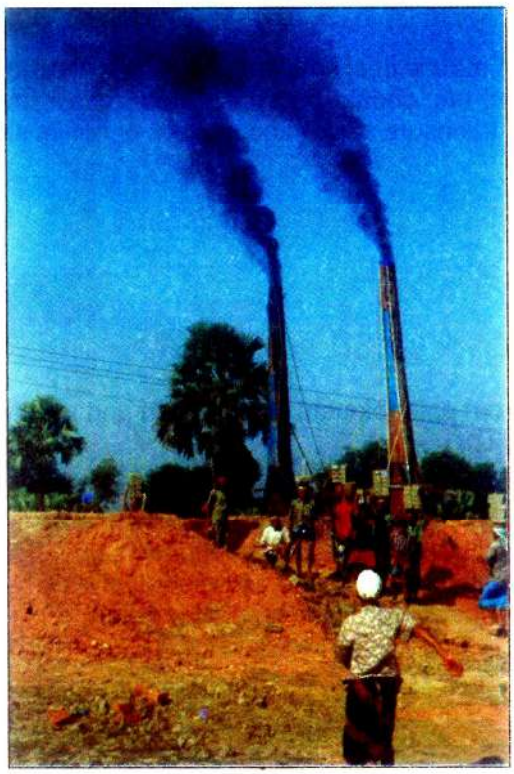
Where dredged fill is the preferred material, in particularly sensitive riverine areas, consideration could be given to reducing sedimentation from dredging by the provision of screens.

Cutter-suction dredger.

Issue 13 : Brickworks

The shortage of aggregates in Bangladesh means that bricks are used extensively in road construction works, and thus their manufacture is an indirect impact of any road project. There are a number of negative environmental effects associated with brick manufacturing, including the loss of land for the excavation of clay, the sourcing of fuel, air pollution and the use of child labour.

Mitigation Measures: The environmental assessment of any road project will need to consider the requirements for bricks and stipulate in the EMP (see Chapter 7) adequate mitigation measures to ensure good environmental practices in the production of bricks to be used on the project. This is a specialist area and, if necessary, advice should be sought from the DoE on this issue.



Road construction often requires large quantities of bricks.

Issue 14 : Air Pollution from Hot Mix Plants

Pollution can arise from tarmac plants, depending upon the fuel and equipment used. Large-scale works are likely to have better equipment and generate less pollution than smaller scale operations. Fortunately the negative impacts on air quality are usually of short duration only.

Mitigation Measures: Stipulation of type of fuel and plant can help reduce air pollution to an acceptable level. Locating plant well away from settlements and houses will also help reduce any health impacts.

Issue 15 : Transport of Construction Materials

The haulage of construction materials can cause considerable dust on unsurfaced roads, and cause a short-term decrease in local air quality, affecting humans, wildlife and plants.

Mitigation Measures: Regular watering of haul roads can reduce dust creation to a certain degree. Selected construction materials, such as sand, cement, etc. should be transported in covered vans. Appropriate mitigation measures should be taken to ensure safety and prevent or minimise environmental pollution.

Construction of Embankments and Cuttings

Issue 16 : Erosion and Sedimentation

Siltation and sedimentation of watercourses can arise from embankment construction and in hilly areas the creation of road cuttings can lead to soil erosion.

Mitigation Measures: There are a number of mitigation measures that can prevent erosion occurring, including reducing the slope of the cutting, installing drains and planting the slope. For planting to take hold, the angles of slopes need to be reduced in any case. However it should be noted that slope reduction has a cost penalty, since it requires increased land acquisition.

Construction of Bridges and Culverts

Issue 17 : Diversion Works

Considerable delays to traffic can occur if diversion works are not properly planned, implemented, signed and managed.

Mitigation Measures: The project EMP will need to specify all aspects of road diversion works in order that they can be incorporated into contract documents.

Temporary diversion works.

3.2.4 Operation and Maintenance

Traffic Movement

Issue 18 : Improved Communications and Trade Opportunities

The major benefit of any new road or bridge in Bangladesh is the greater integration of the country, thus improving social and economic development from the national to local level. This can be clearly demonstrated in major projects such as the Jamuna Bridge that linked the western and eastern parts of the country and gave a substantial boost to the economy of the North-West of the country.

Mitigation Measures: All opportunities need to be taken to maximise the socio-economic benefits of road and bridge construction, especially if dredging operations associated with major projects have resulted in the creation of surplus areas of flood free land. Where appropriate, these areas should be utilized for the establishment of new towns and settlements in association with industrial and commercial areas.

Issue 19 : Air Pollution

Motorized traffic generates a wide range of air pollutants, the most significant from a human health point of view being various oxides of nitrogen (NO_X), hydrocarbons (HC), carbon monoxide (CO), lead compounds and carbon (soot). Particulates (PM) are emitted by all engines, particularly diesel engines. There are major health concerns throughout the world with regard to the very fine particulates, notably $PM_{2.5}$ and PM_{10}.

All the main pollutants from vehicle exhausts disperse widely into the atmosphere and their concentrations reduce rapidly with distance from the road. However in Bangladesh road vehicles, especially trucks and buses, are often very old and poorly maintained so producing far more pollutants than necessary. This has implications for health in densely populated locations where people live and work close to the road.

Mitigation Measures: The best approach to the reduction of air pollution impacts is through legislation and strict enforcement of higher standards for vehicle emissions.

Issue 20 : Traffic Noise

Noise pollution is becoming an increasingly serious problem, adversely affecting human health, the quality of life and wildlife. Traffic noise emanates from many sources, including engines and tyres but the most significant cause in Bangladesh is the excessive use of horns.

Mitigation Measures: Where possible, new roads should be routed away from inhabited areas. This is not always feasible, so that near sensitive sites, such as schools and hospitals, consideration should be given to the erection of sound barriers, as have recently been installed along a section of the Bhairab Bridge approach road near the secondary school in Bhairab.

Issue 21 : Road Repair and Maintenance

Impacts from road repair and maintenance are generally fairly minor and include very localised and short term air pollution from tar boilers and delays to traffic because of diversion works.

Mitigation Measures: Good environmental practices can reduce these impacts to a minimum. These practices are usually set out in an Environmental Management System (EMS).

Issue 22 : Maintenance of Roadside Planting

The maintenance of new roadside planting provides employment opportunities for local people.

Mitigation Measures: Roadside maintenance work should be given to the most vulnerable, including women, in line with current practice.

Newly planted trees require maintenance.

Issue 23 : Operation of RHD Depots

Environmental concerns likely to arise in the day to day operation of RHD depots are very similar to those discussed with regard to contractors' camps and yards (see Issue 11), for example the safe disposal of solid and liquid waste materials, such as oil, grease, hydraulic fluids, metals, plastics and sewage, and the potential pollution of land, watercourses and groundwater.

Mitigation Measures: Good site management can prevent negative impacts occurring. The most important mitigation measures being the recycling of materials, or their safe disposal where they cannot be re-cycled. Septic tanks should be properly constructed to deal with sewage effluents.

Road pavement construction.

SUMMARY CHECKLIST OF RHD ACTIVITIES, POTENTIAL IMPACTS AND MITIGATION MEASURES

RHD Activity	Potential Significant Environmental Impacts	Range of Mitigation Measures Available
PLANNING AND DESIGN (PRE-CONSTRUCTION PHASE)		
Route Selection	o Impacts on sensitive areas o Induced uncertainties relating to land acquisition o Land speculation in order to obtain compensation	o Avoid areas altogether o Full public consultation and information on project & compensation arrangements o Video route, noting land uses & businesses in order to record existing situation
Road Design	o Severance o Road Safety o Hydrology o River Navigation	o Keep all existing roads (rural or urban) open by crossings or underpasses / overbridges o Provide safe crossing points (carry out Road Safety Audit) o Separate motorized & non-motorized traffic o Adequate number of culverts & bridges o Increase height of bridges over waterways
Land & Property Acquisition	o Loss of farmland o Loss of homestead o Loss or displacement of business	o Change route or location of project o Resettlement and/or compensation o Cash compensation or alternative land or property
Selection and Sourcing of Materials	o Forest clearance & erosion of cleared land o Loss of farmland	o Specification of sustainable sources of materials
CONSTRUCTION PHASE		
All Construction Works	o Employment Opportunities	o Priority given to local people, particularly those adversely affected by the project
Site clearance for contractors' camps rights of way, etc.	o Loss of vegetation, including trees	o Salvage existing crops and top soil o Plant embankments with trees o Auction timber quickly & efficiently to avoid losses and deterioration
Establishment of contractors' camps rights of way, etc.	o Waste disposal	o Recycle materials, including oil, grease, hydraulic fluids o Construct septic tanks
Sourcing & Manufacturing of Construction Materials	o Creation of borrow pits for earthworks materials causing loss of farmland/homesteads & displacement of businesses o Dredging for fill leading to river sedimentation & fish loss o Air pollution, sourcing of fuel & labour issues in brickworks o Air pollution from hot mix plants o Transport of construction materials leading to dust on haul roads	o Maximize potential for fish production in borrow pits o Keep borrow pits clear of water hyacinth o Fit sediment screens in very sensitive riverine environments o Strictly enforce existing legislation regarding brickworks operations o Control type, fuel, & maintenance of plant & locate away from existing settlements o Dampen roads regularly & clear spillages
Construction of Embankments & Cuttings	o Erosion of slopes o Siltation of watercourses	o Plant slopes with trees o Provide adequate drainage o Reduce slopes
Construction of Bridges/Culverts & Diversion Works	o Traffic congestion	o Provide diversion route with adequate road width and surface

RHD Activity	Potential Significant Environmental Impacts	Range of Mitigation Measures Available
OPERATIONS & MAINTENANCE PHASE		
Traffic Movement	o Improved communications & trade opportunities o Air pollution Increase in traffic noise o Increase in traffic noise	o Major benefit to be maximized by planned new development, especially at major bridge sites o DoE to introduce and enforce standards for road vehicles o Provide noise barriers at sensitive locations (e.g. hospitals, schools)
Maintenance Works - Roadside Planting	o Upkeep of roadside planting, providing income opportunities, improved landscape and habitats	o Major project benefits to vulnerable groups. especially the poor & women
Maintenance & Operation of Depots	o Disposal of wastes o Sanitation	o Recycle materials, including oil, grease, hydraulic fluids o Construct septic tanks

Source: Adapted and developed from the Draft Sectoral Guidelines for Environmental Management : Road Construction, Improvement, Rehabilitation and Maintenance (SEMP, 2002) and the Guidelines on Environmental Planning Issues related to Physical Planning (LGED 1999).

Trees help protect embankments from erosion.

4. ENVIRONMENTAL ASSESSMENT OF RHD PROJECTS

4.1 What is Assessed - Environmental Components

The term environment covers all the human and natural conditions or resources within which people, communities, plants, animals, organism exist or operate. The environment is a single, interrelated whole, of great complexity and variety, where an impact upon one resource will also have knock-on effects on other resources.

Although the environment is an interrelated system, when carrying out environmental assessment, it is general practice to consider the environment on the basis of a number of separate components as shown below:

Environmental Components

The human environment:

- **Socio-economic resources** - such as agriculture, settlements, employment
- **Cultural heritage** - such as archaeology, buildings and sites of historic or religious importance
- **Health and safety**
- **Landscape and townscape**

The natural environment:

- **Ecological resources -** such as wildlife, plants and forests
- **Physico-chemical resources** - the quality and attributes of air, water, and soil.

4.2 The Environmental Assessment Process

Environmental Assessment or Environmental Appraisal (see glossary) are broad terms that describe the systematic process of evaluating the potential environmental impact of projects. The objective of the environmental assessment process is to ensure full consideration of the likely environmental consequences of the proposed project, so that decisions can be made with a knowledge of possible future environmental consequences.

The Purpose of Environmental Assessment

The fundamental objective of an Environmental Assessment (EA) is to ensure that full consideration is given to the potential environmental effects of a project, including the views of those who may be affected by it, before any irrevocable decisions are taken.

EA involves the collection of information about the existing state of the environment, evaluation of the potential impact of the proposed project and recommendations as to ways in which any adverse impacts can be minimized. It is thus an important tool in the overall project decision-making process. The relationship between the project cycle and RHD environmental actions is shown in Figure 4.1.

This section describes the EA process from project identification or definition through to the approval process, and includes references to the related studies and activities that are part of the wider process. It includes description of the two most well known activities or techniques - a summary level assessment called Initial Environmental Examination (IEE) and a more detailed assessment called Environmental Impact Assessment (EIA).

Bridge under construction near Bhanga.

4.3 Screening – Determining the Level of Environmental Assessment

Screening is the process of determining whether a project requires Environmental Assessment (EA), and if it does, whether it should be an IEE or full EIA. The practice in Bangladesh, and in WB and ADB projects, is to screen projects through pre-determined criteria.

The primary activities of RHD are the planning, design, construction, extension, reconstruction, operation and maintenance of roads, bridges and ferry ghats. The procedures that need to be followed for environmental assessment of these works, as determined by the DoE, are shown in Figure 4.2. Activities fall into two broad categories as follows:

Amber B Category:

- Road construction / reconstruction / extension (feeder road, local street)
- Bridge construction / reconstruction / extension (less than 100m length).

Red Category:

- Road construction / reconstruction / extension (regional, national and international)
- Bridge construction / reconstruction / extension (over 100m length).

The differing needs for documentation for environmental management and assessment are clearly stated for each category of proposed development. The documents include:

- Initial Environmental Examination (IEE)
- Environmental Impact Assessment (EIA)
- Environmental Management Plan (EMP)
- Social Management Plan (SMP)
- Resettlement Action Plan (RAP)
- No-Objection Certificate (NOC).

For Amber B Category an IEE is normally adequate, together with an EMP in outline form. If land acquisition will cause involuntary resettlement, then a Resettlement Action Plan (RAP) may be required. A No-Objection Certificate is required from the local government.

For Red Category a full EIA is required, coupled with a more comprehensive EMP than was necessary for the shorter IEE. The EMP can be part of the EIA or, more normally, a self-standing document. If the social impacts are significant then a separate Social Management Plan is sometimes produced. If there is land acquisition (highly likely) that causes involuntary resettlement, then a Resettlement Action Plan will be required. A No-Objection Certificate is required from the local government.

The DoE broad categorization is a useful starting point for the screening process, but it is recommended that additional checks are made to ensure that the project is receiving the appropriate level of assessment. This is because environmental impacts arise not as a direct result of the classification or type of the road (e.g rural feeder road or national highway) but the nature of the work and the sensitivity of the area in which the road, bridge or ferry ghat is, or would be, situated. For example, building a new bridge of less than 100m in length in an ecologically critical area only requires an IEE according to the DoE criteria since it is an Amber B project, but such a project may have far greater environmental impacts than the reconstruction of a national highway on an existing embankment, which theoretically requires a full EIA because it is classified as a Red Category project. The danger of applying rigid categories is, therefore, that assessment levels are either too cursory, thus overlooking important issues, or too detailed, and consequently wasteful of resources. Judgement should therefore be applied as to which level of assessment to apply. The following basic principles should be followed by RHD:

- Start environmental screening as early as possible in the project development process, so that decision makers and senior management can be alerted to any potential environmental concerns early in the design process.

- Do not restrict project screening only to the RHD personnel - informal consultation with local people, local government officials, other government departments, and environmental groups may be helpful in arriving at the right level of EA.

- If there is any doubt, the advice of the DoE should be sought.

Some organisations (for example DFID, see Appendix A: References and Websites) have developed screening checklists to determine the level of EA rather that apply a strict system of project categorisation. The use of similar checklists by RHD and their consultants is suggested as a way of ensuring that projects are assigned into the appropriate assessment category. The following is a very simple checklist that should be completed by engineers with some training in environmental assessment.

The Environmental Sensitivity of the Project Location

Is the road, bridge or ferry ghat located in, close to or does it cross :

- an Ecologically Critical Area?
- an important wildlife habitat or breeding area?
- a World Heritage Site?
- a hilly area prone to earth slips and erosion?
- an important fish migration route?
- a waterway used by country boats?
- a beel, haor or other wetland?
- a water recharge area?
- a previously undeveloped area, such as hill forest or mangrove?
- habitats occupied by indigenous peoples?
- a densely populated urban area?
- a major industrial or commercial area?

- ***The Nature and Magnitude of the Works Proposed***

What is the scale and type of the work proposed? Will it involve the following works:

- new embankments that might restrict the flow of floodwaters?
- cutting a large number of trees?
- creating extensive areas of new borrow pits?
- land acquisition, especially of farmland or homestead land?
- blocking a navigable waterway or ghat?
- bringing road traffic closer to existing houses and community facilities?

Potential Significant Impacts

Having considered the environmental sensitivity of the project location and the size and type of engineering works, the next task is to bring these factors together to arrive at a preliminary judgement as to whether the environmental impacts are likely to be significant. The following questions can be asked:

- Will the project negatively (or positively) affect a large area of environmental sensitivity?
- Will the project affect a large area of productive land, whether it is farmland, homestead land or forest?
- Will many people or businesses be directly or indirectly affected?
- Are mitigation measures likely to be able to reduce or remove any negative impacts?
- Could there be potentially adverse indirect effects of the project?
- Even if the project on its own might have no major impact, could it add to an existing problem in the area (i.e. a cumulative impact)?

It is important to note that screening is not a detailed appraisal and only needs to be carried out to a sufficient level of detail to determine the most appropriate category of EA. There will almost certainly be many doubts as to likely impacts, since at this stage of the process, very little analysis or data is available. This can be addressed in two ways:

- Where there is considerable doubt or uncertainty, a cautious approach would be to assume a higher category of assessment.
- The EA process itself contains many internal checks. Even if a lower category assessment is assigned to a project at screening, e.g Amber B, if the IEE appraisal reveals potentially more serious adverse environmental impacts than originally anticipated, then the project can be re-categorized as a Red Category project, and a full EIA carried out.

Ferry ghats generate significant local employment.

4.4 Public Consultation and Participation in Environmental Assessment

Public consultation and participation is an important element in the environmental assessment process for two reasons. Firstly it improves the **quality** of the assessment, by providing better knowledge of local conditions and potential effects, not necessarily apparent to professionals from outside the area. This local information can help engineers avoid costly mistakes and design a better project, including mitigation measures. Secondly, participation will better **inform** the public on the aims and objectives of the project and help make it more acceptable. This will be particularly important where local people and businesses will lose land or the businesses and where the cooperation of the local population is required by RHD in drawing up a social action plan and in any subsequent resettlement.

The process of public consultation and involvement of stakeholders in environmental assessment should be conducted using a specific format, questionnaire or checklist. Details are provided in the Environmental Manual, Volume 2.

Consultation should involve a wide a range of people or organizations with an interest or stake in the project (stakeholders). Some or all of the following should be consulted:

- local residents, including indigenous communities
- local people's representatives
- thana and locally based government officials
- community organizations and unions
- NGOs
- representatives of vulnerable groups, for example women's societies
- local businesses and business associations
- local educational institutes
- local media.

Stakeholders can be involved in the environmental assessment process at any time, although there are two stages when it is particularly productive and helpful:

- At the outset of the project, when **scoping** the EIA. Local people and organisations can aid engineers and environmental specialists in identifying important environmental concerns.

- At the EIA **review** stage, when it is important to check that all likely impacts have been recognized and considered, and, wherever possible, adequate mitigation measures identified.

Earthworks construction.

4.5 Commissioning an Environmental Team

Carrying out an EA is a skilled task for which specialist training or experience is required. Basic training should be extended to include those responsible for the overall direction of the EA, in order that they have a thorough understanding of the purposes and role of EA in the planning process, the methods to be used in EA, and the role of the EMP.

An EA team can be fairly small, and it is not uncommon for the IEE of a small project to be completed by single, well-qualified and experienced specialist. Generally, a full EIA is led by a single individual who will coordinate the work of a number of specialists. Most of these specialists will have a relatively short input into the project. An environmental team looking at a major new road project might, however, have a large range of specialists, depending upon the nature of the local environment and the expected important environmental issues. Some of the skills that might be required in an EA team include:

- Highway or Bridge Engineering
- Drainage Engineering and Hydrology
- Remote sensing Specialist
- Ecology
- Agriculture, Forestry and Fisheries
- Air Quality Sciences
- Acoustics (Noise)
- Urban and Regional Planning
- Cultural Heritage
- Sociology
- Economics.

Two important points need to be made with regard to team composition and organization. Firstly, not withstanding the need to have adequate expertise in key areas, care will need to be taken not to create too large an assessment team. For example, air quality scientists with experience of the roads sector are rare in Bangladesh, and specialist equipment and laboratory facilities in short supply. Engaging a specialist air quality scientist should, therefore, only be considered where air pollution is expected to be a particularly important issue. Where the issue is not considered critical, it is becoming increasingly possible to find general environmental consultants who specialise in EA work, including the roads and highways sector. These consultants generally have broad training in all aspects of EA and are able to cover the work of a number of experts to a level adequate for the preparation of an EA.

A second important consideration is that environmental impact studies are conducted in an interdisciplinary, rather than a multi-disciplinary manner. The advantages of an interdisciplinary team are that the team members will be trained in different fields, with different concepts and methods and will be able to address common problems in a more collaborative and integrated manner through a process of continuous dialogue and communication between themselves.

Figure 4.1 The Project Cycle and RHD Environmental Actions

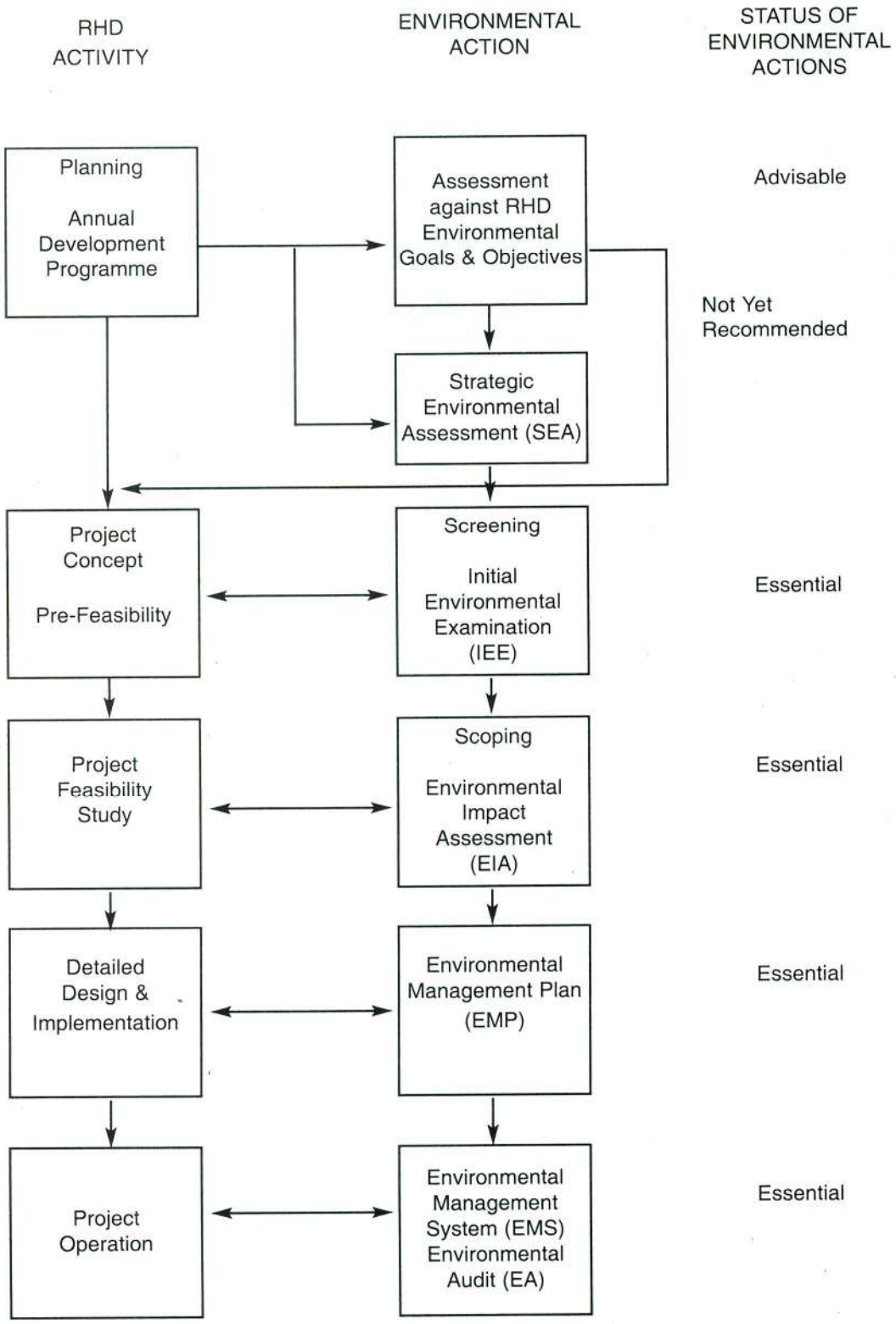
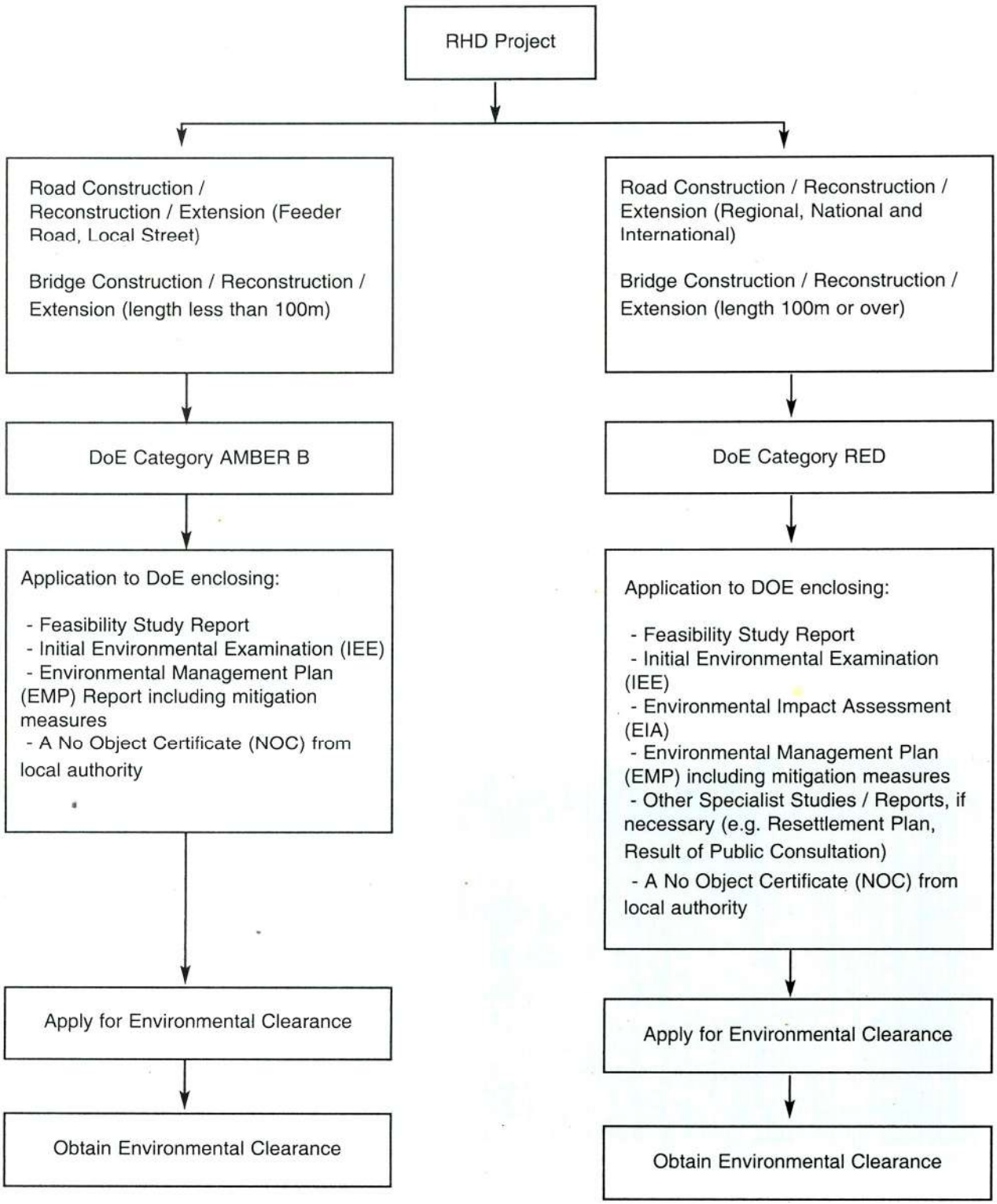


Figure 4.2 Obtaining Environmental Clearance - A Summary



Source: Based upon EIA Guidelines for Industries, DoE, Ministry of Environment & Forest, Government of the People's Republic of Bangladesh, June 1997.

5. INITIAL ENVIRONMENTAL EXAMINATION (IEE)

An Initial Environmental Examination (IEE) is the most basic form of EA and is intended to be used where environmental impacts are expected to be of a minor nature, or as the first stage in the preparation of an EIA. It is intend to be a fairly quick process, using existing available data sources wherever possible. If the IEE confirms that there are unlikely to be any significant environmental impacts, then a full EIA is not required and the IEE will form the definitive environmental assessment for submission to the DoE.

There are a number of slight variations in the methods that different bodies advocate in preparing an IEE. The five basic steps proposed here for undertaking an IEE are similar to those recommended by the DoE but with a slight change in sequence to reflect the specific procedures and requirements of RHD. This change in order does not affect the review process of the DoE.

It is important to note that to conform to DoE procedures, an IEE will need to be accompanied by an EMP. The EMP is also a key feature of the EIA process and guidance on this is given later in Chapter 7.

5.1 Defining the Project Location and Extent

The boundaries of the project need to be defined at the outset in order to help determine the area for which data should be gathered. For roads projects, this is usually defined as the road corridor. The road corridor should be drawn on an adequately scaled map, large enough to show all important elements of the project, such as culverts and bridges and new road junctions. The road corridor should be drawn sufficiently wide to ensure that all potential direct impacts can be covered. However occasionally indirect impacts, such as those associated with sourcing of embankment material, may extend beyond the road corridor and in such cases the project may have more than one project area boundary. The boundary of the project area can be extended at a later date should this be necessary, but it is clearly preferable to get it right first time around.

Road construction generates considerable indirect employment.

5.2 Data Collection and Site Visit

Specially commissioned surveys are unlikely to be required for an IEE, and the collection of data from existing 'secondary' sources should normally be adequate. Environmental data could be obtained from a wide range of sources, notably the review of previous reports and studies, published statistical information such as that available from the DoE and the Bangladesh Bureau of Statistics (BBS), ordnance survey maps, time series image data from SPARRSO, and any maps showing drainage, embankment and irrigation projects and ECAs, Forest Reserves and buildings or sites of cultural heritage and tourist importance.

It is essential that one or more reconnaissance field visits are carried out to verify that the desk study information is still accurate or is up to date. Much may have changed since the previous information was gathered. The survey visit may also uncover information not previously known. Local people and organization are often an excellent source of this additional information.

5.3 Identification of Impacts

There are a number of approaches to identifying potential environmental impacts at IEE level but the least complicated and most commonly used are checklists and matrices. They suffer from the inherent fault that they can be very subjective in terms of both whether an impact will occur and what its likely impact might be. Against this acknowledged disadvantage, checklists and matrices are fairly straightforward, relatively quick to complete and can easily be checked by independent observers to ascertain their validity.

Checklists

A checklist appraises the project as a whole against all of the existing environmental resources (also commonly called environmental parameters) in the study area, e.g. the road corridor. The evaluation is based upon a simple prediction of the effect that the project will have on each environmental resource, using a simple scale. That proposed by the ADB and DoE is as follows:

- No Impact
- Significant Impact (positive and negative)
- Insignificant Impact (positive and negative)
- Unknown Impact
- Mitigated Impact.

This impact scale has the advantage that it is simple, since it only distinguishes between significant and non-significant impacts, thus making the task of reviewers and decision makers more straightforward. The other useful feature is the reference to mitigated impacts, although at IEE level there is often a lack of certainty as to the implementation, and therefore the effectiveness of mitigation measures.

Not all environmental resources will be considered of equal importance, and some checklists have been developed to provide weighting to certain parameters. For example, the local community may consider the generation of employment to be of more importance than the appearance of the landscape. In such a case, a weighting would be applied to give a higher value to any impact upon the local economy than to its impact on the landscape.

It is important to point out, however, that weighting resources is a particularly subjective matter (in an already very subjective approach) so that if not done carefully, it can lead to distortions in the evaluation and, therefore, in the overall conclusions of the IEE.

Matrices

Matrices are slightly more complex than checklists and they usually link individual project activities in vertical columns with environmental resources or important environmental concerns in rows. This allows the impact of individual project activities, such as embankment construction or the sourcing of fill material, to be separately identified, and thus helps to identify potential mitigation measures.

Identification of Potential Mitigation Measures

Mitigation measures are specific remedial steps adopted to minimise adverse impacts. The principles of environmental mitigation have already been outlined in Chapter 3.

At the pre-feasibility stage, only a broad indication can be given as to likely mitigation measures, since at this point in the project, firm project design details have yet to be worked up. Nevertheless the range, type, scale and likely effect of measures that could reduce environmental impacts needs to be highlighted in the IEE.

The important factors to be borne in mind when assessing which mitigation to specify or assume at the IEE stage are:

- How realistic is the proposed mitigation? For example, is an alternative route feasible from an engineering or financial perspective?
- Would funding be available for the measure proposed?
- How far would the proposed mitigation measure reduce the forecast negative impact?

Certainty with regard to the implementation of proposed mitigation measures is critical to the validity of the EA process, since in many cases a project will only be approved on the basis that proposed mitigation measures are actually carried out. If approval for the project is solely dependent upon the IEE, therefore, details of the proposed mitigation measures will need to be included in the project Environmental Management Plan (EMP) (see Chapter 7).

Consideration of Alternatives

In assessing schemes at the pre-feasibility stage, there should normally be consideration of alternative ways or means of addressing a problem. For example, when considering the case for a new road, the alternatives would be to not build the road, or to choose an alternative route for the project. For river crossings, the alternative solutions might be to improve the ferry operations or to choose an alternative location for the bridge crossing. Within a project, there could also be alternatives for particular project components which could have very different impacts upon the environment. For example, alternative designs for supports, or sourcing of fill materials from

either dredged fill from a river or from borrow pits at the roadside. All of these project design decisions will have implications for the environment and should be considered in the IEE. The choice of project option will need to be justified in the IEE, and later in the EIA if this should be required.

5.4 Preparation of IEE Report

The IEE report is required to summarize the findings of the assessment and to recommend whether a full EIA is likely to be required. A suggested contents list for an IEE is included in Appendix B. The key components of the IEE report are as follows:

- an Introduction, covering the purpose of the report, its scope and authors
- a (brief) Description of the Project
- a (brief) Description of the Proposed or Existing Road Corridor / Project Area
- an Evaluation of Potential Impacts and Mitigation Measures
- Environmental Management and Monitoring Proposals
- Findings and Conclusions.

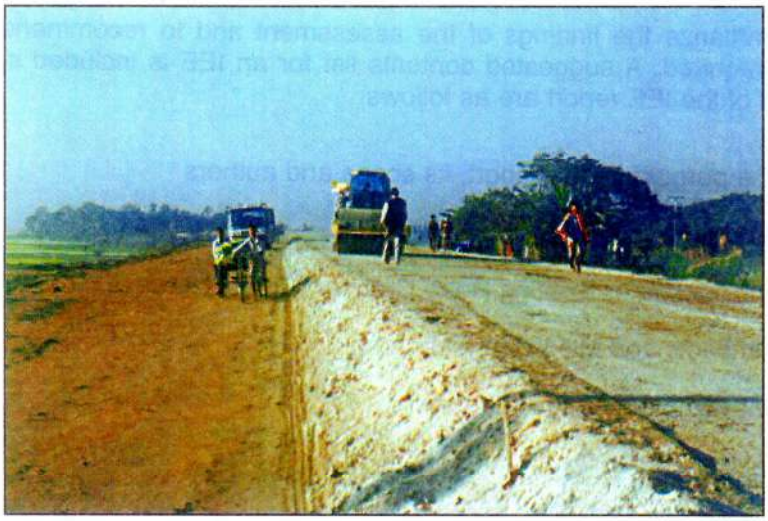
The Findings and Conclusions will need to recommend whether a full EIA should be prepared for the project and what other additional studies might be required. Although there are pre-determined project assessment categories, it is important that the IEE presents an accurate assessment of the likely impacts since this will greatly aid the decision making process, especially in cases where the correct level of assessment is not clear cut.

An IEE is likely to be adequate on its own when:

- The project is not located in or near an environmentally sensitive area.
- None of the negative impacts is likely to be significant, including those reduced by mitigation measures.
- There is no need to acquire additional land.

5.5 *Environmental Management Plan (EMP)*

An EMP will need to accompany the IEE. At this stage of the project it will be relatively general and will need to be gradually expanded and elaborated as project details are firmed up through project feasibility (EIA) and contract letting stages. A more comprehensive description of the EMP is given in Chapter 7.



Widening an existing road embankment.

6. ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

An EIA is a comprehensive evaluation of the likely negative and positive environmental effects of a project. It contains the same basic elements and follows the same general sequence of actions as the IEE but is a far more detailed and complex document. However there should also be a greater level of certainty about the EIA evaluation for the following reasons:

- It will be undertaken at the feasibility stage of the project, when the project details are more clearly defined; for example, there will be more certainty about project location, and construction methods and materials than was possible at pre-feasibility stage.
- More information can be gathered about the existing environmental conditions.
- A more comprehensive evaluation of impacts is possible because of the increased information available.
- There will be more certainty regarding the feasibility and affordability of mitigation measures.

The EIA will also be expected to deal with the management of the project in more detail and to provide the overall framework and links with other closely related documents, notably an expanded EMP, and Social and Resettlement Action Plans.

A summary diagram showing the main steps to be taken in carrying out an EIA is shown in Figure 6.1.

The need to carry out a full project EIA will have been determined at the project screening stage or following completion of the IEE. Where there is any doubt as to the need for an EIA, the advice of the DoE can be sought.

On occasions it may be possible to proceed to the preparation of an EIA without passing through the IEE stage, for example where it is clear that the more comprehensive EIA will certainly be required and the preparation of an IEE would bring no additional benefits.

Ferry ghat.

6.1 Scoping

Scoping is the process by which the extent and depth of the EIA is determined, and where particularly important environmental concerns are identified. The great value of scoping is that it provides two-way information, i.e. the project is explained to the public and the public provides information to the implementing authority. It is thus an integral part of sustainable development.

Scoping involves both desk research and consultation. Typical activities might include:

- Research into other EIAs prepared for similar projects and in the same area.
- A survey of other literature, such as relevant academic and scientific papers.
- Consultation with expert opinion, including the views of local government officials and staff of NGOs.
- Discussions with local communities and local representatives. Scoping is a particularly important and effective point at which to involve the public, since it will give them the opportunity to make a positive and highly valuable contribution to the project.

The scoping should reveal the **Important Environmental Components (IEC)** that will require particularly careful examination in the EIA on account of their potential criticality to the community or the natural or built environment.

6.2 Project Definition

This follows the same basic process as described for the IEE Step 1 but is carried out in much greater depth.

The boundaries for the assessment will need to be defined. (This is sometimes referred to as 'bounding'). With a highway or bridge project, it is usual to define a road corridor, which is calculated as a certain distance either side of the road. The corridor needs to be wide enough to ensure that most direct impacts are included within the corridor. It should therefore include all land directly affected by the project, adjoining forest and beel or hoar areas, nearby areas of cultural heritage importance and housing that might be affected by road noise. The corridor might need to be widened at road junctions to include any potential indirect impacts of traffic changes along these other roads. The examination of the effects on surface water drainage and boat navigation, and the sourcing of fill materials might sometimes require the study area boundaries to be widened to include these particular environmental issues.

Even if the road corridor has already been defined in the IEE, this may need to be reviewed if there have been any changes to the engineering design from the pre-feasibility concept stage.

6.3 Data Collection

An EIA will require far greater information about existing environmental conditions than an IEE. In addition to the collection of data from existing published sources, specially commissioned surveys may be required in areas where published data is scarce or non-existent. For example,

these might include surveys of local air quality and noise or, in Ecologically Critical Areas (ECAs) and Forest Reserves, surveys may be required if existing information is poor or out of date. For sensitive areas, review of existing time series data should be carried out.

It is important to be realistic about the need for additional surveys or field investigations. Such work can be costly; for example, air and noise surveys require specialist equipment and laboratory analysis. A rough guide as to the requirement for additional field surveys is whether the scoping exercises have identified that particular issue as an Important Environmental Component (IEC). If so, then additional data is almost certainly required; if not, then specialist studies may not be justified.

The EIA should certainly not be used as an excuse to gather academic data for purposes not directly connected to the RHD project.

The baseline information should concentrate on the following features:

- Project area characteristics (location, topographic features, major rivers, watersheds, foothills, infrastructure, etc.)
- Climatic conditions, i.e. temperature, rainfall, humidity, flooding, etc.
- Population characteristics and spatial distribution
- Land uses of the area including urban areas
- Socio-economic characteristics
- Natural resources including agriculture and fisheries
- Areas of nature conservation importance and important habitats for wildlife
- Buildings or sites of historical or cultural importance
- Air quality and noise data if available.

It is essential that one or more reconnaissance field visits be carried out to verify that the desk study information is still accurate or is up to date. Much may have changed since the previous information was gathered. The survey visit may also uncover information not previously known. Local people and organizations could be an excellent source of this additional information.

Rickshaw and pedestrian underpass, Bhairab.

6.4 Impact Prediction and Analysis

In the IEE report, potential impacts will have been broadly identified and generally subjective quantification of these impacts will have been made. For full EIA, there should be greater emphasis on a more accurate **quantification** of environmental effects and a fuller evaluation of their **significance**.

For many impacts, quantification of impact will be straightforward. For example the quantification of the number of households affected should be possible because, at the engineering feasibility stage, more precise information on, for example, route alignment and land take should be available.

For other impacts quantification can be far harder to predict. For example, the blocking of floodwaters by new embankment could have a large impact upon future fish catches but such impacts are extremely difficult to quantify, i.e. there will be a high degree of uncertainty. It is important to record where uncertainties exist in order that they are not overlooked in the evaluation process. Some of the most significant impacts of a road or bridge project can be those that are difficult to quantify, especially impacts upon fisheries and wildlife and socio-cultural impacts.

The actual methods used in impact prediction and impact analysis in EIA are similar to those used in IEE, although there should be increased opportunity in an EIA to discuss more complex interrelationships between project activities and impacts, between direct impacts and indirect impacts and also to take account of cumulative impacts.

Impact Significance Criteria

Evaluating the significance of an impact is a critical part of EIA. The significance of an impact will be assessed against a number of variables, the following being amongst the mostly commonly used:

Importance	the value or quality of the resource that is affected (e.g. is it a site of international ecological significance, such as the Sundarbans, or is it just of local importance?)
Magnitude	the degree of the impact (e.g. is the resource, for example a wetland, totally drained or only partly impacted?)
Extent	the proportion of area affected (e.g. is the whole road corridor impacted or only a very short stretch?)
Time	the duration and frequency of the impact (e.g. is the noise from piling likely to be of short or long duration and frequent or infrequent?)
Probability	the risk of impact (e.g. how likely or certain is the loss of fish resources as a result of the project?)
Reversibility	the ability of the resource to recover after disturbance (e.g. the likelihood of wildlife returning to the area once construction work is complete).

Scaling the Impact

At the IEE stage a simple impact scaling was recommended, i.e.:

- No Impact
- Significant Impact (positive and negative)
- Insignificant Impact (positive and negative)
- Unknown Impact
- Mitigated Impact.

As stated previously, this impact scale has the advantage that it is simple, since it only distinguishes between significant and non-significant impacts, thus making the task of reviewers and decision makers more straightforward.

At the EIA stage a more elaborate impact scale might be preferred so as to allow more differentiation between impacts. This is recommended in many environmental guidance manuals, including that adopted by LGED. The only problem with the more complex scale is that it is often difficult to make the more subtle and accurate predictions required unless those carrying out the EA have both access to a large amount of analytical data and considerable personal expertise and experience.

It is recommended that for evaluation purposes, the impact scale should broadly follow ADB and DoE practice, although it is suggested that it may be very helpful to decision makers to differentiate between moderately significant and highly significant impacts. The proposed RHD impact scales for EIA are as follows:

- No Impact
- A Small or Minor Negative Impact (Insignificant Impact)
- A Moderate Negative Impact (Moderately Significant)
- A Major or Severe Negative Impact (Highly Significant)

- A Small or Minor Positive Impact (Insignificant Impact)
- A Moderate Positive Impact (Moderately Significant)
- A Major Positive Impact (Highly Significant)
- Unknown Impact.

It is important to note that it is necessary for those carrying out an EIA to make an evaluation twice, once without mitigation measures, and again with mitigation taken into consideration. The scale above is applied both before and after mitigation.

Mitigation Measures

The broad principles of environmental mitigation have been discussed previously in Chapter 3. It is important that proposed mitigation measures are not only adequate to reduce adverse impacts to an acceptable level but that they are also implemented as intended.

At the feasibility stage, i.e. the EIA stage, it is necessary that mitigation measures are more precisely defined than was the case in the preparation of the IEE, where only a broad indication as to measures was possible. In an EIA, *the mitigation measures need to be sufficiently well-defined so as to allow the contractors bidding for the works to be able to include the cost of the measures in their fee bid.*

Examples of a Hierarchy of Mitigation Measures are:

Consider	***Mitigation Action***	***Typical Mitigation Measures***
First	Avoidance or Prevention	• Move route of road or location of bridge or ferry ghat • Change design • Change construction method • Change season of works
Second	Minimization	• Create temporary diversions • Plant roadside trees to replace those lost • Erect safety barriers
Third	Alleviation	• Compensate affected persons
Also	Enhancement	• Improve crossing facilities for pedestrians

Former borrow area.

6.5 Preparation of EIA Report

The EIA report, sometimes referred to as an Environmental Impact Statement (EIS), should focus its attention primarily upon the environmental impacts that are significant. Other impacts will need to be mentioned but only briefly. The number and significance of the environmental issues and mitigation measures will thus determine the length and depth of the document.

The contents list for an EIA is similar to that of an IEE but issues will obviously be covered in more detail. There are a number of good models for the layout of an EIA and there is no single standard. A model contents list for an EIA is given in Appendix B. The model used by the DoE is a shortened version of that used by the ADB and either is considered suitable for use by RHD. Some minor adjustments to the DoE model are recommended as a starting point to meet the specific requirements of RHD.

An EIA Report should include as a minimum :

Executive Summary, Conclusions and Recommendations

Introduction
Project Description
Alternatives Considered
Description of the Environment
Environmental Impacts and Mitigation Measures
Environmental Management Plan

6.6 Guidance on the Review of Environmental Assessment Reports

An environmental assessment report has a critical role to play in the decision making process, and it therefore needs to provide an accurate evaluation of likely impacts. It needs to be adequate in terms of both **quality** (accuracy, reliability and clarity of data, evaluation and conclusions) and **coverage** (comprehensiveness of all likely issues, impacts, and possible mitigation measures).

To obtain **Environmental Clearance**, application will need to be made by RHD to the DoE. This will be accompanied by the appropriate documents, including an IEE and/or EIA and an EMP (see Figure 4.2). The DoE has established procedures and criteria for carrying out the review of Environmental Assessment reports submitted to them. The DoE applies these criteria to determine whether clearance should be given and, if so, what conditions should be applied to any clearance certificate.

RHD should carry out its own review of an environmental study in the following circumstances:

- Where an environmental assessment has been undertaken by RHD itself, the report should be reviewed 'in house', preferably by other staff members. The review should be as objective as possible, and should concentrate upon evaluating the quality, accuracy and coverage of the assessment and the adequacy of mitigation measures proposed.

- In cases where the environmental assessment has been prepared by other parties on behalf of the RHD, for example by consultants, contractors or by donor agencies, RHD staff should review the draft IEE or EIA in order to satisfy themselves that the assessment is adequate. This should be done before submitting the documents to the DoE.

6.7 Who should carry out the Review ?

RHD staff with training and knowledge of environmental assessment methods and procedures should carry out the review of environmental reports in order to obtain necessary approval as per ECA and ECR. For specialised issues, an experienced and qualified person from outside the Department, such as a freelance consultant or academic, should be hired on a short-term consultancy basis to assist RHD in carrying out the review.

6.8 Environmental Review Criteria

The following table provides a summary of suggested review criteria for an assessment prepared by or on behalf of RHD.

CHECKLIST OF CRITERIA FOR ENVIRONMENTAL ASSESSMENT REVIEW

IEE/EIA Report Component	**Content, Coverage & Quality to be Checked**
Introduction	Is the need for the project (project objectives) clearly explained?
	Is the study methodology briefly outlined?
	Have discussions with other agencies, environmental groups and local populations been recorded? (Details of contacts and any discussions would normally be in an appendix.)
	Have the resources devoted to the project been stated and the time scale and period of the environmental study been specified?

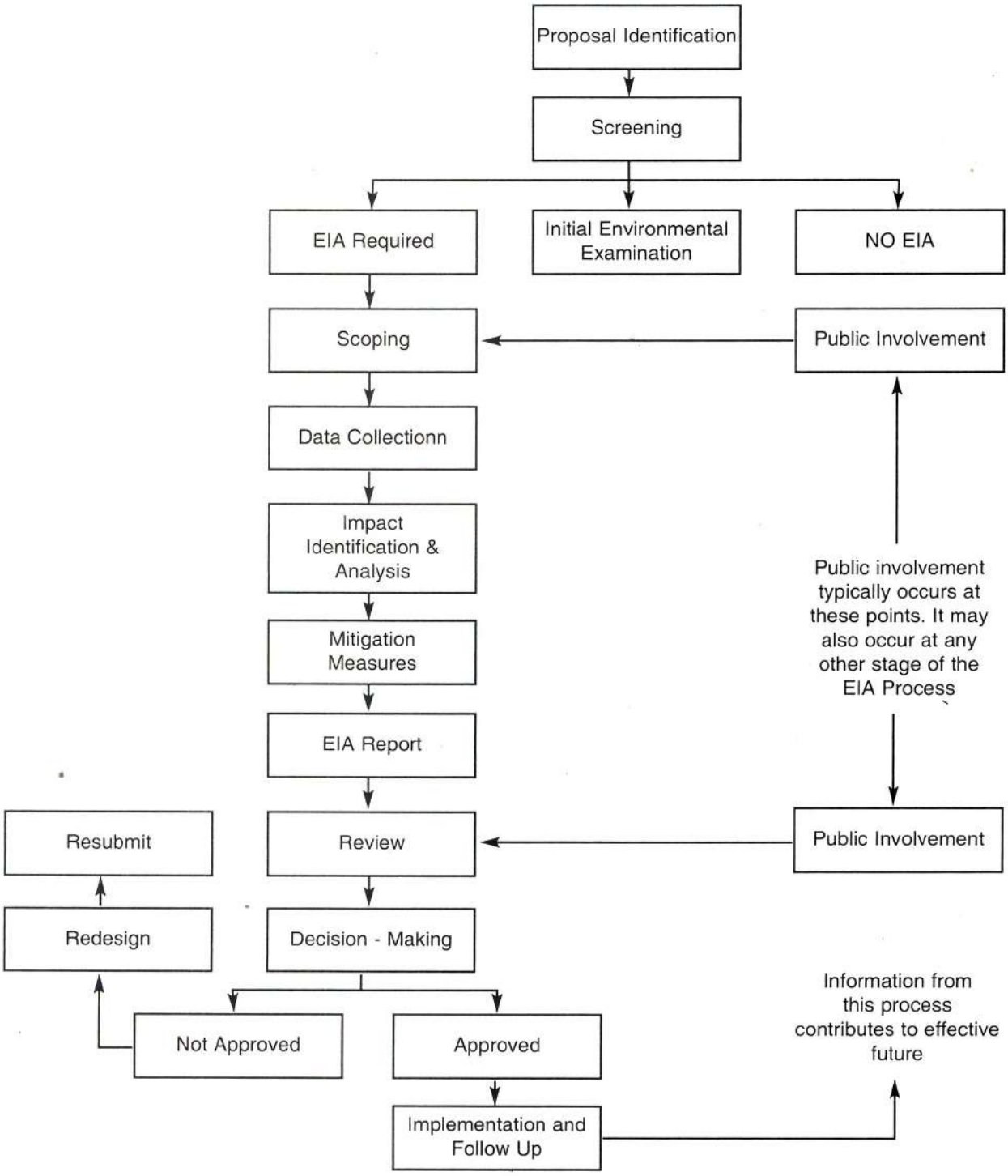
IEE/EIA Report Component	Content, Coverage & Quality to be Checked
Project Description	Is the project location clearly shown on a map, including the wider road corridor and specific locations of RHD work?
	Are the project components adequately described (e.g. the road location, length, right of way, number, type, length and location of bridges and culverts, engineering works proposed, methods and materials to be used, land acquisition requirements, etc)?
	Have the different project phases / stages been identified and the likely time and duration of the works specified?
Environmental Baseline Conditions	Are the road corridor and/or the areas covered by the environmental surveys clearly specified?
	Is the existing situation clearly established and any existing trends identified?
	Are seasonal differences (if any) noted?
	Are all environmental resources (human, ecological and physical) equally covered?
Environmental Impacts	Are all potential environmental impacts identified and evaluated? Have those issues considered to be significant been separately identified and evaluated?
	Are the identification and evaluation methods sound and in accordance with accepted practice?
	Are the spatial location and extent of impacts clearly defined, including use of maps where necessary?
	Have the links between different impacts been made and their interrelationships been described?
	Are impacts quantified and are the magnitudes of impacts described consistently across subjects?
	Are findings clearly shown and easily understood by a non-specialist? (e.g. Is the significance of air quality data explained in terms of human health and standards?)
	Do any of the project impacts have potential to add significantly to cumulative impacts in a wider area? (e.g. A number of minor new embankments can, when added together, lead to serious restriction in the free flow of water and river traffic.)
	Are proposed mitigation measures likely to address adequately the identified impacts? If not, have the residual impacts (i.e. original impacts as reduced by the mitigation measures) been clearly defined?

IEE/EIA Report Component	Content, Coverage & Quality to be Checked
Consideration of Alternative Schemes	Have alternative solutions to address the original project objectives been adequately explored?
	Are the reasons for the rejection of project alternatives clearly supported by evidence?
Conclusions and Recommendations	Do the report conclusions flow logically from the study findings and do they appear to be sound?
	Is the need for further environmental studies identified, and are the conclusions of the environmental report dependent upon these further studies?
	Do the report recommendations flow logically from the conclusions and do they appear to be sound?
Environmental Management Plan (EMP)	Does the EMP clearly show how mitigation measures will be implemented?
	Does the EMP contain an implementation timetable and schedule?
	Are those organisations responsible for implementation clearly identified for each task?
	Is the EMP realistic in terms of available financial and human resources?
Environmental Monitoring and Evaluation System (EMES) (If included)	Does the EMES contain an implementation timetable and schedule?
	Are those organisations responsible for monitoring clearly identified?
	Is the EMES realistic in terms of available financial and human resources?
Appendices	Do the appendices provide all the supporting background information relevant to the review of the document?
	Is the bibliography adequate?

Material stockpiles.

Bangladesh's landscape is a valuable environmental asset.

Figure 6.1 Generalised Environmental Assessment Process Flowchart



Source : Based on UNEP Environmental Impact Assessment Training Resource Manual, Second Edition, June 2002.

7. THE NEED FOR AND SCOPE OF AN ENVIRONMENTAL MANAGEMENT PLAN

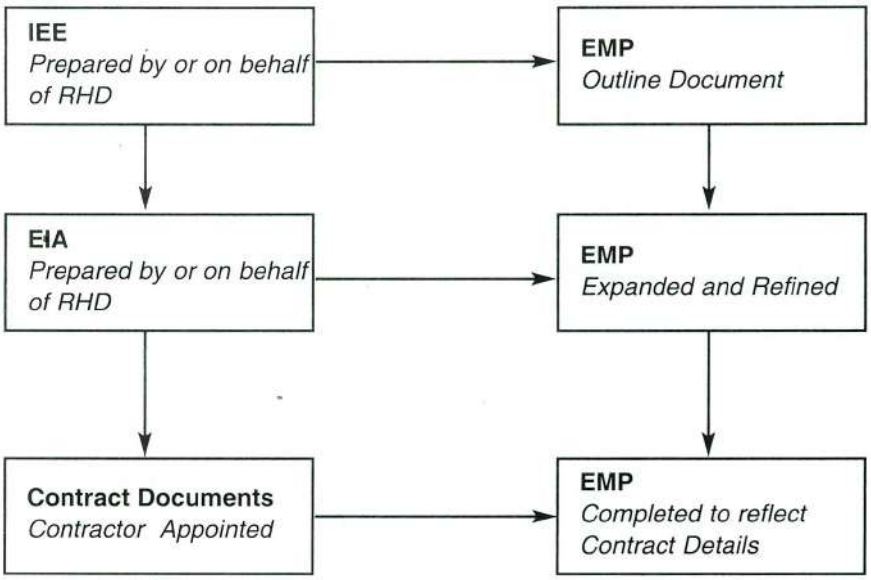
7.1 Evolution of the Environmental Management Plan

An Environmental Management Plan (EMP) is a document that defines the measures, procedures and responsibilities involved in the implementation of the proposed project. An EMP is sometimes referred to as an Environmental Action Plan (EAP), in order to highlight the fact that the emphasis of the document is upon execution rather than evaluation and analysis.

Unlike an IEE or EIA, an EMP is a document that needs to change in response to changes in project specifications and needs to be up-dated throughout the life of the project. Preparing an EMP is therefore essentially an evolutionary process.

An EMP is prepared to accompany the IEE at the pre-feasibility stage of the project. However at this stage of the project cycle, construction methods and details will not be known, so that much of the document will be in outline, with little detail. As the project develops during the feasibility (EIA) stage, it will necessary to expand the EMP document, as more engineering information becomes available and the nature and feasibility of mitigation measures are better understood. However even at this stage, not all project methods will be known. Only when a contractor has been appointed will it be possible to produce a fully comprehensive EMP.

The Evolution of the Environmental Management Plan



7.2 Contents of an EMP

The EMP is a framework document that helps to integrate other more specialist activities and subsidiary plans, such as Social Action Plans, and Resettlement Plans. It is normal that these specialist socio-economic plans are prepared separately from the EMP as discussed in Chapter 8. Occasionally there may be a requirement for a separate Environmental Monitoring Plan but generally the EMP could cover any monitoring requirements for a road project or the socio-economic plans. This is discussed further below.

The contents list for a typical EMP is suggested below:

Contents of an Environmental Management Plan (EMP)

- Mitigation measures to be taken to avoid or minimise adverse environmental impact, including responsibility, timing and budget.
- Measures to be taken to add or enhance environmental benefits, including responsibility, timing and budget.
- Institutional support to be provided to enable effective environmental management / monitoring of the project.
- Monitoring and auditing programme, including locations, frequency, parameters, methods, responsibility and budget.
- Specific format for environmental monitoring for different parameters/ issues.
- Recommendations for environmental management of operations, including biodiversity / land management, pollution control, energy efficiency and transport.
- Environmental legislation and standards that apply to the project.
- Resources and funds required to implement environmental management. Contractual and management arrangements for environmental management.
- Consultation and participation arrangements.

Adapted from: DFID Environmental Guide, Department for International Development, London, 1999.

7.3 Monitoring

It is generally necessary to monitor the implementation of the project so as to ensure that impacts are as predicted and that mitigation measures are effective. If they are not, then the

monitoring will alert RHD, and its agents and contractors, of the need to take action to remedy the situation.

The principles that should be applied when deciding what to monitor are summarised below.

What should be monitored:

Effects that :

- can be measured
- have a cause-effect relationship with the project
- are uncertain
- can be mitigated or prevented
- have an important role to play in decision making
- are important to the public
- can be measured against reasonable costs.

Source: Government of Bangladesh, Roads and Highways Department, Construction of Bhairab Bridge, Environmental Action Plan, Haskoning / Nuttall, November 1999.

Thus it is not necessary or desirable to monitor all project impacts but only those that meet the practicality criteria described above.

7.4 Other Related Plans and Specialist Studies

Often the most significant impacts of any highway or bridge project are those related to the human environment. Many of these issues, for example those of severance, cultural heritage, and landscape can be dealt with very effectively within the context of the project EIA and EMP.

However other socio-economic issues involving land acquisition, compensation, livelihoods and gender, are both complex and highly specific. For example, the construction of roads and bridges can lead to a significant reduction in agricultural land and the displacement of people. This can dislocate production systems and de-link people from sources of incomes and productive assets. Loss of land might also render people unable to cope in a new environment where there is greater competition for resources.

In addition to the physical losses of land and livelihood, resettlement can also weaken community structure and the social networks of kinship, mutual assistance, cultural identity and traditional authority. This may cause long term hardship, impoverishment and environmental damage.

There is a range of plans and strategies that can be developed to cover socio-economic issues. However because the methodological approach and terminology used in such studies is very specific, experienced specialists should carry them out, probably as part of a separate team.

The documents covering socio-economic impacts use a variety of different titles and terms, and, as with many environmental studies, documents covering essentially the same areas and

activities are often given different titles. The following socio-economic documents represent those most commonly required for a major new highway or bridge project:

Social Management Plan (SMP), sometimes referred to as a ***Social Action Plan (SAP)***. This is broadly the equivalent of the EMP, and sets out in general terms all the social and economic actions required for project mitigation. It may cover resettlement and land acquisition but this is normally dealt with in a separate, subsidiary document.

Resettlement Action Plan (RAP), also called a ***Land Acquisition and Resettlement Plan (LARP)***. A separate RAP or LARP will normally be required where people need to be resettled and paid compensation for loss of land and livelihood.

Two other specialist areas in the socio-economic field should be mentioned. The ***Sustainable Livelihoods Approach (SLA)*** is a methodology favoured by DFID and concentrates primarily on examining the actions that are needed in order that project affected persons (PAPs) can continue to earn a living in a post project situation. Another related approach is that described under the general heading of ***Gender and Development (GAD)***, which concentrates upon the impact of development projects upon women.

A resettlement village at Jamuna Bridge.

8: ENVIRONMENTAL MANAGEMENT OF DAY TO DAY ACTIVITIES

8.1 Introduction

The focus of these guidelines so far has been upon the environmental management and assessment of construction and rehabilitation works. The risk of smaller scale day to day activities causing environmental problems is generally not nearly so great. However it is important to remember that a large number of even small adverse impacts can have a 'cumulative' impact that could be significant. This section therefore summarises the types of activities that could have even minor environmental impacts and outlines how they can be controlled in a simple Environmental Management System (EMS).

8.2 Day to Day Activities

This section outlines two broad areas to be covered by an EMS:

- non-project specific activities posing some risk to the environment.
- areas where RHD has responsibilities for stewardship of environmental resources.

Activity	***Possible Adverse Impacts***	***Required Actions***
Storage of oils, fluids and liquids in RHD depots and sites	Water and air pollution and ground contamination	• All containers should be sealed • Bunding may be required for large quantities • Oil traps • Care in handling
Waste disposal	Water and ground pollution Loss of resources	• Recycle all containers & all materials • Otherwise dispose of in environmentally sound manner
Road repairs	Air pollution from melting bitumen Disposal of existing materials	• Introduction of more modern equipment • Re-use existing materials whenever suitable
Maintenance of RHD sites	Borrow pits	• Borrow pits to be kept free of nuisance weeds such as water hyacinth • Access to pits for fishing, etc., to be kept open to all
Road safety	Road signs and markings	• Warning signs, white lines and speed bumps to be maintained and kept visible at all times
Tree trimming	Disturbance to wildlife	• Only carry out outside breeding seasons
Vehicle maintenance	Air pollution Water and ground pollution	• Vehicles to be regularly serviced • Service areas to be sealed to avoid contamination

8.3 An Environmental Management System

Day to day environmental management activities can best be controlled by a formal EMS. The international EMS standard is ISO 14001 which is intended to ensure that organisations meet their legal obligations and that environmental incidents are avoided.

For RHD, an EMS would need to:

- identify Departmental activities and their potential impacts (see previous table).
- match impacts with legislative requirements. If these are not comprehensive, then match impacts with RHD Environmental Goals and Objectives (see Chapter 2).
- identify cause, effect and control (mitigation).

These issues will need to be examined by RHD in detail before a formal EMS can be introduced and implemented. Decisions will need to be made as to how the EMS is introduced into the Department and how it relates to Quality Assurance Procedures. Building an EMS will also require procedures, manuals and training.

Introduction of an EMS is proposed once Environmental Assessment procedures have been introduced into the Department.

Heating tar for road repairs.

APPENDIX A REFERENCES & WEBSITES

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World Bank, Environmental Assessment at the World Bank, World Bank, Washington, USA, 1999.

RELEVANT INTERNET SITES

Further information can be obtained from the following Internet sites. Several of the sites provide links to numerous other web sites. Addresses can change without warning.

Asian Development Bank
http://www.adb.org

Available documents on environmental aspects include Environmental Guidelines on Roads and Highways, Impact Assessment, Road Upgrading, Sector Projects, etc. Specific projects in Bangladesh: (Bangladesh - 22321) Project Completion Report on Road Overlay and Improvement Project, July 2002.

Australian EIA Network
http://www.erin.gov.au/net/eianet.html

This is an extensive site managed by Environment Australia's Environmental Protection Group which includes contact names and addresses, case studies and information on EIA training resources.

Canadian Environmental Assessment Agency
http://www.ceaa.gc.ca

This site provides information about the Canadian Environmental Assessment Act. It also contains reports of the study on environmental assessment effectiveness and links to numerous other relevant sites.

Department for International Development
http://www.dfid.gov.uk

This site is about the activities of DFID around the world. In Bangladesh DFID provides development assistance which is documented in the Country Strategy Paper published in 1998 and updated every three years. Available publications are on Environment, Natural Resources, Land tenure and other disciplines.

Envirolink
http://envirolink.org

This site provides a compilation of comprehensive, up-to-date environmental resources available through the WWW. It has links to sites covering just about any topic related to the environment field, including risk assessment.

Envirosense
http://es.inel.gov

This site is the U.S. Environmental Protection Agency's pollution prevention forum, a repository of information related to pollution prevention, compliance, pollution control technologies, etc. It has numerous databases.

Government of the People's Republic of Bangladesh
http://www.bangladeshgov.org

Under the Ministry of Environment and Forest information can be obtained on Bangladesh Forest Department and Bangladesh Forest Research Institute.

Global Environment Facility
http://www.gefweb.com/

International Association for Impact Assessment
http://www.ext.NoDak.edu/IAIA/

This site contains information about the IAIA, selected references on various aspects of EIA and numerous links to relevant sites, including the Impact Assessment Journal and the IAIA Newsletter.

International Institute for Sustainable Development
http://iisd1.iisd.ca

This homepage has a number of documents relevant to EIA, including an EIA database. It also contains ISO 14000 information.

United Nations Development Programme
http://www.sdnbd.org/partners.htm *(links)*

UNDP Bangladesh chapter under Sustainable Development Networking Programme provides information about various NGOs active in environmental work.

United Nations Environmental Programme
http://www.unep.org

UNEP Divisions in different regions of the world are: Early Warning and Assessment; Environmental Policy Implementation; Policy Development and Law; Environmental Conventions; Technology, Industry and Economics; Global Environment Facility Coordination; Communications and Public Information; Regional Cooperation. This site also provides various environmental publications.

World Bank
http://www.worldbank.org/es

A search on environmental assessment retrieves a number of documents, including papers detailing EIA case studies in developing countries.

APPENDIX B MODEL CONTENTS LIST FOR IEE & EIA REPORTS

The contents of an IEE and EIA should be similar, the main difference being in detail of information and depth of analysis.

Typical Contents of an IEE or EIA Report

Summary, Conclusions and Recommendations

1. Introduction

Project Setting
Rationale and Objectives for the Project
Methodology for the Environmental Assessment
Project Scoping and Public Consultation Processes
Background and Purpose of the Report
Scope of the Study
Team Details and Resources

2. Project Description

Type and Category of Project, including Location
Need for the Project
Spatial Extent of Operation
Methodology and Schedule for Implementation
Alternatives Examined

3. Environmental Baseline Description

Physical Environment, including:
- Topography
- Climate
- Geology and Soils
- Surface and ground water

Biological Environment, including:
- Flora
- Fauna
- Rare and Endangered Species

Socio-Economic Environment, including:
- Population and Demography
- Economic Activities
- Transport and Infrastructures
- Land use
- Public Health and Safety
- Noise and Vibration
- Archaeology and Cultural Sites including Graveyards

4. Assessment of Impacts

Assessment Methodology
Impact Identification, Quantification and Valuation
Impact Prediction
Cumulative Impacts

5. Environmental Management Plan

Mitigation
Compensation Strategy
Resettlement Strategy
Residual Impacts
Monitoring Programme

6. Public Participation and Consultation Process

Glossary, Abbreviations, Bibliography, Appendices