THIRD ROAD REHABILITATION AND MAINTENANCE PROJECT

DHAKA - SYLHET ROAD
and
FEEDER ROAD ‘A’

EXECUTIVE SUMMARIES FOR THE
CONSOLIDATED ENVIRONMENTAL MANAGEMENT PLANS

March 1998

DHV Consultants BV. The Netherlands
in association with

Consulting Engineering Services (India) Pvt. Ltd.
Development Design Consultants Ltd.
Desh Upodesh Ltd.
GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

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Subject : Executive Summaries of EMPs
File : K4008.02.001
Date : 9 March 1998
Our reference : NHB/MMA/RHD/CONSOL.EMP
The presented consolidated Environmental Management Plans are part of RRMP3 project, of which the component for “Nalka-Hatikamrul-Bonpara New Road Construction” has already been consolidated by October 1997 and therefore is not considered in this Report.

Following the mandate given by the Bank and the Client the other two RRMP3 components referring to the Environmental Management Plans for both Feeder Road A and Dhaka-Sylhet Road were reviewed and consolidated. The review was undertaken following the Bank’s and the Client’s instructions and guidance by the environmentalist seconded by DHV Consultants BV.

As for Feeder Roads Type A, the reviewing was a joint effort during the time of reporting between the Environmental Expert of DHV and the Environmental Expert of Mouchel & Partners Ltd. Consequently, all findings and recommendations presented thereunder represent the consolidation of the Environmental Management Plan for this RRMP3 component.

As for Dhaka-Sylhet Road the preliminary environmental assessment, completed in September is by its nature an Initial Environmental Examination (IEE). Review and modifications were undertaken by the Environmental Expert assigned with the consolidation. Due to absence of the Environmental Expert of Mouchel & Partners Ltd. who previously was occupied with the IEE and drafted the Environmental Management Plan (Feb.1998) it was not possible to ensure cross-reference and share responsibilities for concluded matters.

The consolidation efforts for this component included (i) focusing on additional investigations on specific alternatives and/or points of environmental sensitivity (ii) giving consideration to a broader scope of impact analysis wherever considered necessary, (iii) consulting and cross-checking, including field inspections, with the engineer team and hydrologists to address the most significant concerns relating to possible options for either new alignments in the proposed corridor, (iv) analyse the trade-off between land-acquisition, resettlement needs, flooding incidents and design requirements in some of the more sensitive sections (v) addressing to the maximum extent possible the need to mitigate the impacts commonly associated with extraction of large quantities of fill material, both from borrow pits in flood-prone lowlands and in hill sites.

Thorough consideration was given to the possible need of further environmental and design studies as well as confirming the environmental category of this project component.

Additional recommendations were included relating to institutional strengthening of the Technical Wing / Environmental Unit of RHD in view of the countries further need to assess and monitor environmental impacts associated with road constructions.

Dhaka, 9 March 1998
Background and Rationale for this EMP

The Consolidated Environmental Management Plan (EMP) for Dhaka-Sylhet Road Upgrading and Rehabilitation Project has been prepared in accordance with IBRD guidelines as set out in the Bank’s Operational Directive OD 4.01 Environmental Assessment. It takes particularly into account the identified key adverse and beneficial impacts that are associated with the project’s physical and socio-economic interventions. The EMP also discusses potential impacts which the environmental setting exerts on the project, mainly those associated with flooding and erosion. Particular care has been taken to address potential impacts originating from the large quantities required for fill material. The principal potential adverse impacts associated with the project are the direct and indirect social and socio-economic effects connected with the acquisition of land and other assets in order to accommodate the improved road and associated structures. These matters are dealt with in a detailed Resettlement Action Plan currently under preparation. There was no provision to cover these issues in detail while consolidating the Environmental Management Plan for all RRMP3 components concerned.

In this context it needs to be stressed out that the most significant direct impacts of upgrading the road relating to social aspects, caused by land acquisition are described and assessed in detail in the project’s Resettlement Action Plan (RAP) during the early implementation phase. In this EMP a number of social and socio-economic impacts as well as mitigation and management measures associated with land acquisition and income-generating possibilities linked with the project design are not dealt with in detail, as these matters are subject to be consolidated along with the RRMP3 Resettlement Action Plan (RAP) currently under preparation by a contracted NGO. However, in the interest of completeness and soundness of the proposed mitigation measures, these matters are briefly referred to where appropriate. This refers mainly to the efforts made to offset and/or compensate for environmental impacts and severance to Project Affected People (PAP) focus on social forestry schemes and on rehabilitation measures for borrow pits.

The proposed project-specific action plan covers basically all measures which will be taken in relation to enhancing beneficial impacts and avoiding, minimising or compensating adverse impacts, so as to enhance overall environmental performance of the project. It also covers the institutional and organisational framework within which environmental management measures and monitoring will be carried out, together with staff requirements and cost estimates for implementation.
Review and Consolidation

Following the mandate given by the Bank and the Client the Environmental Management Plan for both Feeder Road A and Dhaka-Sylhet road was reviewed and consolidated, as requested, by the environmentalist seconded by DHV Consultants BV. The review was undertaken according to the Bank’s instructions and guidance.

The reviewed EIA includes some specific environmental examinations which could not be performed earlier. Items not discussed or presented elsewhere, being addressed specifically in this report include:

- the organisational framework for environmental management,
- roadside tree planting
- assessment of fill material requirement and identification of suitable borrow sites
- borrowpit rehabilitation measures
- environmental monitoring
- institutional strengthening programmes.

After thorough consideration of all facts involved, and consulting with the PCWD of this project, it is concluded that this document represents the consolidated EIA, including the consolidated Environmental Management Plan for the Dhaka-Sylhet Road Project. This EMP also includes enhancement measures, actions which although not essential to the project will, at low cost, bring appreciable social, environmental or developmental benefits.

As stated in the Consolidation Documents for RRMP3 submitted on 18 October 1997 it was indicated that it needs to be clarified to which extent both the Bank’s environmental guidelines and new government regulations on environmental assessment apply to this project, and therefore whether a formal IEE and/or EIA should be prepared. The present report is assumed to facilitate the decision to obtain domestic environmental clearance.

The consultant, after carefully analysing the key adverse impacts likely to occur in context of this project, came to the conclusion that this project can remain under category B once the focal points flagged out in this report are properly and timely addressed. It is ascertained that with the countermeasures and discussed alternatives described in the management and mitigation plan the need to reduce, limit and offset the identified key adverse impacts (mainly in road section 109 and 115) is sufficiently addressed to justify this project remaining under environmental category B.

Several actions were identified as being need to be addressed partly because they relate to loan conditions, partly to the critical path and the budgeting of the project. Among them are

(i) Appropriate project-specific land acquisition and compensation procedures and an implementation programme.

(ii) A decision as to the extent to which responses to indirect effects should be incorporated in the rehabilitation project. Prime candidates are road safety and roadside development control. Indirect effect monitoring include noise, reduced air quality, road safety, driver behaviour, and roadside development.
In accordance with the identified constraints and needs the EMP recommends that the project should be used as an opportunity for capacity building, particularly within RHD. Prime candidates are land acquisition procedures, bioengineering, (iii) road maintenance and environmental monitoring, e.g. air and noise pollution, accident frequency, success/failure of roadside plantation schemes.

The Project

The project comprises upgrading and rehabilitation works to approximately 220 km of National Highway between Sitalakhaya Bridge near Dhaka, and Sylhet. The decision for the present route choice is based on cost-benefit analyses taking into account trade-offs between political preferences, travelling time, economic return, linkage of commercial centers, socio-economic as well as environmental impacts.

Approximately 70% of the alignment will follow that of the existing main road, while 30% will follow that of existing district roads (see Fig. 1.1). The principal engineering works include:

- embankment crest raising to provide protection against a 1 in 10 year flood event
- widening of embankment crests to 15.8m in order to accommodate a two-lane central carriageway widened to 7.4m, together with flanking sealed rickshaw lanes 1.5m wide, and 1.8m wide shoulders for use by pedestrians, as well as flattening of embankment slopes to achieve stability
- minor realignment, mainly to ease sharp bends and to improve sight lines and approaches to structures, junctions etc
- major realignment in Sections 2A and 2B to follow to the extent necessary and discussed in this report that of existing district roads, in order to shorten the distance from Dhaka to Sylhet by approximately 32 km
- construction of 8 bypasses (all following the alignment of existing district roads) totalling approx. 18.5 km, in order to avoid particularly congested commercial and residential areas and/or to mitigate risks of water ponding in bazaars.
- replacement of approximately half of all existing bridges and box culverts and almost all pipe culverts, together with rehabilitation works to those which do not need replacement
- pavement improvement including surfacing of the whole length of the main carriageway with asphaltic concrete
- replanting removed roadside trees
- post-use rehabilitation, where applicable, of borrow pits

The works will be executed in two stages under 6 contract packages, each covering from 28 to 44 km, within a total construction period of 3-4 years.

Impacts

Possible impacts on the project caused by the environment relate to flooding events and erosion, mainly in those road sections which will follow the new alignment along district roads. Of special concern are flooding events where the new alignment will cross the Korowai River, caused by the poor condition of protective embankments. Other concerns relate to Section 2A where ponding between the existing district road and the nearby hill chain is reported to be a
major problem for the local villages sited along this road. Bypassing these sites and amply increase of culverts in these sections are considered to be appropriate design countermeasures to cope with these adverse conditions.

Other environmental impacts relate to the likelihood of seismic activities in the project area. Appropriate factors of reasonable safety against seismic acceleration has been incorporated in the design of all structures.

During the pre-construction phase, key potential adverse impacts comprise:

- those connected with the acquisition of approximately 250 ha of land and the assets thereon in order to accommodate the project works,
- interruption to utilities such as water, gas, telephone, and power distribution systems which are adjacent to or cross the alignment, and need to be relocated
- the loss of large numbers of roadside trees (up to 27000) along most of the 150 km of road between settlements, many of which are mature, and not only provide shade to travellers and are of aesthetic value, but also provide small branches and leaves for use as fuel, to the benefit of the very poorest segments of society

Impacts which are considered to be of lesser significance are inducement of uncertainties and stress in roadside residents associated with surveys and the subsequent land acquisition and compensation procedures, and the stimulation of new construction to obtain fraudulent compensation.

During the construction phase, the majority of key potential impacts are adverse, being:

- Temporary and/or permanent loss of agricultural land and/or a reduction in productivity associated with the need for some 6.2 million m$^3$ of fill material from borrow pits for embankment widening and raising, and the possibility of other adverse effects if pits are developed at sites which are socially or environmentally unsuitable.
- Concern is raised when crushed bricks are to be used for sub-grade to supply about half of the required aggregate material (750 000 m$^3$) due to the illegal bur wide-spread use of wood as fuel. Unless strict controls are exerted during the contractor’s supervision the widespread illicit use of timber in brick kilns will accrue the already critical depletion of forest resources, particularly in the nearby border area with India where uncontrolled cutting and smuggling of timber into Bangladesh is causing major environmental hazards. Brick kilns will also contribute to considerable local air pollution if fired with coal.
- Crushed stone (another 750 000 m$^3$) used for sub-base and base, sourced locally will also create employment, but with potential negative impacts as extraction will accumulatively contribute at extraction site to adverse environmental and other impacts such as increase of fine siltation, change of current pattern and increase of river current, increased downstream bank erosion, and border and user conflicts.
- Compounded with problems associated with increased noise and dust on haul routes, construction traffic is likely to result in increased traffic congestion, road safety hazards and damage to existing road pavement and structures through speeding and overloading of construction material haulage vehicles, particularly in the case where minor roads are used as haul routes.
- In addition to job creation in construction materials supply industries, the contractors are expected to employ a labour force of, at peak, 24,000-36,000. This represents a large amount of temporary employment, much of which will be in rural areas where labour
opportunities outside agriculture are very limited, and even agricultural labouring is highly seasonal. Construction work also provides opportunities for women, thus helping to redress the gender imbalance in rural employment. Anticipated adverse impacts of low to moderate magnitude caused by this labour force concentration would include

- sanitation problems and pollution
- drinking water shortage
- increased pressure on local markets and food supply
- increased insecurity and social imbalance in among the local residents
- increased crime rate
- friction and individual conflicts

Less significant potential impacts during construction, most of which are of a localised, temporary and reversible nature are:

- increased pressure on local services,
- fuelwood depletion,
- loss of income, fuel and construction wood from roadside trees,
- increased fishing efforts at culverts, and impeded fish migration,
- increase of stagnant water areas being potential breeding places for waterborne disease vectors:
- temporary land take for camps, stores, diversions;
- land unsuitability on at contractor's sites if not properly cleared/restored after use;
- interruption to navigation during bridge construction;
- relocation of some cultural assets;
- interference with schools (noise, accident risks, air pollution);
- air and soil pollution from asphalt plants and use of bitumen.

The post-construction phase is associated with a higher proportion of beneficial impacts than previous phases, and both beneficial and adverse impacts are of a permanent nature. Key impacts are closely linked with the fact that the Dhaka-Sylhet Road passes through more than 140 villages and bazaars, resulting most likely in:

- an increase in the frequency of accidents due to improvements in width, surface smoothness and improved geometry, which are likely to result in higher vehicle speeds and, coupled with the increase in height of embankments an increase in the severity of accidents;
- major increases in economic activities and stimulation of development along the route, as a result of a significant improvement in road conditions and the consequent reduction in vehicle operating costs.

Potential impacts of lesser significance were identified as:

- an improvement in living and working conditions in those settlements which are bypassed, through a reduction in traffic levels, and consequent reduction of congestion, accidents, noise and air pollution
- a worsening of conditions for settlements along the road as a result of increased traffic speeds in terms of increasing severance
an improvement in the management of roadside trees, leading to ownership by, or benefit sharing with local communities and user groups, with particular benefits accruing to the poorest and most disadvantaged members of society.

an increase in traffic-generated noise and air pollution in areas which remain or become more congested as traffic levels increase.

A number of impacts which are commonly encountered in connection with road projects are not expected to occur in the present case, or are of very minor significance. These include

Direct

- Major increase in sediment in streams affected by erosion at construction sites and fresh road cuts, fills and waste dumps: almost no cuttings on route; embankment fills will be vegetated.
- Major landslides, slumps, slips and other mass movements in road cuts: the planned road does not traverse hilly terrain, although it passes nearby in some sections.
- Alteration of overland drainage (where road cuts intercept perched water tables, springs, etc.): not relevant - road does not traverse hilly terrain.
- Destruction or damage to terrestrial wildlife, habitats, biological resources or ecosystems that should be preserved: none traversed by road.
- Alteration of hydrological regimes of wetlands by causeways with harmful effects on these ecosystems: road follows existing alignments across floodplains.
- Interruption of migratory routes for wildlife and livestock: not relevant.
- Increased collisions with wild animals: not relevant - large mammals are extinct in the area.
- Transmission of communicable diseases from workers to local populations and vice versa: a good portion of workers will be local.
- Creation of temporary breeding habitats for mosquito vectors of disease, e.g., sunny, stagnant pools of water: many exist already.
- Creation of transmission corridor for diseases, pests and weeds: road already exists.

Indirect

- Unplanned or illegal timber cutting: minimal natural timber resources in area; precautions required to control the use of timber illegally used for brick manufacturing.
- Long-term or semi-permanent destruction of soils in cleared areas not suited for agriculture: no new areas to be cleared.
- Unplanned development and illegal invasion of homelands of indigenous peoples by squatters and poachers causing serious social and economic disruption: not relevant.
- Destruction of or damage to terrestrial wildlife habitats, biological resources or ecosystems that should be preserved, by induced development: these are already under extreme pressure

Residual Impacts

Relate to uncertainties among communities with respect to Land Acquisition. Uncertainty relates to the extent the borrow pit rehabilitation programme will be followed up, and to what level living conditions along the new road and its bypasses will improve or deteriorate. Doubtless there will be residual adverse impacts associated with community severance due to the fact that the road will represent a physical barrier between the community halves bisected by the road.
Management and Mitigation Measures

The project's overall environmental strategy has the following main components:

- **Impact avoidance**: changing project location, design and construction methods to avoid impacts. Particular emphasis has been placed on alignment design to minimise land acquisition, not raising embankment height through some built-up areas, the provision of bypasses, and where new alignments have been necessary, following existing roads rather than creating new alignments. Also, designs incorporate a number of measures to promote road safety, to maintain clearance at structures traversed by country boats, avoidance of encroachment on a structure of cultural heritage significance, and minimisation of the need for relocation of services.

- **Impact minimisation**: where impacts cannot be avoided, implementing mitigation measures to reduce the impacts to acceptable levels. In the majority of cases, this applies to construction impacts, and mitigation has taken the form of the introduction of new or modified clauses in construction contract documents, which are specifically aimed at environmental protection and the promotion of social welfare of the workforce and the inhabitants of the project surroundings.

- **Compensation**: where impacts cannot be avoided or mitigated to an acceptably low level, arranging compensation, for example cash and other support for people affected by land take; extensive roadside tree planting to replace lost trees. Also falling into this category is the provision of technical and other support services and facilities to those who wish to develop borrow areas as fish ponds, or otherwise restore lost productivity.

- **Enhancement**: measures which at little cost to the project give appreciable social or developmental benefits, e.g. the provision of bus stops and institutional strengthening.

Main mitigation measures considered during the **Pre-Construction Phase** relate to:

**Land Acquisition**

comprising minimising LAQ, raising embankment where absolutely necessary, timely announcement and involvement of an experienced NGO, promulgation of information as for income-generating opportunities for PAPs.

**Alignment Design**

following specific criteria, minimising LAQ, inclusion of bypasses. An issue still to be resolved relates to the trade-off retaining the standard FL height throughout Dhaka-Sylhet highway not to allow temporary flooding, or accept to certain degree flooding where the embankment would be lowered in densely populated areas where villages/bazaars are transgressed. The solution to this issue lies in additional field investigation to identify the need for re-aligning the road in the given sections. The guiding principle for this decision should be based on an economic cost-benefit analysis and a specific (local) environmental examination of the sections concerned.

**Site Selection of Borrow Pits and Possible Post-use Information for Landowners**

Careful site selection to minimise environmental impacts commonly associated with large borrow pits located in flooded lowlands and/or hilly areas with highly erodible soils are duly
considered in this project. Provision has been made to safeguard the interests of landowners in terms of minimising the possibility of exploitation by contractors, and making available support services (probably through an NGO) in relation to redevelopment, with particular emphasis on restoration as fish ponds where this is appropriate.

Design Safety Provision and Infrastructure Enhancement Measures
Standard and modified mitigation measures applied in this project relate to improved road geometry, junction layout, segregation of lanes for slow traffic and pedestrians (where applicable), bus stops, bypasses, railway overpasses and road markings. Enhancement measures incorporated in the road design relate to bus stops and improvement of ferry ghats. The inclusion of additional rest stops is not recommendable.

Hydrological Measures and Navigation
The road design includes appropriate features to accommodate various aspects of hydrology relevant in various road sections, such as prevention of overtopping, prevention of saturation of formation, cross-drainage structures, and protective measures against scour and wave run-up. Appropriate navigational clearances are determined on field observations and data.

Cultural Heritage
In case of bypasses, new alignments, embankment widening and borrow pit site selection, the project’s approach includes all precautions to preserve cultural and religious assets where this project could possibly interfere.

Mitigation measures considered during the Construction Phase include:

Main mitigation activities will focus two large-scale programmes which are both designed to benefit the bio-physical and the socio-economic environment, giving particular emphasis on the incorporation of income-generating opportunities to PAP and disadvantaged groups in the project area.

Borrow Pits - Possible Post-Use for Fish Culture
A good part of environmental management measures linked with this project are connect with the post-use programme designed for borrow pits. The EMP details the common issues associated with derelict borrow pits, and devises a design which could make optimal post-use of these structures. Apart from socio-economic benefits attributable to selected beneficiary groups (from PAP) this rehabilitation programme would represent an ecological enhancement.

Tree Plantation Programme (Social Forestry)
As the project will require substantial numbers of mature trees to be removed it is recommended to incorporate the respective mitigation measure in the overall project design. i.e. adequate re-planting of suitable species along the newly widened embankments. Like the borrow pit rehabilitation program this plantation would require group selection and formation preferably among the PAPs, women, the poor and the landless, organised into groups by an NGO. The general principle of community participation in maintenance of the trees and sharing in the benefits by those who participate will be applied, following the ruling guidelines for lease arrangements and benefit share agreements established by RHD Arboriculture Unit.
Management and mitigation measures envisaged during the Post-Construction Phase will focus on maintenance work for the road plantations, through an NGO working together with the beneficiary groups, and on road maintenance works, through institutional set-ups which are likely to be established in the near future while re-organising RHD.

Environmental Monitoring

Environmental monitoring will comprise two elements, compliance monitoring, which involves checks on whether prescribed actions have actually been carried out, and effects monitoring, which is concerned with monitoring and recording the consequences of project activities on the biophysical and social environment. In common with most road projects, much higher emphasis has been placed on compliance rather than effects monitoring, since the greatest potential for direct environmental damage occurs before and during construction, and impacts during these stages can be predicted and consequently controlled by design adjustments and constraints placed on the contractors' activities.

At the pre-construction stage, compliance monitoring will include checks on the designs, contract documents and the land acquisition process. The first two will be the responsibility of the design consultant, with later independent checking by the consultants appointed in connection with construction supervision monitoring, and the third by the NGO/consultant appointed by RHD to oversee implementation of the RAP. The RAP will also be checked by the Bank and RHD to ensure compliance with their respective policies, Bangladesh legal requirements etc.

During the construction phase, compliance monitoring will concentrate on:

- Review of contractor's proposed designs and working methods
- Site-specific review of contractors' temporary facilities
- Regular site inspections
- Certification of site clearance and restoration
- Checking on implementation of roadside tree planting

Apart from matters relating to the RAP effects monitoring will very largely be concentrated in the construction phase, and will be carried out as a subsidiary activity within the general compliance monitoring framework. Objectively verifiable indicators have been identified which will be utilised to monitor and report on any unacceptable environmental effect observed by the supervision team.

Effect monitoring relating to air and noise pollution will remain RHD's own responsibility as this project has not incorporated respective items to perform these tasks.

An important mechanism for effects monitoring will be the community liaison process to be established by the Contractor, in relation to his facilities and operations, and by the Engineer, as part of day-to-day project management. This will include regular site inspections, evaluation of contractors' returns and community liaison meetings. Responsibility for this aspect will lie with the Engineer and the Engineer's Representative.
During the post-construction phase, effects monitoring will include inspections of pavement, embankments and structures in connection with planning and programming maintenance works, and will be carried out by the Network Management Wing of RHD to be established through the RRMP3 Institutional Development Component. Monitoring of the tree planting component of the project will be the responsibility of either the Arboricultural Unit of RHD or the NGO appointed by RHD to oversee the planting programme, depending on the approach taken to implementation.

Decision is still pending as to whether post-construction monitoring of effects such as accident rates, noise and air pollution will be carried out. This EMP also recommends that a post-evaluation should be undertaken in the form of social and environmental impact evaluation carried out by an independent consultant.

**Implementation and Organisation of the Environmental Management Plan**

Being one component of RRMP3 this project along with the respective EMP will be implemented by the Ministry of Communications (MOC), co-ordinated by a Project Steering Committee chaired by the Secretary, Roads and Railways Division. Under this superstructure RHD will manage RRMP3’s civil works programme and will establish a Project Implementation Office (PIO) in Dhaka, with a Project Civil Works Director (PCWD) in charge of implementation of the new construction and rehabilitation works. He will have on his staff three Resettlement Officers and one senior local Environmental/Resettlement Specialist. Besides, RHD Arboriculture Unit will provide all necessary assistance in the implementation of the road tree plantation schemes.

**Responsibilities**

RHD will also commission a supervision consultant to act as the "Engineer's Representative" in dealings with the contractors, and will place resident engineers and other staff at each contractor's base camp for contract supervision. The supervision consultant will field staff for the engineering supervision team, the environmental supervision team (headed by a Senior Environmental Engineer) and assist in the implementation of the borrow pit rehabilitation and tree plantation programmes.

During construction, RHD engineering staff will be required to respond to any environmentally-related issues raised by the Environmental Engineer acting as the Engineer's Representative, for example in relation to compliance to environmentally related construction clauses, borrow pit proposals or the design of speed countermeasures through settlements.

The supervision consultant, through the Environmental Engineer will undertake a broad range of tasks in relation to design, supervision, certification and measurement, many of which are environmentally and socially-related.

**Implementation Schedule**

The EMP details an environmental action plan, providing all necessary information on time schedule and responsibilities.
Staff Requirement

The requirement for specific science-based environmental skills is limited, and will be met by a 4-6 month input by international specialists, split into 4 visits spaced at strategic intervals throughout the construction period. This limited requirement for international expertise presupposes a full-time commitment by 1 international engineer and 3 local engineering staff on the supervision consultant’s team to environmentally-related tasks, and excludes any time required for formal staff training. In addition, the team would also require limited inputs from an international social forester and planner (2 months), and national and international fisheries specialists (2 months each), in connection with various aspects of the tree planting and borrow pit restoration programmes respectively.

Institutional Strengthening

The present organisation and staffing of RHD does not permit any effective response to environmental matters. RHD has an Environment Unit headed by a Superintending Engineer, but the unit has no staff, mission statement or operating budget, and the Head has no environmental training.

Under the 1997/98 Interim Reorganisation, RHD will create a Technical Services wing. Within the wing there would be a Roads and Environment division, in turn comprised of three units: Road Design, Road Safety, and Environment and Resettlement. Arboriculture would remain a separate division within Technical Service, along with Bridges (East), Bridges (West), and the Bangladesh Road Research Laboratory. In addition to ensuring that project plans meet donor guidelines, an important element of the work of the new Environment and Resettlement unit will be meeting the requirements of domestic environmental law.

At this stage no further strengthening of the Environment and Resettlement Unit is proposed in relation to the Dhaka-Sylhet project. However, the project, and more generally RRMP3 as a whole, provides an opportunity for the creation of an environmental management capacity within RHD. The logical vehicle for such institutional development is the Institutional Development Component (IDC3). It is strongly recommended that IDC3 include provision for TA and training in environmental assessment and environmental policy development for the roads sector.

Environmental Management and Monitoring Costs

Total environmental management and monitoring costs which are not included elsewhere in project budgets are estimated to be approx. US$ 805,000. This figure excludes the costs of monitoring in relation to roadside planting of trees, the extent of which will be determined by the social forester, but which is not expected to be a costly item.

Monitoring costs associated with accidents, air pollution and roadside development have also been excluded, since it has been assumed that these will be carried out under other programmes.

Additional cost of US$ 20400 may incur if the recommendation is followed to include an independent environmental review one year after project completion.
Fig 1.1
REHABILITATION OF DHAKA - SYLHET ROAD
LOCATION PLAN
MARCH 1998
L. G. Muirhead & Partners Ltd. U.K.
in association with
Beca Worley International, New Zealand,
Transroute, France
Engineering Science Ltd., Bangladesh.
EXECUTIVE SUMMARY

Background

This Environmental Management Plan (EMP) forms part of the environmental documentation for the Feeder Roads Type A (FRA) component of the Third Road Rehabilitation and Maintenance Project (RRMP3) in Bangladesh and has been prepared in accordance with IBRD guidelines.

The presented EMP is based on information and assessments presented in previous documents, namely

- a Sectoral EIA which was developed in the early stages of project preparation, when prioritisation studies were still underway, and the choice of road sections which would ultimately be included in the project had not been made, and
- an environmental review (ER) of the road sections selected for inclusion in the overall FRA component, which was carried out in order to establish whether or not project implementation would give rise to unacceptable adverse environmental impacts on any of the sections.

Social and socio-economic impacts, mitigation and management measures associated with the official land acquisition process are not considered in detail, as these matters will be dealt with in the consolidated RRMP3 Resettlement Action Plan (RAP) which is currently under preparation.

The Project

The FRA project will comprise rehabilitation and maintenance works to approximately 500 km of road sections which are all located in districts lying to the west of the Brahmaputra - Jamuna - Meghna river. The principal components of the works will include (as necessary on each section):

- widening of embankments to achieve the required minimum crest width of 7.4m to accommodate a 3.2m carriageway with 1.5m sealed shoulders and 0.6m earth shoulders on either side, flattening of side slopes to 1:2 v:h to achieve stability, and provision of erosion protection
- raising of embankment crest levels to allow all-weather use in floods up to a 1 in 10 year event
- limited construction of new embankments, in situations where there is a need for minor realignment to improve sight distances or to reduce the radius of curvature on sharp bends in the interests of road safety and suitability for higher vehicle speeds, or where there is effectively no existing embankment, or where existing embankments are threatened by river erosion
On all sections within the project, embankment and pavement improvements will form the bulk of the works.

The civil works will be carried out under a number of construction contracts, let under national competitive bidding procedures acceptable to RHD and the Bank. Within each year of the three-year construction programme, several contracts will be executed concurrently. Construction is expected to be relatively labour-intensive.

All the sections of road included in the overall project lie in flat areas of the western parts of Bangladesh, either within the floodplains or the delta lands of the Brahmaputra-Ganges-Jamuna-Meghna river system. Land use is dominated by smallholder subsistence farming centred on the production of rice, although a wide range of other crops are also grown.

There are no areas of high ecological value, such as natural forest, mangroves or undisturbed wetlands, along or in the immediate vicinity of any of the project roads, all of which pass through lands which have been heavily modified by man in connection with agricultural development.

**Impacts and Mitigation Measures**

There is a general similarity in the environmental settings of all road sections within the overall project and, although there will be some variation between sections in terms of the nature and scale of the improvement works, these too are broadly comparable. As a result, there are no major differences between sections in terms of potential environmental impact.

All impacts are such that they can be controlled to an acceptably low level through the adoption of suitable mitigation measures. Residual impact is expected to be low in all cases, providing that the specified mitigation measures are fully adopted.

The potential impacts on which the environmental management is focused, and the mitigation /enhancement measures which will be adopted are outlined below.

**Pre-construction phase**

During the pre-construction phase, significant adverse potential impacts could arise from the need for acquisition of land and property in order to accommodate the proposed works, a major part of which will comprise embankment widening. Effects on family wealth and incomes have the greatest potential significance. Lesser impacts will include inducement of uncertainties amongst the local population, regarding various aspects of the land acquisition process, which disturb family life and can promote social unrest, and problems associated with stimulation of new construction solely with the aim of fraudulently obtaining compensation.
Considerable effort has been expended by the Phase I design consultants to minimise the area of land which needs to be acquired in connection with the works, since this is the most effective mitigation measure. It is expected that this approach will continue to be adopted in relation to Phase 2 design. Nevertheless, approximately 210ha of land will need to be acquired for the overall project, of which about three quarters is expected to be agricultural land and the remainder homestead land. In total, some 21,300 households are expected to be directly affected by the land acquisition process; an average of 42 households/km.

Although the number of PAHs is very high, it should be recognised that, for the majority, the extent of impact is expected to be marginal, since only a small proportion of an individual's landholding is likely to be affected by land acquisition. Analogy with very similar FRB projects suggests that about two-thirds of affected households will lose less than 5% of their holding, about one third less than 10%, and only 1.5% more than 20%.

In the case of homestead land, it seems unlikely that acquisition of a narrow strip will result in the need for demolition of houses and/or relocation, since most are set back from existing road margins by at least 5-6m, and in many cases, by far greater distances. The high level of agricultural landholding fragmentation is expected to result in land acquisition having only marginal effects on all but the smallest landholders, sharecroppers, agricultural labourers, and the relatively few people who rent agricultural land.

Payment of compensation for acquired land and other assets is expected to reduce the financial effects on PAHs to an acceptably low level, provided that the compensation paid truly reflects the financial losses incurred. Support to PAHs, in various forms including income-restoration programmes, will be provided under the RRMP3 RAP programme, which will include elements relating to families, individuals and groups who are both directly and indirectly affected by the land acquisition process.

The problem of community uncertainties regarding land acquisition will be dealt with by the NGO appointed by RHD to oversee and assist with RAP implementation, who will be responsible for promoting (in conjunction with the local authorities, and as an integral part of implementation of the RAP) an information dissemination programme to those likely to be affected, primarily on a community basis, but with individual assistance to those families who require it.

The NGO will also be responsible for preparing a dated photographic or video record of the land to be acquired, immediately before commencement of the land acquisition process, whose existence will be publicised, and which will be used as a means of minimising and refuting fraudulent compensation claims relating to the recent erection of structures.

**Construction Phase**

**Employment opportunities**

Beneficial impact will arise from employment opportunities for local people with contractors. In order to enhance this aspect, the construction contracts will include clauses to require the contractors to maximise local hire of labour; to carry out a specified percentage of the works (as measured by contract value) by hand labour; to take positive steps to recruit women, the
poor and destitute and the landless as labour; and to ensure that at least 30% of the unskilled labour force employed at any one time is female.

**Loss of roadside trees**

Loss of roadside trees resulting from the need for clearance to accommodate embankment raising and widening works (mainly in connection with the latter) and pavement improvements is a major adverse potential impact affecting all sections. Apart from their aesthetic value, the trees provide an important source of fuel and/or income for the poorest sections of the community, and in particular for poor women.

Various engineering options to reduce the need for felling were investigated, but none were found to be feasible. The extent of loss cannot be quantified at present, but it is clear that on nearly all lengths of road which traverse open agricultural land, most, if not all, the existing trees on embankments will have to be felled. In most cases, the trees are relatively young, having been planted in the last 6-10 years, and the number of mature trees affected will be relatively low. In locations where large banyan trees are located close to existing road margins, embankment works have been designed so as to avoid the need for felling, since these trees have high cultural significance.

Mitigation will take the form of a major tree-planting programme which will result in a net gain in the numbers of roadside trees, and will provide benefits in terms of employment for the most disadvantaged sections of local communities.

Tree planting will be carried out in broad conformity with the RHD Arboricultural Unit guidelines. Approximately 2000 trees/km will be planted on average. Where embankments are low, two rows will be planted on each side, with three rows on higher embankments. Provision will be made for protecting young trees against depredation by livestock, particularly by goats. Bamboo, or a similar type of fencing is preferred to establishment of hedges comprising compact, fast-growing bushes with a low growth habit, since protection is needed immediately after planting, and hedges will not provide immediate protection.

Groups of the poor, destitute and landless (with particular emphasis on participation by women), will be organised by an experienced NGO, to raise and plant the trees and subsequently to maintain them. The groups then share the benefits of the planting scheme as trees are harvested. Preliminary assessment suggests that approximately 40 groups will need to be established in connection with implementation of each year's planting programme to be executed over a period of 3 years. Short-term (about 12 months) paid work will benefit approximately 400 families per year. Additional and longer-term benefits may arise if some of the scheme participants can be encouraged to use skills learned in project tree-raising to set up their own home-based small-scale businesses.

**Land productivity loss associated with borrow pits**

Long-term loss of productivity of land developed for borrow pits also constitutes a major adverse potential impact. Large quantities of borrow material will be required in connection with embankment works on all sections within the project. Preliminary estimates suggest that, on average, 10,000 m$^3$/km will be required. If the usual shallow side-borrow practices of local contractors were to be permitted, this could adversely affect the productivity of approximately
500ha of agricultural land in total, through the removal of fertile topsoil coupled with worsening of drainage conditions resulting from a lowering of ground level.

Government will not acquire the land needed for borrow pits, and agreement will have to be reached between contractors and private landowners regarding lease fees. There is a high probability that payments under lease agreements would fail to provide adequate compensation for productivity loss.

Primary mitigation has involved minimisation of borrow requirements through careful engineering design, and in particular, through restricting new embankment construction, raising and widening to lengths where it is absolutely necessary on sound engineering grounds.

Secondary mitigation focuses on three elements:

- introduction of clauses into the construction contracts which forbid extensive shallow borrow practices (except in exceptional circumstances), require pits to be spaced at not less than 1.5km intervals, and make provision for safeguarding the financial interest of landowners, mainly through requiring lease agreements to cover the nature and extent of post-use reinstatement works

- provision of advice to landowners concerning the likely effects of borrow pit (and associated access track) development on their land, and the options regarding post-use reinstatement, so that appropriate lease agreement terms can be negotiated with contractors

- implementation of a major technical assistance programme to landowners, with the prime objective of offsetting income losses resulting from reduced agricultural productivity, through the adoption of new or amended agricultural practices on affected land, increasing productivity on an owner's unaffected land, or the development of managed fish ponds

In the last two respects, it is proposed that the assistance should be planned, co-ordinated and partially provided through an experienced national NGO, supported by local NGOs, particularly in relation to the fish pond element. Landowners who do not wish to develop and operate fish ponds on their own will be encouraged to lease the borrow pits for pond development by local groups comprising the poor and landless, with technical and management support from a local NGO.

_Erosion of embankments_

All embankment materials are inherently easily erodible, either by rainfall runoff or wave action during flood episodes. In the long term, both embankment and pavement integrity become threatened, with consequent adverse effects on trafficability of the road and a reduction in the social, socio-economic and economic benefits arising from project implementation.

Embankment erosion will be reduced to acceptably low levels by the incorporation of clauses in the specifications for the establishment of full vegetation cover on completion of the earthworks and, in the case of wave erosion, the incorporation of suitable bank protection measures in the project designs. Provided that routine inspections are carried out to identify any embankment sections where erosion is taking place, and effective and timely remedial actions are implemented, embankment and pavement integrity will be preserved in the long term.
Other construction impacts

A number of impacts, which are associated with general construction activities are anticipated. Most are short-term, reversible impacts. They include the following:

- Friction between imported workers and the local population
- Increased pressure on local services, particularly medical facilities
- Water pollution from sanitary and other wastes and spillage
- Competition for water resources with other users
- Fuelwood/forest depletion through use in contractors' camp facilities, tar boilers, brick kilns etc
- Reduction of land use options for worksites and base camp areas if not properly cleared on completion of the works
- Overloading of road pavement and structures on mobilisation/demobilisation of heavy plant, and by general haulage traffic
- Increased traffic congestion and road safety problems associated with construction traffic
- Interference with phone and electricity lines
- Interruption to navigation caused by in-river construction works
- Air pollution from hot-mix plants

All the above will be mitigated and reduced to acceptable levels through the inclusion of appropriate clauses in the construction contracts and enforcement during the construction period.

Operational Phase

The potentially significant impacts during the operational phase are:

- Major improvements in local trade and communications, and a reduction in transport costs, to the benefit of all communities on both the improved sections of road and connecting roads.
- Impedance to boat traffic on navigable waterways resulting from inadequate clearance at new or replacement bridges.

Continued long-term enjoyment of the benefits arising from the improved roads will only be possible if effective routine and periodic maintenance is carried out. Otherwise, the condition of the roads and associated structures will gradually deteriorate to the pre-project state. The matter of road maintenance is to be addressed under another component of the RRMP3 project, and therefore is not considered further in this Environmental Management Plan.

The design of all bridges has taken into account the need for adequate soffit and lateral clearance under flood conditions, according to the requirements for each class of navigable waterway. Consequently, no impact is anticipated in this respect.
Organisational Aspects

The RRMP3 project will be managed and implemented by RHD and its various sections and zonal offices under the Chief Engineer. High level management and co-ordination functions for individual components of the overall RRMP3 project will be provided through a Project Implementation Office (PIO) in Dhaka, headed by the Project Civil Works Director (PCWD).

The PCWD in his role as the ‘Engineer’ as defined in the construction contracts, will have primary responsibility for management and co-ordination of all matters relating to construction supervision and monitoring, including environmental management. He will be advised and assisted in his management functions by a joint venture of foreign and local consultants (the construction supervision and monitoring consultants - CSMC), who will be responsible for day-to-day supervision and monitoring.

The CSMC Team Leader will be designated as ‘Engineer’s Representative’, and will be the primary linkage between RHD and the consultants at project (Dhaka) level. He and his support staff will be responsible for construction supervision and monitoring at site level, and will have environmental management responsibilities in this respect.

The CSMC team will include a part-time expatriate Environmental Specialist, whose responsibilities will include provision of advice and assistance to the consultants’ Team Leader and his engineering staff on environmental matters, including those specifically involved in the implementation of environmental management functions.

In his more general role as overall manager and co-ordinator of the FRA project, the PCWD will also have other high level responsibilities and functions, which will cover aspects of environmental management as well as implementation of the RAP. Since the NGOs responsible for planning and management of the tree planting and borrow pit restoration programmes will be appointed by, and will report directly to RHD, the PCWD will also have primary responsibility for these aspects of environmental management, although the NGOs themselves will be responsible for day-to-day management of their mitigation programmes.

Implementation Schedule

An environmental management implementation schedule has been prepared which is fully co-ordinated and integrated with the preliminary project implementation schedule. This indicates all key dates by which specified actions should take place by specified bodies, if efficient implementation of the EMP is to be achieved.

Environmental Monitoring

Monitoring during the pre-construction phase of the project will be concerned with checking that the project designs and specifications incorporate appropriate measures to minimise negative impacts and to enhance beneficial impacts, and that appropriate environmental protection clauses have been included in the contract documents to allow control of actions by the contractors which are potentially damaging to the environment. This will be the responsibility of the CSMC Team Leader, supported by his Environmental Engineer.
Environmental monitoring during the construction phase will comprise four groups of activities:

- review of the contractors' Site Environmental Plans, method statements and temporary works designs to ensure that environmental protection measures specified in the contract documents have been given due consideration and, when implemented, will provide an acceptable level of impact control
- systematic observation on a day-to-day basis of all site activities and the contractors' offsite facilities such as base camps and borrow areas, as a check that the contract requirements relating to environmental matters are in fact being complied with, and that no unforeseen impacts are occurring
- certification of site clearance, on completion of the works
- monitoring related to the implementation of the tree-planting and borrow pit restoration programmes

The first three activities will be fully integrated with other construction supervision and monitoring activities carried out by CSMC. Primary responsibility for ensuring that an adequate level of monitoring is carried out in relation to these will lie with the Engineer and the Engineer's Representative, as part of their duties connected with controlling site activities. Actual monitoring will be carried out by site staff from CSMC, under the direction of the Resident Engineers responsible for each site. Technical support in terms of environmental expertise will be provided CSMC Environmental Engineer during his periodic visits to the sites.

Environmental inspection checklists for site use will be developed by the CSMC Environmental Engineer in collaboration with the ER and REs, prior to the commencement of construction, so as to facilitate systematic monitoring and recording. The Environmental Engineer will be responsible for providing basic training in the management and monitoring of environmental aspects to REs and site staff, to be carried out prior to the commencement of construction, and on a refresher basis during construction as required.

All environmental monitoring records will be reviewed initially, as they are received at the CSMC site offices by the REs concerned, who will decide on the appropriate course of action to be taken in cases where unsatisfactory reports are received. In the case of relatively minor matters, advice to the contractor on the need for remedial action may suffice, but in all serious cases, the ER will be informed without delay, who will either recommend to the Engineer an appropriate course of action, or will issue instructions to contractors to take remedial action, if his delegated powers allow him to do this.

Since the management and monitoring systems will all be effectively under the control of the project proponent, it is recommended that an independent environmental review should be carried out approximately 7 months into the first year's construction programme, so as to provide a fully independent assessment of the environmental performance of the adopted impact control measures and procedures.
Environmental Management and Monitoring Costs

Many of the costs associated with implementation of the Environmental Management Plan have already been, or will shortly be, included in the project budget, as an integral part of specific cost items.

The costs of the borrow pit reinstatement programme (excluding managing/co-ordinating NGO costs) will be met from private sources (lease payments and/or micro-credit arrangements) and, as such, should not be included in the project budget.

Incremental costs associated with implementing the EMP, which are not provided for under other items in the project budget are:

- NGO costs related to the provision of planning and implementation management/co-ordination services for the borrow pit reinstatement programmes (US$ 704,400)
- costs of provision of technical support to the planning/co-ordinating NGOs for both the tree planting and borrow pit programmes (US$ 321,000)
- costs of implementing an independent environmental review (US$ 20,400)

In view of the importance of the tree planting and borrow pit programmes to minimisation of two of the three key adverse impacts of the project, and therefore to overall environmental performance, together with the desirability of having a completely independent environmental review during the construction phase, it is proposed that the costs of the above items should be met wholly by the Bank.
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