Environmental Management Framework
(Technical & Financial support from SNV-Bhutan)

Rural Access Project (RAP II)
(For World Bank Financing)

Department of Roads,
Ministry of Works & Human Settlement
Royal Government of Bhutan

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Final Report

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<th>Abbreviation</th>
<th>Definition</th>
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<tbody>
<tr>
<td>CA</td>
<td>Competent Authority</td>
</tr>
<tr>
<td>DANIDA</td>
<td>Danish International Development Assistance</td>
</tr>
<tr>
<td>DoF</td>
<td>Department of Forest</td>
</tr>
<tr>
<td>DoR</td>
<td>Department of Roads</td>
</tr>
<tr>
<td>DYT</td>
<td>Dzongkhag Yargye Tshogdu</td>
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<tr>
<td>EA</td>
<td>Environmental Assessment</td>
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<tr>
<td>EAA</td>
<td>Environmental Assessment Act, 2000</td>
</tr>
<tr>
<td>EC</td>
<td>Environmental Clearance</td>
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<tr>
<td>ECOP</td>
<td>Environmental Codes of Practice</td>
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<tr>
<td>EFRC</td>
<td>Environmental Friendly Road Construction</td>
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<tr>
<td>EFRC-SP</td>
<td>Environmental Friendly Road Construction Support Project</td>
</tr>
<tr>
<td>EI</td>
<td>Environmental Information</td>
</tr>
<tr>
<td>FNCA</td>
<td>Forest and Nature Conservation Act, 1995</td>
</tr>
<tr>
<td>FNCR</td>
<td>Forest and Nature Conservation Rules, 2000</td>
</tr>
<tr>
<td>FYP</td>
<td>Five Year Plan</td>
</tr>
<tr>
<td>GYT</td>
<td>Geog Yargye Tshogchung</td>
</tr>
<tr>
<td>NEC</td>
<td>National Environment Commission</td>
</tr>
<tr>
<td>NECS</td>
<td>National Environment Commission Secretariat</td>
</tr>
<tr>
<td>Nu</td>
<td>Ngultrum (Bhutanese currency; equivalent to Indian Rupees)</td>
</tr>
<tr>
<td>OHS</td>
<td>Occupational Health and Safety</td>
</tr>
<tr>
<td>RECOP</td>
<td>Regulation for the Environmental Clearance of Projects, 2002</td>
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<tr>
<td>RGoB</td>
<td>Royal Government of Bhutan</td>
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<tr>
<td>SEA</td>
<td>Strategic Environmental Assessment</td>
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<tr>
<td>EMF</td>
<td>Environmental Management Framework</td>
</tr>
<tr>
<td>SNV</td>
<td>Netherlands Development Organization</td>
</tr>
<tr>
<td>WB</td>
<td>World Bank</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>-----------------------------------------------------------</td>
</tr>
<tr>
<td>Chathrim</td>
<td>Act, rules and regulations, codes of conduct</td>
</tr>
<tr>
<td>Dzongdag</td>
<td>District Administrator</td>
</tr>
<tr>
<td>Dzongkhag</td>
<td>District</td>
</tr>
<tr>
<td>Dzongkhag Yargye Tshogdu</td>
<td>District Development Committee</td>
</tr>
<tr>
<td>Geog</td>
<td>Lowest Administrative block</td>
</tr>
<tr>
<td>Geog Yargye Tshogchung</td>
<td>Block Development Committee</td>
</tr>
<tr>
<td>Gup</td>
<td>Elected head of a geog</td>
</tr>
<tr>
<td>Ngultrum</td>
<td>Bhutanese currency, pegged to Indian Rupee</td>
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Executive Summary

1. Introduction

 Royal Government of Bhutan has been implementing Rural Access Project (RAP) to improve rural access to market, schools, health centers, and other services in four Dzongkhag, eventually to improve the quality of life and productivity of rural communities under the financial assistance of World Bank and technical support from SNV Bhutan. Under this project, the Environmental Friendly Road Construction Technology was adopted to minimize the adverse environmental impacts and to enhance the project benefits to the extent possible. In order to predict environmental impacts during road constructions and subsequent operations, Environmental Assessment (EA) were carried out for all RAP sub-projects. Accordingly, suitable mitigation measures were designed and recommended to avoid and minimize such impacts.

With the encouraging progress of Rural Access Project, the Royal Government of Bhutan intends to implement the next phase of RAP as follow up/next credit of World Bank. The proposed Rural Access Project II will cover tentatively 65 to 75 Km of Feeder Roads. The sub-projects identified under RAP II include (i) Jangchucholing - Tashidingkha Road (14.3 Km) in Wangdue Dzongkhag, (ii) Kothakpa – Khar - Tsebar Road (10 Km) in Pemagatshel Dzongkhag, and (iii) Drujegang - Balung (42.5 Km) Dagana Dzongkhag. In order to facilitate the formulation of RAP II project, this study has been carried out to prepare consolidated experience of EA process adopted under RAP I and simplify the EA process for RAP II.

The main objectives of the present study primarily include the consolidation of EA experience of Environmental Friendly Road Construction Support Project and RAP I providing specific outputs with specific objective to institutionalizing the environmental conservation aspects covering:

- Assessment of applicable Royal Government of Bhutan’s Environmental Policies and World Bank’s safeguard policies in the form of regulatory framework,
- Assessment of existing institutional capacities to implement environmental management measures(plan), and future requirement of strengthening,
- Development of Environmental Framework, which provides key environmental issues, management measures and implementation mechanism as ready reference guide for addressing typical issues in rural access project.

2. Methodologies

The methodology adopted during the preparation of this document included the review of documents, interaction with stakeholders and information collected from the field during the course of EA studies of Jangchucholing - Tashidingkha Feeder Road Project, which is one of the sub-projects to be constructed under RAP II. The documents reviewed included various RGoB policies, legislation, regulations, and guidelines, as well as the World Bank Safeguard Policies. In addition other relevant documents reviewed included EA studies carried out during RAP I, Progress Report of RAP I and documents related to EFRC.

Consultative meetings and interviews were held with a number of institutions and people. Prominent among them included officials of DOR, NECS, SNV, and other stakeholders. The draft of this document was circulated for review by key stakeholders and comments received have been incorporated.
3. Review of Legal and Regulatory Framework

The RGoB has made considerable progress in the development of environmental law and regulations over the last five years. Much of this development has occurred since the initiation of RAP I, meaning that RAP II will take place in a substantially strengthened regulatory environment.

The most significant laws and regulations relating to environmental protection and with specific relevance to the transport sector are:

* Environmental Assessment Act (2000);
* Regulation on the Environmental Clearance of Projects (2002);
* Regulation on Strategic Environmental Assessment (2002);
* Sectoral Environmental Assessment Guidelines and Environmental Codes of Practice;
* Biodiversity Act 2003;
* Forest and Nature Conservation Act (1995);
* Forest and Nature Conservation Rules (2000);
* Road Act (2004);
* Land Act (1979);
* Mines and Minerals Management Act (1995); and
* Geog Yargay Tshogchung ("GYT") and Dzongkhag Yargay Tshogdu ("DYT") Chatrims (2002)

All but three of these laws and regulations have been enacted since 1999. The most important development in relation to the environmental assessment and management of road development is the implementation of the Environmental Assessment Act (EAA) (2000). The Act is of international "state of the art" standard, is well known to proponents, and is accepted as an integral part of business development activity in the country.

Another important development has been the promulgation of detailed administrative guidelines and regulations. The Regulation for the Environmental Clearance of Projects (RECOP) (2002) now provides adequate detail for the implementation of the EAA. The Regulation is also important because it provides the basis for delegating environmental clearance authority to line Ministries and other Competent Authorities (all of which are specified in Annex 2 of the Regulation).

Legal backing for the Strategic Environmental Framework envisaged by this consultancy is fully provided by the Regulation on Strategic Environmental Assessment (2002). While it has not been used to any significant extent to date, this Regulation provides a powerful basis for future investigation of the environmental impacts associated with policies, programmes, and plans. Analysis of SEA laws and regulations existing in other parts of the world shows that Bhutan's regulation is one of the strongest and all-encompassing.

These laws and regulations relating to environmental assessment are now supported by strong sectoral guidelines and codes of practice, developed by the NEC and by the Department of Roads. These documents help proponents through the environmental clearance administrative system, and assist them with the practicalities of preparing environmental assessment studies, Environmental Management Plans, and Environmental Monitoring Plans.
Executive Summary

The World Bank’s safeguard policy on Environmental Assessment will definitely be applicable to the sub-projects, and the safeguard policies on Natural Habitats may also be applicable, if the feeder roads fall either partially or fully inside Protected Areas or their buffer zones. A comparison of the dictates of these two World Bank policies and national laws and regulations indicates that the Bhutanese environmental regulatory system is entirely capable of meeting the World Bank’s interests.

4. Institutional Arrangement for Implementation

The Department of Roads (DOR) will implement the Environmental Assessment and Environmental Management Framework in close partnership with National Environmental Commission and other stakeholders: In terms of Environmental Assessment implementation, the responsibilities will be based on existing institutional mechanism, which are summarized hereunder:

Ministry of Works and Human Settlement: Review of environmental information related to road projects prepared prior to the project implementation, solicit additional information from DOR if inadequate, provide or deny clearance, if it is listed in annex - 2 of RECOP, forward the documents to NEC requiring EA level studies, review Terms of Reference for EA studies, assess EA report and forward for approval to NEC, conduct environmental monitoring (spot checking or periodic), facilitate environmental monitoring and auditing by NEC.

Department of Roads/Rural Access Project: Field investigation covering feasibility studies, detailed design, implementation of projects, securing of no objection certificates from affected organizations, preparation of environmental information, submission of application of Environmental Clearance, drafting of Terms of Reference for EA studies, conduct EA studies ( either through in-house staff or by engaging consultants), regular monitoring of implementation of EMP. Environment Unit under Department of Roads will primarily responsible for EA related activities.

National Environment Commission Secretariat: Review of Environmental Clearance applications and issuance/ denial of Environmental Clearance; determine if full Environmental Assessment is required; approve terms of reference for full Environmental Assessment; review Environmental Assessment report where full Environmental Assessment is carried out and issue/ deny Environmental Clearance based on such report; carry out periodic spot checks.

Local Government (DYT/GYT)/Local Communities: identification and prioritization of sub-projects, support DOR/RAP to carry out the preparation of environmental information of the project, dissemination of information, mobilization of communities and stakeholders, facilitation of public consultation, monitoring of EMP, and management of disputes.

Recommendations: Based on the review of institutional arrangement, the suitable recommendations have been made to enhance the capabilities of DOR/MOWHS officials and private sectors such as consultants and contractors. The capability enhancement for DOR/MOWHS officials includes training on EMP preparation and implementation, on the job training for EA studies, review and approval, and bio-engineering technology. Similarly, the recommendations are also made to enhance the capabilities of professionals working in relevant private sectors covering training on EA process, preparation and implementation of EMP and design and implementation bio-engineering works.

5. Potential Environmental Impacts

The Rural Access Project is expected to have moderate to low environmental risks, and the project can be identified as "Category B" project based on World Bank classification for Environmental Assessment. The sub-projects under RAP II need to undergo through Environmental Assessment level studies in accordance with the Environmental Assessment Act 2000 and its regulations.
The potential environmental adverse impacts based on the experience of RAP 1, is presented in full reports along with the generic mitigation measures. The impact identification and possible mitigation measures are to be carried out with respect to the site specific conditions and requirements during the preparation of environmental information, and based on such information, the Terms of Reference are to be prepared for full scale EA.

6. Environmental Management Framework

The Sectoral Environmental Management Framework (EMF) outlines the mechanism and procedures for carrying out environmental assessment and management procedures at various stages of project ranging from project identification, feasibility studies, detailed engineering design, construction and subsequent operation and maintenance. The steps include the preparation of Environmental Information (Environmental Brief) required for screening, preparation of Terms of Reference for EA level studies, collection and analysis of environmental baseline information covering physical, biological, social and cultural aspects. In addition, the EMF also include the step for identification, prediction, and evaluation of environmental impacts, alternative analysis, design of mitigation measures, preparation and implementation of Environmental Management planning covering environmental monitoring, and auditing. The methodologies for every step is comprehensively described with formats and matrices, in the framework, which can be used as manual and it will sufficiently facilitate in minimizing the efforts to develop sub-project specific EAs / EMPs.
1 Introduction

1.1 The Context

As a land-locked country, Bhutan’s socio-economic development depends largely on an efficient and reliable road network. The Royal Government of Bhutan (RGOB) has therefore given road infrastructure development a high priority in all past five year plans (FYPs) as well as in current ninth FYP with 9% of total Plan Outlay. As a result, Bhutan has now over 4,392 km motorable road, including 1,579 kms of national highways, 459 km of District Roads, 1270 km of Feeder Roads including project roads, 388 km farm roads, 570 km of forest roads and 125 km of Urban Roads (DOR, 30th June 2005). In spite of remarkable progress, a large number of rural communities still remain unconnected and has to endure long hours of walking to access basic services.

Considering the emergence of expansion of transportation network to provide accessibility to rural community, RGOB is implementing the Rural Access Project (RAP I) with the financial assistance of the World Bank from the year 2000 and expected to be completed by June 2006. The project aims to improve access of rural communities to market, schools, health centers, and other economic and social infrastructures in order to improve the quality of life and productivity of rural areas. The project also aims to help strengthen the institutional capacity for implementing environmentally friendly approaches to improve rural access, community involvement in rural road selection and management, and improved infrastructure maintenance. The project is close to its completion, soon after which RGOB plans to undertake next phase of this project under follow up next credit of the World Bank - as Rural Access Project (RAP II).

The development of road network brings about positive changes for the society in terms of economic and social aspects. However, it also causes adverse impacts on local environment through degradation of physical, biological, socio-economic and cultural environment. In order to conserve the environment and maintain the pace of development in a balanced manner, RGOB has enacted a number of Acts, Regulations, Policies, Standards and Code of Practices. The need for Environmental Assessment (EA) prior to the implementation of development project has been made mandatory. Accordingly, the regulatory institutions have been setup to review the EA report, implement mitigation measures, and conduct environmental monitoring at various stages of development projects. National Environmental Commission (NEC) under Royal Government of Bhutan is mandated as the main regulatory agency to approve the EA reports, and carryout environmental monitoring.

In order to achieve sustainable development, RAP has made attempts to integrate environmental conservation with the road development. Accordingly, Environmental Assessments (EA) were carried for all sub-projects, and environmental mitigation measures suggested were duly implemented during the course of project implementation. Department of Roads (DOR) at present intends to document consolidated experience of EA process adopted in RAP I and simplify the process for follow up project, RAP II.

1.2 Rural Access Project II

Department of Roads is planning to execute the Rural Access Project II (RAP II) as follow up project under next credit of the World Bank and the DOR is currently in the process of formulating the project. The main objective of the proposed project is to provide the connectivity of rural areas to eventually improve the socio-economic status of population living within the zone of influence of the proposed roads under RAP II. Under the RAP II, DOR intends to develop about 65 to 75 Km of feeder roads. The important roads to be constructed under RAP II include:
Environmental Management Framework

Jangchucholing - Tashidingkha Road (14.3 km) in Wangdue Dzongkhag

Kothakpa - Khar - Tsebar Road (10 Km) in Pemagatshel Dzongkhag

Drujegang - Balung (42.5 Km) Dagana Dzongkhag

At present, DOR has completed the detail survey work for Jangchucholing - Tashidingkha road (14.3 km) in Wangdue Phodrang Dzongkhag. The detailed survey of remaining first 15 km of 42.5 km Drujegang - Balung road is currently underway. Simultaneously Environment Assessment, Geotechnical studies and Social Impact Assessment of these two roads are in progress.

1.3 Objectives and Scope of Environmental Management Framework

1.3.1 Key Objectives of EMF

The main objectives of the study as indicated in Terms of Reference include the consolidation of EA experience of Environmental Friendly Road Construction (EFRC) Support Project and RAP I providing specific outputs with a specific objective to institutionalizing the environmental conservation aspects covering:

- The applicable Royal Government of Bhutan’s Environmental Policies and World Bank’s safeguard policies in the form of regulatory framework,
- The existing and future needs in institutional capacities to implement environmental management measures (plan),
- Environmental Framework, which provides key environmental issues, management measures and implementation mechanism. The framework should be a ready reference guide for addressing typical issues in Rural Access Project.

Details of the study objectives, including the terms of reference for the preparation of the Environmental Management Framework (EMF) are presented in Appendix 5.

1.3.2 Approach and Methodology adopted

The methodology adopted for the preparation of the EMF included: (i) review of relevant RGOB’s environmental and other relevant legislations and operational guidelines; (ii) identification of stakeholders and environmental issues; (iii) identification of adverse environmental impacts and strategies on how they could be minimized or mitigated; (iv) identification of positive impacts and how they could be enhanced; (v) incorporation of these findings into EMF; (vi) establishment of indicators and mechanisms for monitoring and evaluation; and, (vii) examination of institutional arrangements.

1.3.2.1 Review of Existing RGOB’s Environmental Legislation and Regulatory Framework

The prevailing regulatory arrangement for Environmental Assessment in terms of screening, review and approval process of screening, scoping exercise, review and approval of EA documents, prevailing threshold limits for carrying out EA, implementation of Environmental Management Plan, Environmental Monitoring and Auditing, etc were assessed. During the course of this exercise, the institutions involved are identified including their roles and responsibilities. This has been done through review of existing documents, legislations, and interview with stakeholders. Effectiveness in identification of gaps, coordination and overlaps of the prevailing regulatory frameworks have been listed and suitable recommendations made for effective implementation of EA.
1.3.3 Institutional Arrangement for Implementation

Under this task, the interaction with stakeholders, field visits to sampled area and review of existing documents and literatures were made to understand the existing institutional arrangement and its functions for environmental management with reference to EFRC and RAP I. Attempts were made to identify the institutions involved covering public, private and civil society with respect to their roles and responsibilities in project implementation. Under this task, the strength and limitations of prevailing institutional arrangements were assessed and suitable recommendations have been made with respect to:

- Relevance to the current institutional setups, constraints, limitations, opportunities to utilize the potential of existing institutions and specific recommendations for mainstreaming the environmental management
- Area of improvement in enforcement and integration of environmental measures/regulations, updating and reporting systems
- Capability strengthening measures covering the existing roles and capacity of implementing agencies and line departments, environmental units, as well as the private contractors, consultants and Non-governmental Organizations (NGOs).

1.3.3.1 Environmental Management Guidance Manual

Under this task, the potential environmental issues arising from road construction and its effective management measures in rural road in Bhutan have been identified and ascertained. For this, secondary information from Environmental Assessment carried out under RAPI, Standard Bidding Documents developed for EFRC/RAP, Bio-engineering manuals developed under RAP, Department for International Development (DFID) supported land slide and environmental management guidelines and other EA studies carried out in neighboring countries were collected and reviewed. Consultations and were made with various stakeholders engaged in road construction and management. Based on these, generic list of environmental issues are identified covering various regions of country.

After accomplishment of above exercises, Environmental Assessment Manual has been prepared for facilitating EA studies in future. The manual covers Identification of environmental issues associated with rural access projects, Data/information and regulatory/institutional structures to be followed for preparation of detailed EAs for sub-projects, and Sectoral Environmental management framework in terms of generic Environmental Management Plan (EMP).
2 Review of Legal and Regulatory Framework

2.1 Introduction

As stated in the Terms of Reference, the purpose of Task 1 is to assess the legal and regulatory framework for the environmental management of road construction in Bhutan. This section will present a brief summary of relevant laws and regulations in place at the time of writing (January 2006). It also compares existing laws/regulations against those in place when RAP I was initiated (i.e. 1999). By way of comparison, conclusions are drawn about the effectiveness of changes made to the regulatory structure over the course of the last seven years. It also includes a comparison between the Bhutan environmental regulatory framework and relevant World Bank Safeguard Policies.

The evaluations includes and assessment of existing responsibilities, legal mandates and performance across environmental and relevant sector agencies to identify effectiveness of coordination, gaps and overlaps. The suggestions thus made are expected to inform and influence regulatory changes, where necessary.

2.2 Summary of Current Laws and Regulations

The RGoB has made considerable progress in the development of environmental law and regulations over the last five years. Much of this development has occurred since the initiation of RAP I, meaning that RAP II will take place in a substantially strengthened regulatory environment.

The most significant laws and regulations relating to environmental protection and with specific relevance to the transport sector are:

* Environmental Assessment Act (2000);
* Regulation on the Environmental Clearance of Projects (2002);
* Regulation on Strategic Environmental Assessment (2002);
* Sectoral Environmental Assessment Guidelines and Environmental Codes of Practice;
* Biodiversity Act 2003;
* Forest and Nature Conservation Act (1995);

1 A number of government policies and guidelines relating to environmental protection are also in place. While these have no legal effect, and so will not be dealt with in any detail in this section, their existence suggests an intention on the part of the RGoB to extend its environmental protection interest. The most significant of these policies are:

* Forest and Nature Conservation Rules (2000);
* Road Act (2004);
* Land Act (1979);
* Mines and Minerals Management Act (1995); and
* Geog Yargay Tshogchung ("GYT") and Dzongkhag Yargay Tshogdu ("DYT") Chatrims (2002)

These laws and regulations are summarized in Table 2.1, along with a comparison of the regulatory situation that existed at the initiation of RAP I.
Table 2.1: Significant Laws and Regulations Relating to Environmental Protection in Bhutan

<table>
<thead>
<tr>
<th>Law/Regulation</th>
<th>Summary of Important Aspects</th>
<th>Comparison with Regulatory Situation at Initiation of RAP I (1999)</th>
</tr>
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<tbody>
<tr>
<td>Environmental Assessment Act (2000)</td>
<td>The Act establishes procedures for the assessment of potential effects of strategic plans, policies, programs, and projects on the environment, and for the determination of policies and measures to reduce potential adverse effects and to promote environmental benefits. It makes environmental clearance (EC) mandatory for any project/activity that may have adverse impact(s) on the environment. Based on the review of environmental information submitted by the project applicant, the National Environment Commission Secretariat (NECS) or the Competent Authority (CA) may issue/ deny EC or determine the need for a full environmental assessment (EA). Where a full EA is determined necessary, the applicant will be asked to prepare EA documents according to the terms of reference (ToR) approved by the NECS. The NECS will review the EA report and accordingly issue/ deny EC. The NECS or CA may issue EC when it is satisfied that: (a) the effects of the project on the environment are foreseeable and acceptable; (b) the applicant is capable of carrying out the terms of EC; (c) the project, alone or in connection with other programmes/activities, contributes to the sustainable development of the Kingdom and the conservation of its natural and cultural heritage; (d) adequate attention has been paid to the interests of concerned people; and (e) the project is consistent with the environmental commitments of the Kingdom. EC for a project shall be reviewed and may be revised and renewed at least every five years, unless a shorter period is stated. The NECS or CA may review and modify the terms whenever there is: (a) unacceptable risks to the environment resulting from the project which were not known at the time the clearance was issued; (b) availability of improved and cleaner technology; and (c) a need to bring the project into compliance with changes to the laws of the country. Non-compliance with environmental terms specified in the issuance of environmental clearance makes the offender liable to penalties that may include compensation for environmental damage, fines, sanctions, and suspension or revocation of environmental clearance in part or full.</td>
<td>The Environmental Assessment Act did not exist at the time of initiation of RAP I, although a Draft Act was in place from 1997. Before the EAA came into force, road construction activities in Bhutan were required to comply with the environmental compliance notification No. NEC/EA/98-99/655 (dated 24th February 1999). While the purpose and content of EA procedures would have been well known to larger proponents through international experience, the EAA has considerably strengthened environmental law in the Kingdom. The Act is of international &quot;state-of-the-art&quot; standard, is well known to proponents, and is accepted as an integral part of business development activity in the country.</td>
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<tr>
<td>Regulation on the Environmental Clearance of Projects (RECOP) (2002)</td>
<td>The Regulation defines responsibilities and procedures for the implementation of the EAA. Its focus is on the issuance and enforcement of EC for individual projects. Its purpose is also to: • provide meaningful opportunities for public review of the potential environmental impacts of projects; • ensure that all projects are implemented in line with the sustainable development policy of the RGoB; • ensure that all foreseeable impacts on the environment, including cumulative effects, are fully considered prior to any irrevocable commitments of resources or funds;</td>
<td>At the time of initiation of RAP I, no detailed administrative guidelines or regulations existed. RECOP now provides adequate detail for the implementation of the EAA.</td>
</tr>
</tbody>
</table>

2 Article 6.11 of the EAA defines Environmental Clearance as the decision, issued in writing by the NECS or the relevant Competent Authority, to let a project proceed, which includes terms (and conditions) to ensure that the project is managed in an environmentally sound and sustainable way.

3 Article 6.4 of the EEA defines a Competent Authority as any agency of RGoB who has the power to issue development consent for a project.
### Environmental Management Framework

#### Law/Regulation

<table>
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<tr>
<th>Summary of Important Aspects</th>
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<tr>
<td>• ensure that all feasible alternatives are fully considered;</td>
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<tr>
<td>• ensure that all feasible means to avoid or mitigate damage to the environment are implemented;</td>
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<tr>
<td>• encourage the use of renewable resources, clean technologies and methods;</td>
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<tr>
<td>• ensure that concerned people benefit from projects in terms of social facilities;</td>
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<tr>
<td>• help strengthen local institutions in environmental decision making; and</td>
</tr>
<tr>
<td>• help create a uniform, comprehensive database on the environmental and cultural conditions and assets in the country.</td>
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</table>

At a minimum, all EC applications must contain the following information:

- potential adverse effects of the project on the environment including direct, indirect and cumulative effects;
- how the project complies with relevant sectoral guidelines or codes of practices, if any, issued by the NECS or CA;
- how the impacts of the project will be avoided, minimized or reduced; and
- the environmental benefits of the project, including how the project will benefit concerned people and use clean and sustainable technologies.

All ECs must contain terms and conditions adequate to fully protect the environment and satisfy the requirements set forth in the Regulation. The EC shall be subject to and contingent upon public notice and the absence of any appeal within 30 days. At the minimum, the EC shall specify binding mitigation and compliance measures, and appropriate monitoring, recording and reporting requirements. Non-compliance with environmental terms prescribed in the issuance of EC makes the offender liable to penalties that may include compensation for environmental damage, fines, sanctions, and suspension or revocation of EC in part or full. The NECS or CA may renew the EC after expiry of its duration if the project is in compliance with the environmental terms or may change the terms and conditions at the time of renewal with a sound justification for such changes in writing to the holder.

The Act requires that all CAs establish an environmental unit to implement the EA process for projects/activities assigned to them. The NECS may require the applicant to designate a focal person to ensure compliance with the terms of EC. All significant projects are required to establish an environmental unit responsible for ensuring compliance with the terms of EC. Annex 2 of the Regulation lists projects/activities for which competent authorities have been assigned for screening and issuance/denial of environmental clearance, and projects/activities that do not require EC. For activities that are not listed in the aforesaid Annex, EC must be secured from the NECS.

**Regulation on Strategic Environmental Assessment (2002).**

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<tr>
<th>The purpose of this regulation is to:</th>
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<tr>
<td>• Ensure that environmental concerns are fully taken into account by all government agencies when formulating, renewing, modifying or implementing any policy, plan or programme, including Five-Year developmental plans under Articles 7 and 32.2 of the EAA 2000. Agencies are required to perform a Strategic Environmental Assessment before any of the abovementioned proposals are adopted by the Royal Government of Bhutan. Agencies are required to include an &quot;environmental statement&quot; in the draft of the proposal;</td>
</tr>
<tr>
<td>• Ensure that the cumulative and large scale environmental effects are taken into consideration while formulating, renewing, modifying or implementing any policy, plan or programme;</td>
</tr>
<tr>
<td>• Complement project-specific environmental reviews as per RECOP and to encourage early identification of environmental objectives and impacts of all government proposals at appropriate planning levels;</td>
</tr>
<tr>
<td>• Promote the design of environmentally sustainable proposals that encourage the use of renewable resources and clean</td>
</tr>
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</table>

**Comparison with Regulatory Situation at Initiation of RAP I (1999)**

- The Regulation is also important because it provides the basis for the delegation of EC power to line Ministries and other Competent Authorities (specified in Annex 2 of the Regulation).
- Over the last 2 or 3 years, NEC has been gradually delegating its EC powers to Competent Authorities. The most recent example of this trend has been the establishment of District Environment Committees (DECs) in all 20 Dzongkhags. The NEC is currently helping these DECs to build capacity, through training of the Committees themselves, and through aid-funded scholarships for future Executive Officers.
- This designation of Competent Authorities (especially DECs) is a good example of effective decentralization, which is an important part of RGoB policy.
Environmental Management Framework

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<tr>
<td>Sectoral Environmental Assessment Guidelines, Environmental Codes of Practice, and other Guidelines.</td>
<td>Technologies and practices; and Promote and encourage the development of comprehensive natural resource and land use plans at the local, dzongkhag, and national levels.</td>
<td>As such, it provides an excellent legal backing for the Strategic Environmental Framework proposed by this project.</td>
</tr>
</tbody>
</table>

Sectoral guidelines for EA were first formulated in 1999, preceding the enactment of the EAA in 2000. At that time, the guidelines pertained to hydropower, power transmission lines, highways and roads, forestry, mining and mineral processing, and new and existing industries. In 2003/04, the NECS undertook a revision of these sectoral EA guidelines with assistance from the Asian Development Bank (ADB). In addition, it also developed new guidelines for the tourism and urban development sectors, and environmental codes of practices (ECOP) for storm water drainage systems and installation of underground and overhead utilities. Information required to be submitted for EC in accordance with the new Guidelines include:

- Applicant's details;
- Project objectives;
- Relevance to overall planning;
- Funding and costs, including environmental management costs;
- Project description, including project location, category and length of the road, road specifications, management of excavated materials, and quantity of explosives and the techniques that will be employed in their use;
- Alternatives in terms of the project itself and road alignment;
- Details of public consultation;
- Project site environmental details such as topography, geology, and water courses;
- Project site ecological details such as land use and vegetation, protected areas, and wildlife and flora;
- Project site social details such as beneficiary population and affected properties (including cultural properties);
- Impacts and mitigation measures.

The Guidelines are important because the RECP (in Article 28.2(b)) requires that proponents "comply with relevant sectoral guidelines or codes of best practices" when they present environmental information to Competent Authorities. The Department of Roads (Ministry of Works and Human Settlement) has also produced a separate Environmental Codes of Practice (Highways and Roads). This is still in draft form.


As a consequence, the NEC revised the 6 sectoral guidelines in 2003/4, and added two more. The new guidelines provide specific advice to proponents as to how to proceed towards Environmental Clearance, including suggestions as to how to prepare EA studies and documentation. The 8 NEC Guidelines and two Environmental Codes of Practice have recently been supplemented by a draft Department of Roads Environmental Codes of Practice, and guidelines for the preparation of Environmental Management Plans. These Guidelines and Codes of Practice now provide strong support for proponents wanting to develop new projects that might have environmental impact.
## Environmental Management Framework

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<tr>
<td>Biodiversity Act 2003.</td>
<td>The Biodiversity Act of Bhutan 2003 asserts the sovereignty of the country over its genetic resources, the need to promote conservation and sustainable use of biodiversity resources as well as equitable sharing of benefits arising from sustainable use, and the need to protect local people's knowledge and interests related to biodiversity. It lays down the conditions for the grant of access, benefit sharing, and protection, and describes various rights, offences and penalties.</td>
<td>This Act did not exist at the time of initiation of RAP I. While it does not have significant impact for transport-related proposals, it does provide stronger support for the conservation of biodiversity than existed in 1999.</td>
</tr>
<tr>
<td>Forest and Nature Conservation Act (1995).</td>
<td>The first environmental legislation to be passed in Bhutan was the Bhutan Forest Act 1969, which brought all forest resources under government custody with the intent to regulate forest utilization and control excessive forest exploitation. This law was repealed in 1995 with the enactment of the Forest and Nature Conservation Act (FNCA) 1995, in keeping with evolving conservation needs and to allow for community stewardship of forests. The objective of the FNCA is to &quot;provide for the protection and sustainable use of forests, wildlife and related natural resources of Bhutan for the benefit of present and future generations.&quot; It covers forest management, prohibitions and concessions in government reserved forests, forestry leases, social and community forestry, transport and trade of forestry produce, protected areas, wildlife conservation, soil and water conservation, forest fire prevention, and enforcement and penalties.</td>
<td>This Act existed at the time of initiation of RAP I. It provides a strong legal basis for the protection of forests and nature reserves, and has significant impact on the planning of forest roads.</td>
</tr>
<tr>
<td>Forest and Nature Conservation Rules (2000).</td>
<td>In accordance with the powers and duties conferred under the FNCA, the Ministry of Agriculture has promulgated the Forest and Nature Conservation Rules (FNCR) 2000, to allow for: • preparation, review, approval, implementation, monitoring and evaluation of forest management plans; • reservation of government reserved forests, allotment of land and land rights in government reserved forests, regulation of activities in lands allotted for private use, collection of forest produce from government reserved forests, compensation for acquired lands, prohibitions, restrictions and concessions in government reserved forests, and forestry leases; • creation of private and community forests, including procedures for registration of private and community forests and effects consequent upon registration, management and use of community forest resources, and responsibilities and powers of the community forest management group and concerned government agencies; • transport and trade of forest produce, including extraction and marketing procedures and inspection of forest produce in transit or in trade; • declaration of protected areas, administration of PAs, and prohibitions in PAs; • protection of wildlife and use of certain wild species; • prevention of forest fires, land clearance, and activities potentially impacting soil, water and wildlife resources; and • enforcement and penalties for offences related to all of the above.</td>
<td>This Regulation did not exist at the time of initiation of RAP I. It provides detail for the implementation of the Forest and Nature Conservation Act (1995).</td>
</tr>
<tr>
<td>Road Act (2004).</td>
<td>This Act establishes powers and responsibilities for various agencies for road planning, design, construction and maintenance at the central, dzongkhag, geog, and municipal levels. The Act also provides the framework for setting technical standards and requirements. In relation to environmental management, Section 4(1)(h) gives the Department of Roads the power to adopt and promote environment-friendly techniques in the implementation of road activities. Section 7(2) requires that agencies responsible for road construction and maintenance works conform to &quot;environmental considerations&quot;, &quot;geological stability considerations&quot;, and &quot;preservation of agricultural land&quot; (amongst other things).</td>
<td>This Act did not exist at the time of initiation of RAP I. It provides the Department of Roads with power to adopt environment-friendly construction techniques, and requires agencies responsible for</td>
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## Environmental Management Framework

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| **Land Act (1979)** | This Act stipulates procedures and requirements for:  
- the registration of land;  
- entitlement to land;  
- right of possession of land;  
- land valuation and taxation;  
- land transactions;  
- allotment of government land;  
- construction or renovation of social infrastructure such as irrigation channels and roads on landed property;  
- sharing of benefits from such infrastructure;  
- use of grazing land;  
- land tenancy; and  
- land conversion and encroachment.  
At the time of writing, a national Task Force is reviewing and revising the Land Act, to make it more suitable for evolving development needs. | This Act existed at the time of initiation of RAP I. The Act is undergoing review at the time of writing, and may well end up providing additional environmental controls on the use and management of land. |
| **Mines and Mineral Management Act (1995)** | This Act recognizes the preservation, protection, and setting of environmental standards, and conservation of natural resources consistent with the provisions of the Act and other environmental legislation. It requires that restoration of mined areas is carried out in a proper manner, the objective being to create a suitable and acceptable environment as approved by the National Environment Commission. Prior to granting a mining lease, a final mine feasibility study based on an assessment of technical, financial, environmental, and social parameters, is required. Among other things, the feasibility study needs to contain a Mine Plan, Environmental Management Plan and Restoration Plan. | This Act existed at the time of initiation of RAP I. While it has little impact on feeder road construction, it does provide strong environmental controls over mining activities (before, during, and after extraction), and provides additional legal support to the EAA. |
- the requirement of environmental clearance (Articles 32-34);  
- conditions for an environmental restoration bond (Articles 56-61);  
- maintenance of records on mining operation, including environmental protection measures (Article 86, clause 86.8);  
- compliance with all emission limits and ambient air quality standards adopted by the National Environment Commission (Articles 154 and 155);  
- water, dust and noise pollution management needs (Articles 159-170);  
- monitoring of environmental quality in and around the mine lease area and reporting of the area's environmental state (Articles 182-184). | These Regulations did not exist at the time of initiation of RAP I. They provide very strong support for aspects of the EAA, by formally stipulating the need for mining to require environmental clearance, and requiring adherence to emission limits, and monitoring. |
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</table>
| Geog Yargay Tshogchung ("GYT") and Dzongkhag Yargay Tshogdu ("DYT") Chatrims (2002). | The Chatrims were enacted to support the decentralization policy and empower locally elected community bodies (DYTs and GYTs) with the authority and responsibility to decide, plan and implement development programmes and activities, including those concerning environmental management. Powers and functions vested in the DYTs and GYTs in relation to environmental management are specified below. **Environment-related provisions in DYT Chatrims, 2002** Article 8 of the DYT Chatrims 2002 gives the DYT the power and function to:  
- promote awareness and dissemination of national objectives (section 3);  
- adopt procedures and rules to implement national laws, wherever relevant (section 10); and  
- make recommendations on activities with major environmental impacts such as construction of roads, extraction and conservation of forests, mining and quarrying (section 13). Article 9 of the DYT Chatrims 2002 gives the DYT the power and function to adopt and enforce regulations with respect to:  
- designation and protection of monuments and sites of cultural and historical interests (section 1);  
- designation and protection of areas of special scenic beauty or biodiversity, such as dzongkhag parks and sanctuaries (section 2);  
- control of noise pollution (section 8);  
- establishment of quarries and mines in accordance with Mines and Mineral Management Act 1995; and  
- protection of public health as per prevailing national guidelines or Acts (section 14). Article 10 of the DYT Chatrims, 2002, gives the DYT broad administrative power and function to give direction and approval on:  
- construction of farm and feeder roads (section 5);  
- forest management plan including extraction, conservation and forest road construction in accordance with the FNCA (section 8);  
- protection of forests, tsamdo and all types of government and community lands from illegal house and similar construction and other encroachments (section 19);  
- control of construction of structures, whether on national, communal or private lands, within 50 feet of highways, including enforcement of measures such as cessation of construction and demolition of the structures (section 20);  
- choice of trekking routes and camps for tourists (section 22); and  
- mobilization of voluntary actions in times of natural catastrophes and emergencies (section 26). Article 13 of the DYT Chatrims 2002 gives the Dzongkhag Administration the powers and functions to:  
- construct farm and feeder roads, in conjunction with the NEC (section 5);  
- determine the choice of design, construction methods and building materials for forms, which do not have to follow standard designs in conformity with acceptable technical and structural norms (section 12); and  
- approve allocation of timber permits as per the rules and regulations issued by the MoA from time to time (section 16). **Environment-related provisions in GYT Chatrims 2002** Article 8 of the GYT Chatrims 2002 gives the GYT the power and function to adopt and enforce regulations at the geog level with respect to:  
- safe disposal of waste (section 1);  
- control and prevention of pollution of air, soil and water (section 2);  
| These laws did not exist at the time of initiation of RAP I. The Chatrims were specifically enacted to support the Government's decentralization policy. They provide considerable power to the regional (Dzongkhag) and local (geog) levels of government. Strong environmental provisions are not yet being fully exercised, but the laws provide for Dzongkhags and Geogs to have substantial control over environmental protection. At the Dzongkhag level, this power will be exercised primarily by the District Environment Committees. |
Environmental Management Framework

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<tr>
<td>* sanitation standards (section 3);</td>
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<tr>
<td>* control of communicable livestock diseases within the geog in accordance with the Livestock Act 2001 (section 4);</td>
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<tr>
<td>* allocation of safe and clean drinking water from water supply schemes (section 5);</td>
<td></td>
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<tr>
<td>* allocation of irrigation water, in accordance with the provision of the Land Act 1979 (section 6); and</td>
<td></td>
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<tr>
<td>* protection and harvesting of edible forest products in the local area in accordance with the Forest and Nature Conservation Act 1995 (section 8).</td>
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</table>

Article 9 of the GYT Chathrim 2002 gives the GYT broad administrative power and function at the geog level with respect to:

- administration, monitoring and review of all activities that are part of the geog plan, including the maintenance of community properties such as lhakhangs, goendey, nangtens, choerten, mani dangrem, water supply schemes, irrigation channels, footpaths, mule tracks, farm and feeder roads, suspension and cantilever bridges, micro-hydeles, basic health units and outreach clinics, lower secondary school and community schools, and extension centers of the RNR sector (section 2);
- conservation and protection of water resources, lakes, springs, streams, and rivers (section 7);
- custody and care of communal lands, community forests, including sokshing and nyekhor tsamdo, medicinal herbs and prevention of illegal house construction and all other types of encroachments on land and forests (section 8); and
- prevention of construction of structures, whether on national, communal or private lands, within 50 feet of highways falling in local area (section 9).
2.2.1 Discussion

An analysis of Table 2.1 indicates that the environmental regulatory structure in Bhutan has changed substantially since RAP I was initiated in 1999. All but three of the laws/regulations summarized in Table 2.1 have been enacted since 1999.

The last six years has seen a considerable strengthening of environmental laws, regulations, and guidelines. The right hand column of Table 2.1 provides detailed comment on the nature of these changes.

The most important development in relation to the environmental assessment and management of road development is the development and implementation of the Environmental Assessment Act (EAA) (2000).

This law did not exist at the time of initiation of RAP I. The Act is of international standard, well known to proponents, and is widely accepted as an integral part of business development activity in the country.

Another important development has been the promulgation of detailed administrative guidelines and regulations. The Regulation for the Environmental Clearance of Projects (RECOP, 2002) now provides adequate detail for the implementation of the EAA. The Regulation is also important because it provides the basis for the delegation of environmental clearance power to line Ministries and other Competent Authorities (all of which are specified in Annex 2 of the Regulation).

Over the last 2 or 3 years, NEC has been gradually delegating its EC powers to Competent Authorities. The most recent example of this trend has been the establishment of District Environment Committees (DECs) in all 20 Dzongkhags. The NEC is currently helping these DECs to build their professional capacity. This designation of Competent Authorities (especially DECs) is a good example of effective decentralization, which is an important part of RGoB policy. Legal support for this delegation can also be found in the Geog Yargay Tshogchung ("GYT") and Dzongkhag Yargay Tshogdu ("DYT") Chatrims (2002).

The environmental assessment laws and regulations are now supported by strong sectoral guidelines and codes of practice, developed by the NEC and by the Department of Roads. These documents help proponents through the environmental clearance administrative system, and assist them with the practicalities of preparing environmental assessment studies, Environmental Management Plans, and Environmental Monitoring Plans.

The regulatory structure outlined above is strongly supported by interlinked environmental provisions in the: Biodiversity Act (2003); the Forest and Nature Conservation Act (1995) and Rules (2000); the Road Act (2004); the Land Act (1979); and the Mines and Mineral Management Act (1995) and Regulations (2002).

This analysis indicates that the environmental regulatory structure has improved substantially since 1999. While there are no glaring "gaps" or evident duplications in the existing environmental regulatory structure, some minor suggestions for improving coordination of laws, and providing better legal protection for water resources are outlined at the end of this section.
2.3 Comparison between Bhutanese Environmental Regulatory Structure, and World Bank Safeguard Policies

2.3.1 Introduction

The Bank's safeguard policies require that potentially adverse environmental impacts and selected social impacts of Bank Group investment projects are identified, avoided or minimized where feasible, and mitigated or monitored. To ascertain that these are adequately addressed through the Bhutanese environmental regulatory structure, an assessment of the relationship between World Bank environmental safeguard policies and Bhutanese environmental regulatory structure is carried out. Social impact issues are dealt with in a separate study.

The safeguard policies provide a mechanism for integrating environmental and social concerns into development decision making. Most safeguard policies provide that: (a) potentially adverse environmental impacts as well as specific social impacts should be identified and assessed early in the project cycle; (b) unavoidable adverse impacts should be minimized or mitigated to the extent feasible; and (c) timely information should be provided to the stakeholders, who should have the opportunity to comment on both the nature and significance of impacts and the proposed mitigation measures.

The environment-related safeguard policies that are potentially relevant to this project are Environmental Assessment (OP 4.01), Natural Habitats (OP 4.04), and Forests (OP 4.36).

The Environmental Assessment Policy (OP 4.01) requires environmental assessment of all projects/activities that are proposed for World Bank financing and are likely to have potential environmental risks and adverse impacts in their area of influence. The sub-projects would appear to trigger the EA Safeguard Policy as they will involve development of rural infrastructure that is likely to have impacts on land, water, air, vegetation, and cultural property.

In addition, the concept of developing a Strategic Environmental Framework fits well with the World Bank's attempts to apply Sectoral Environmental Assessment and Regional Environmental Assessment in recent years. Guidelines for WB SEA can be found in Environmental Assessment Sourcebook Updates.

The key requirement of the Natural Habitats Policy (OP 4.04) is to discourage conversion or degradation of critical natural habitats, whether directly through construction or indirectly through human activities induced by the project activities. It is possible that this Policy might be applicable, but only if the sub-projects fall partially or fully inside Protected Areas or their buffer zones.

The purpose of the World Bank's OP 4.36 (Forests) policy is to assist borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development, and protect the vital local and global environmental services and values of forests. The Policy applies to the following types of Bank-financed investment projects:

a) projects that have or may have impacts on the health and quality of forests;

b) projects that affect the rights and welfare of people and their level of dependence upon or interaction with forests; and

c) projects that aim to bring about changes in the management, protection, or utilization of natural forests or plantations, whether they are publicly, privately, or communally owned.
The Policy is primarily aimed at forest management and commercialization projects. As RAP II is likely to have very little impact on the health and quality of forests, its relevance is also limited. However, as with Natural Habitats, this report will briefly discuss its applicability.

A comparison between the three World Bank Safeguard Policies and existing national provisions in Bhutan is contained in Table 2.2. This follows the format for Equivalence Assessment, as outlined in the World Bank’s OP 4.00 (Piloting the Use of Borrower Systems to Address Environmental and Social Safeguard Issues in Bank-Supported Projects), and the Interim Guidance Note (Piloting the Use of Borrower Systems to Address Environmental and Social Safeguard Issues in Bank-Supported Projects).

While it is accepted that the Bank is ultimately responsible for undertaking equivalence assessment, choosing this matrix format allows for a recognized approach to be taken, and enables gaps to be identified and recommendations made as to how these might be bridged.

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4 Dated March 2005
5 Dated June 21, 2005
Table 2.2: Comparison between World Bank Environmental Safeguard Policies and Regulations Relating to Environmental Protection in Bhutan

<table>
<thead>
<tr>
<th>World Bank Safeguard Policy^</th>
<th>Specific Operational Principles or Impacts</th>
<th>RGoB Equivalent Requirement</th>
<th>Possible Improvement Measures (based on similarities/differences between approaches)</th>
</tr>
</thead>
</table>
| OP 4.01: ENVIRONMENTAL ASSESSMENT | 1. Use a screening process. Use sectoral or regional strategic environmental assessment when appropriate.  
2. Assess potential impacts.  
3. Assess adequacy of legal and institutional framework.  
5. Where applicable, normally apply the Pollution Prevention and Abatement Handbook.  
6. Prevent, minimize, or compensate for adverse project impacts.  
7. Involve stakeholders.  
8. Use independent expertise in preparation of EA.  
9. Provide measures to link the EA process and findings with studies of economic, financial, institutional, social and technical analyses of a proposed project.  
10. Disclose EA in a timely manner. | EAA (Articles 7 to 10) and RECOP (Sections 16 to 19) make environmental assessment mandatory, and environmental clearance a prerequisite for all projects/activities that may have adverse environmental impacts. NEECS is the overall authority for the environmental assessment process and the environmental clearance authority for feeder roads and other activities not listed in Annex II of RECOP. RECOP makes it clear that proponents of feeder roads need to follow the guidance provided in the Application for Environmental Clearance Guideline for Highways and Roads (2004). The following Codes of Practice and Guidelines are also relevant: The Department of Roads (Ministry of Works and Human Settlement), Environmental Codes of Practice (Highways and Roads). The Department of Roads Guidelines for Preparation of Environmental Management Plan, Version I. Royal Government of Bhutan, Department of Roads, Ministry of Works and Human Settlement. Environment Friendly Road Construction – Support Project. July 2005). The Regulation on Strategic Environmental Assessment (2002) makes it a requirement for all agencies implementing a policy, plan, or programme to perform a Strategic Environmental Assessment. Screening requirements are outlined in section 28 of RECOP. Environmental (including social) assessment procedures are outlined in section 29 of RECOP. Assessment of alternatives is required by the Application for Environmental Clearance Guideline for Highways and Roads (2004). Prevention, minimizing, or compensation for adverse project impacts is required as part of Environmental Management Planning, which may comprise part of environmental clearance conditions. Consultation requirements are outlined in section 31 of RECOP, and in Application for Environmental Clearance Guideline for Highways and Roads (2004). Private consultants are employed by proponents to undertake EA work. |

^ Objectives and Operational Principles are taken directly from OP 4.00 (Piloting the Use of Borrower Systems to Address Environmental and Social Safeguard Issues in Bank-Supported Projects: March 2005).
### Environmental Management Framework

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<td>OP 4.04: NATURAL HABITATS</td>
<td>1. Use a precautionary approach to natural resources management to ensure opportunities for environmentally sustainable development. Determine if project benefits substantially outweigh potential environmental costs. 2. Avoid conversion or degradation of critical natural habitats, including those habitats that are: (i) legally protected; (ii) officially proposed for protection; (iii) identified by authoritative sources for their high conservation value; or (iv) recognized as protected by traditional local communities. 3. Where projects adversely affect non-critical habitats, proceed only if viable alternatives are not available, and if appropriate conservation and mitigation measures, including those required to maintain ecological services they provide, are in place. 4. Whenever feasible, give preference to siting projects on lands already converted. 5. Consult key stakeholders, including local NGOs and local communities, and involve such people in design, implementation, monitoring, and evaluation of projects, including mitigation planning. 6. Provide for the use of appropriate expertise for the design and implementation of mitigation and monitoring plans. 7. Disclose draft mitigation plan in a timely manner, before appraisal formally begins, in an accessible place and in a form and language understandable to key stakeholders.</td>
<td>Section 62 of the Forests and Nature Conservation Rules (FNCR 2000) prohibits any human activities within the core zone of a protected area unless determined necessary by forest/protected area officials to achieve nature conservation objectives. Section 62 of FNCR also prohibits any construction activities within a protected area except with a written permit or authorization from the Ministry of Agriculture. Section 70 of FNCR stipulates that land clearance should be avoided in protected areas, water catchment areas and areas containing high forest. Section 70 of FNCR also stipulates that land clearance shall not be permitted within 100 feet on either side of the banks of rivers, streams or water sources kept as riparian reserves for conservation. As per the RECOP (Section 17 and 18), official clearance from the Department of Forests is mandatory for projects/activities that affect natural habitats. The Sectoral EA Guidelines for Highways and Roads stipulates a full EA for any road that is located in or goes through a protected area. Assessment of alternatives is required by the Application for Environmental Clearance Guideline for Highways and Roads (2004). Prevention, minimizing, or compensation for adverse project impacts is required as part of Environmental Management Planning, which may comprise part of environmental clearance conditions (as specified in RECOP). Consultation requirements are outlined in section 31 of RECOP, and in Application for Environmental Clearance Guideline for Highways and Roads (2004).</td>
<td>A combination of the Forests and Nature Conservation Rules and the Environmental Assessment Act meet the objectives of the Safeguard Policy, and of the Operational Principles. The only missing aspect is a formal commitment to the Precautionary Principle. It is therefore recommended that the Environmental Assessment Act be amended to incorporate this principle. Alternatively, it could be included in the proposed National Environmental Protection Act.</td>
</tr>
<tr>
<td>OP 4.36: FORESTS</td>
<td>1. The Bank does not finance projects that would involve significant conversion or degradation of critical forest areas or related critical natural habitats. The terms “significant conversion”, “critical forest area”, and “critical natural habitats” are defined in</td>
<td>Section 62 of the Forests and Nature Conservation Rules (FNCR 2000) prohibits any human activities within the core zone of a protected area unless determined necessary by forest/protected area officials to achieve nature conservation objectives. Section 62 of FNCR also prohibits any construction activities</td>
<td>A combination of the Forests and Nature Conservation Rules and the Environmental Assessment Act meet the objectives of the Safeguard Policy, and of the Operational Principles.</td>
</tr>
<tr>
<td>World Bank Safeguard Policy</td>
<td>Specific Operational Principles or Impacts</td>
<td>RGoB Equivalent Requirement</td>
<td>Possible Improvement Measures (based on similarities/differences between approaches)</td>
</tr>
<tr>
<td>-----------------------------</td>
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<tr>
<td>reduction and sustainable development. The objective of the Policy is to assist borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development, and protect the vital local and global environmental services and values of forests.</td>
<td>OP 4.04 (Natural Habitats). 2. The Bank may finance commercial harvesting operations only when the Bank has determined, on the basis of the applicable environmental assessment or other relevant information, that the areas affected by the harvesting are not critical forests or related critical natural habitats. 3. In accordance with OP 4.01 (Environmental Assessment), the environmental assessment for an investment project addresses the potential impact of the project on forests and/or the rights and welfare of local communities. 4. Screen as early as possible for potential impacts on forest health and quality and on the rights and welfare of the people who depend upon them.</td>
<td>within a protected area except with a written permit or authorization from the Ministry of Agriculture. Section 70 of FNCR stipulates that land clearance should be avoided in protected areas, water catchment areas and areas containing high forest. Section 70 of FNCR also stipulates that land clearance shall not be permitted within 100 feet on either side of the banks of rivers, streams or water sources kept as riparian reserve for conservation. As per the RECOP (Section 17 and 18), official clearance from the Department of Forests is mandatory for projects/activities that affect natural habitats. The Sectoral EA Guidelines for Highways and Roads stipulates a full EA for any road that is located in or goes through a protected area. Assessment of alternatives is required by the Application for Environmental Clearance Guideline for Highways and Roads (2004). Prevention, minimizing, or compensation for adverse project impacts is required as part of Environmental Management Planning, which may comprise part of environmental clearance conditions (as specified in RECOP). Consultation requirements are outlined in section 31 of RECOP, and in Application for Environmental Clearance Guideline for Highways and Roads (2004).</td>
<td>A combination of the RECOP and DYT &amp; GYT Chathrim 2000 meet the objectives of the Safeguard Policy, and of the Operational Principles.</td>
</tr>
</tbody>
</table>

OP 11.03: Cultural Property
Cultural property includes sites having archeological (prehistoric), paleontological, historical, religious, and unique natural values. Cultural property, therefore, encompasses both remains left by previous human inhabitants (for example, middens, shrines, and battlegrounds) and unique natural environmental features such as canyons and waterfalls. The rapid loss of cultural property in many countries is irreversible and often unnecessary.

The World Bank's general policy regarding cultural properties is to assist in their preservation, and to seek to avoid their elimination. Specifically:
(a) The Bank normally does not finance projects that will significantly damage non-replicable cultural property, and will assist only those projects that are sited or designed so as to prevent such damage.
(b) The Bank will assist in the protection and enhancement of cultural properties encountered in Bank-financed projects, rather than leaving that protection to chance. In some cases, the project is best relocated in order that sites and structures can be preserved, studied, and restored intact in situ. In other cases, structures can be relocated, preserved, studied, and restored on alternate sites. Often, scientific study, selective salvage, and museum preservation before destruction is all that is necessary.

The Section 17 and subsection 17.2 of RECOP specifically requires that environmental clearance application be supported by clearance from the Ministry of Home and Cultural Affairs if the project involves activities within 50 meters distance of a Cultural Site or sacred landscape.

The DYT and GYT Chathrim 2000 also provide adequate mandate for the protection of cultural properties at the local level as is evident from the following provisions contained therein:
- Article 9 of the DYT Chathrim 2002 grants the DYT the mandate to adopt and enforce regulations, among others, for designation and protection of monuments and sites of cultural and historical interests; and
- Article 9 of the GYT Chathrim 2002 grants the GYT the mandate at the Geog level pertaining to, among others, administration, monitoring and review of all activities that are part of the Geog's plans, including the maintenance of community properties such as takhangs (temples), goendeys (monastic institution) and their nangtens (religious treasures), chortens (stupas), mani dangrems (Stupas), and protection and preservation of nay (sacred natural features), naykhang (abode of deities) or yulha and
<table>
<thead>
<tr>
<th>World Bank Safeguard Policy</th>
<th>Specific Operational Principles or Impacts</th>
<th>RGoB Equivalent Requirement</th>
<th>Possible Improvement Measures (based on similarities/differences between approaches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most such projects should include the training and strengthening of institutions entrusted with safeguarding a nation's cultural patrimony. Such activities should be directly included in the scope of the project, rather than being postponed for some possible future action, and the costs are to be internalized in computing overall project costs.</td>
<td>zhiday, which are not part of custody of a monastic body or government agencies.</td>
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<tr>
<td>(c) Deviations from this policy may be justified only where expected project benefits are great, and the loss of or damage to cultural property is judged by competent authorities to be unavoidable, minor, or otherwise acceptable. Specific details of the justification should be discussed in project documents.</td>
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<tr>
<td>(d) This policy pertains to any project in which the Bank is involved, irrespective of whether the Bank is itself financing the part of the project that may affect cultural property.</td>
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</tbody>
</table>
2.3.2 Discussion

An analysis of the information contained in Table 2.2 indicates that the World Bank Safeguard Policy on Environmental Assessment will definitely be applicable to the sub-projects, and that the Safeguard Policies on Natural Habitats and Forests may be applicable, if the feeder roads fall either partially or fully inside Protected Areas or their buffer zones.

The Environmental Assessment Policy requires environmental assessment of all projects/activities that are proposed for World Bank financing and are likely to have potential environmental risks and adverse impacts in their area of influence. The sub-projects would appear to trigger the EA Safeguard Policy as they will involve development of rural infrastructure that is likely to have impacts on land, water, air, vegetation, and cultural property.

Existing national legal and regulatory provisions appear to more than adequately meet the demands of the EA Safeguard Policy. Environmental Assessment Act (Articles 7 to 10) and RECOP (Sections 16 to 19) make environmental assessment mandatory and environmental clearance a prerequisite for all projects/activities that may have adverse environmental impacts. In addition, RECOP makes it clear that proponents of feeder roads need to follow the elaborate guidance provided in the Application for Environmental Clearance Guideline for Highways and Roads (2004). Codes of Practice and Guidelines produced by the Department of Roads are also relevant.

Existing Bhutanese laws and regulations for habitat protection also appear to meet the requirements of the Natural Habitats and Forests Safeguard Policies. Various provisions of the Forest and Nature Conservation Rules (2000), the Regulation for the Environmental Clearance of Projects (2002), and Department of Roads Guidelines and Codes of Practice, make it clear that environmental assessment and official clearance is mandatory for projects that affect significant natural habitats. For example, the Forest and Nature Conservation Act (1995) prohibits any construction, including motor roads, buildings, fences, or any other physical structures inside a protected area, except with written permission or authorization from the Ministry of Agriculture. In addition, at the dzongkhag level, the DYT is empowered by the DYT Chathrim 2002 to make recommendations on activities with major environmental impacts such as construction of roads, extraction and conservation of forests, mining and quarrying and to enforce regulations with respect to designation and protection of areas of special scenic beauty or biodiversity as dzongkhag parks and sanctuaries.

At the geog level, the GYT is vested with broad administrative power and function with respect to conservation and protection of water resources, lakes, springs, streams, and rivers, prevention of encroachments on land and forests, and protection and preservation of sacred sites.

The analytical comparison of the dictates of World Bank Environmental Safeguard Policies and national laws and regulations, show that the Bhutanese environmental regulatory system is entirely capable of meeting the World Bank's interests. In fact, with regard to Paris Declaration alignment concepts, Bhutan's rules are more stringent than those of the World Bank.

2.4 Conclusion and Recommendations for Regulatory Reform

In Section 2.2.1, a conclusion was made that the environmental regulatory structure has improved substantially since 1999. The analysis indicated that there are no glaring "gaps" or evident duplications in the existing environmental regulatory structure.

The above comparison of World Bank policies with Bhutanese national laws and regulations indicated that there is no need for reform of local laws/regulations to meet the demands of the Bank's Environmental Safeguard Policies.
Environmental Management Framework

While the environmental regulatory structure is inter-linked and strong, there are two areas where new laws could complete an already admirable system. For some time, the RGoB has been pursuing the enactment of a National Environmental Protection Act (NEPA) to act as a symbolic "umbrella" act for all other environmental laws, and to provide an overall legal framework for the functions of the National Environment Commission. NEPA would also enshrine public rights to a clean environment, and would clarify the situation with regard to penalties for pollution. The development of this new Act has been supported by DANIDA, through its funding to the Environment and Urban Sector Programme Support grant to the RGoB.

The second area where the law could be further strengthened relates to better protection for water resources. Water is an extremely important natural resource in Bhutan, in part because projected hydropower expansion provides an opportunity for financial self-reliance in the near future. While water quality is protected to a considerable extent by existing laws (especially the Environmental Assessment Act), it has no dedicated legal protection, and no government agency with a specific mandate to protect it. A new Water Act has been proposed, and financial support for its development has been arranged through DANIDA’s Environmental and Urban Sector Programme Support.

Apart from these suggestions for new laws, no other obvious gaps or duplications exist. The same conclusion, however, cannot be made for institutional arrangements. Decentralization of environmental laws to the dzongkhags has made capacity constraints clear, and bureaucratic duplications are obvious. Areas where institutional reform may be necessary are discussed in Section 3.

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7 EUSPS provides Nu. 770 million to three agencies of the RGoB over the 2004-2008 period.
3 Institutional Arrangement for Implementation

3.1 Assessment of Current Institutional Arrangement

The various stages of the environmental process pertaining to environmental management during the course of planning, designing, and construction and subsequent operation and maintenance involve more than one government agency, different management levels within each agency, and various other parties, such as, project unit, contractor, local community bodies, and the people themselves. The success of EA implementation depends heavily on the ability of the project's management personnel, in collaboration with specialists from other agencies, to take appropriate actions throughout the various stages of the entire road development process. During the course of the implementation of RAP I, the following agencies/organizations were mainly involved:

3.1.1 Rural Access Project

Rural Access Project under the Department of Roads is responsible for:

- Planning, Survey, and Engineering Design
- Alternative analysis for road alignment
- Collection and compilation of environmental information - design and survey team of DOR/RA
- Obtain no objection certificates from stakeholders including public consultation for environment information
- Obtain clearance of project from MOWHS/DOR if EA is not required
- Preparation of Terms of Reference for EA if project require EA studies in collaboration with DOR Environment Unit
- Conduction EA through private consultants/Local firms
- Review of EA report and submit for approval from NEC through DOR and MOWHS
- Preparation of bid documents including specifications by incorporating the mitigation measures as suggested by EA or suggested by environmental information prepared during the screening process
- Construction supervision and implementation of EMP
- Land acquisition and compensation
- Coordination with other agencies for implementation of EMP such as clearance of forest, use of blasting materials, implementation socio-economic activities as part of EMP, etc,

During the course of implementation of Rural Access Project, the strengths and limitation of the RAP I with respect to the Environmental conservation are:

Strengths:

- Good commitment to expand the road network
- Incorporation of bio-engineering works for slope protection and other mitigation measures suggested by EA or Environmental Information in design and cost estimation
- Network in district level (Dzongkhag level) for construction supervision and implementation of EMP
- Involvement of local communities including Dzongkhag and Geog level organization
- Strong public consultation process
Limitations:

- More focused to Road construction and limited focus on environmental conservation during construction and subsequent operation and maintenance
- No/limited human resources for environment conservation to support the project to incorporate environmental measures in planning, design and implementation of EMP
- No involvement of environmentalist and social expert in preparation of environmental information, which is a document almost equivalent to scoping document of EA process, in accordance with RECOP
- Limited human resources for the preparation of Terms of Reference, and supervision and quality control of EA studies conducted by private sectors
- Coordination with local bodies DYT and GYT is limited in environmental monitoring as it has just initiated.

3.1.2 Department of Roads

The Department of Roads is lead agency in planning, designing, construction and maintenance of road network across the country. In relation to the implementation of RAPI, the responsibility of DOR is presented hereunder:

- Facilitate the project office in execution of all project related activities,
- Deployment of human resources whenever required
- Allocate required fund
- Coordinate with ministry and other agencies including donors relating to project related activities
- Review the environmental information prepared during the course of engineering survey, design and cost estimation and recommend for screening to assess whether the sub-project should undergo through EA level studies or clearance and recommend for EA if necessary
- Prepare TOR for EA studies on behalf of project
- Monitor the project related activities covering environment related works including the implementation of EMP.

The strength and limitations Department of Roads is presented hereunder:

Strength:

- Strong commitment to adopt environmental measures in road construction and subsequent operation and maintenance
- Establishment of environment unit to stream line environmental conservation work during planning, design, construction supervision and operation and maintenance
- Establishment of Environment Friend Road Construction project to adopt environment friendly road construction
- Satisfactory track record of undertaking maintenance of road work

Limitations:

- Limited human resources in environmental unit considering the volume of works to be accomplished related to environmental conservation
- No/limited inputs from environmentalist related with biological and socio-economic environment during the preparation for review of environmental information prepared for environmental screening.
• No inputs of biological and socio-economic resources in preparing Terms of Reference for carrying out EA level studies
• Limited human resources for carrying out environmental monitoring during construction and operation and maintenance stages of road related projects.

3.1.3 Ministry of Works and Human Settlement

The MOWHS is responsible among other for undertaking road construction through Department of Roads and various projects. Its main functions related to environmental conservation during implementation and operation and maintenance of road related project includes but not limited to the followings:

• Coordinate, supervise, and monitor the environmental conservation activities in various stages of project covering identification, pre-feasibility, feasibility, detail engineering design, cost estimation, construction and operation and maintenance,
• Review of environmental information related to the road related projects prepared prior to the project implementation and provide clearance if it is listed in annex -2 of RECOP and forward the documents to NEC requiring EA level studies
• Recommend Terms of Reference for carrying out EA studies for approval by NEC
• Coordinate with other line ministries, agencies and donors for executing the smooth work
• Plan and implement human resources development work
• Review EC applications
• Forward EC applications for to NECS
• Monitor EMP implementation in coordination with NEC and DOR
• Evaluation of EMP implementation in coordination with DOR and NEC
• Report on the implementation of EAA to NEC and RGOB annually

The strength and limitation of MOWHS in carrying out its responsibilities are presented hereunder:

Strengths:

• Strong commitment for the integration of environmental conservation with development process
• Presence of Standards and Quality Control Authority (SQCA) under MOWHS, responsible for environmental management
• Allocation of adequate resources for environmental conservation works including human resources development
• Effective coordination with other institutions in environmental conservation

Limitation:

• SQCA is responsible for review and monitoring of EI and EA documents and recommend for approval or further action. This is a separate office under MOWHS with its main mandates for ensuring standards and quality control of construction activities.
• Inadequate human resources with the expertise of reviewing EA documents as well as environmental information submitted by DOR for screening and decisions are made based on the recommendation of DOR
3.1.4 National Environmental Commission Secretariat (NECS)

NECS is the apex body responsible for overall management of environment in the country. The Environmental Assessment Act 2000 empowers NEC as main regulatory institution with the following main responsibilities:

- Supervise the activities of the competent authorities and secretariats, provide guidance and ensure the implementation of act,
- Adopt regulations and policies relating to conservation of environment including EA process, strategic environmental assessment, public consultation and appealing and prosecutions, decision making process, administrative sanctions, emission control limit, etc
- Supervise and conduct environmental monitoring (compliance and impact) and auditing of all development projects
- Review of EC application
- Review and approve TOR for full EA
- Issue EC
- Conduct spot checks
- Enforce EMP in coordination with other stakeholders
- Report on the implementation of EAA to the RGOB annually

The strengths and limitations of NEC are presented hereunder:

**Strengths:**

- Strong commitments for the integration of environmental conservation in development activities
- Adoption of number of regulations including Regulations for the environmental clearance of projects and regulation on strategic environmental assessment, code of conducts, guidelines, etc
- Effective decision making in relation to approval of EA reports, etc
- Competent, dedicated environmental related professionals

**Limitations:**

- Weak environmental monitoring and auditing mechanism in accordance with the EMP documents
- There are certain types of projects that do not require detail EA. EC for such projects are accorded based on EI submit together with Project Design and cost estimation. No monitoring is done on these projects and therefore unforeseen Environmental impacts that may have occurred during implementation cannot be addressed.

3.1.5 Contractors

The construction industry in Bhutan is new and it is emerging over the years. The capacity of construction industry has been increasing in terms of equipments and other types of resources. The main responsibilities of contractors during the implementation of road related projects primarily include undertaking construction works in accordance with the bid documents, and technical specifications, which incorporates the compliance of EMP.

**Strengths:** The contractors involved in road construction in RAP I have successfully completed the construction of civil works within stipulated time frame with reasonable and satisfactory quality.
**Limitation:** As a result of absence of environmental related professionals in construction industry, the implementation of Environmental Management Plan is relatively weak. The adoption of occupational health and safety measures are also not up to the desired level.

**Technical Assistance and Training Team** - The project documents of Rural Access Project I envisioned the provision of TA team to support the project cell for design of remaining sub-project, supervision, monitoring and on-the-job training, with particular emphasis on environmental friendly road design and construction practices. The TA team comprised of Senior Road Engineer, Environmental Engineer, and Road Engineer. In addition, services of short term consultant were also envisioned. The input of TA was sought only during first half of the project period.

Considering adoption of environmentally friendly road construction, which was new in Bhutanese context, the inputs of TA made significant impact to make aware of EFRC technology to DOR and private sector professionals. This has also contributed to transfer of EFRC technology to professionals involved in road design, construction supervision, operation and maintenance. It is noted that local professionals within DOR and private sectors still need training in terms of bio-engineering, and environmental friendly road design, construction, supervision, and subsequent operation and maintenance. The awareness relating to EFRC technology should also reach to recently constituted DEC officials.

**3.1.6 Consultant Involved for EA studies**

During the course of RAP I, EA studies were carried out for almost all the road sub-projects in accordance with the Environmental Assessment Acts and relevant regulations through local consulting companies. As construction industry, the consulting industry is also new in Bhutan. The consulting industry has started in recent years. The strengths and weakness of local consulting companies are presented here:

**Strengths:**
- The consultancy firms have enhanced their capabilities by acquiring resources from domestic and regional markets and through networking.
- All EA studies except one sub-project under RAP I have been carried out up to the satisfaction of client and regulatory authorities

**Limitations:**
- Limited expert human resources available in private sectors for carrying out EA related studies
- Limited skills for managing the consulting related assignments in terms of preparation of proposal, management of human resources for studies, report preparation, etc.
- Limited resources in terms of equipment, and secretarial facilities
- Lack of multidisciplinary team such as geologist, Botanist and Wildlife expert

**3.1.7 Local Governments (DYT, GYT)**

The local government agencies such as DYT and GYT are empowered to undertake the development activities right from identification, prioritization, planning, monitoring during construction and operation in recent years in line with the principle of decentralization. The project document of Rural Access Project also envisaged their roles in sub-project planning and implementation. In relation to environmental assessment, the roles of DYT and GYT are mainly focused to information dissemination, public consultation, management of disputes during implementation of EMP. The
institutional capabilities of DYT and GYT needs to be further enhanced to undertake responsibility of reviewing EA documents and environmental monitoring.

### 3.1.8 Other Government Line Agencies

The other government line agencies as listed below are involved in EA process particularly screening of project and providing no objection certificates.

<table>
<thead>
<tr>
<th>Agency/concerned people to issue NOC</th>
<th>Why/when</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dzongkhag Administration/City Corporation</td>
<td>When project is located within a Dzongkhag or a Municipality Area</td>
</tr>
<tr>
<td>Department of Forest</td>
<td>Should the road go through a forest land</td>
</tr>
<tr>
<td>Department of Culture</td>
<td>Should the road be located within 50 m of a cultural or religious site</td>
</tr>
<tr>
<td>Nature Conservation Division</td>
<td>within boundary of a Protected Area</td>
</tr>
<tr>
<td>Municipal Authority</td>
<td>within 50 m of a public park</td>
</tr>
<tr>
<td>Private owner</td>
<td>within 50 m of a human dwelling</td>
</tr>
<tr>
<td>Private property owners</td>
<td>Should the road construction need to acquire private property</td>
</tr>
<tr>
<td>Department of Health</td>
<td>within 50 m of hospital</td>
</tr>
<tr>
<td>Department of Education</td>
<td>within 50 m of school</td>
</tr>
<tr>
<td>Bhutan Power Corporation Ltd</td>
<td>Should the project require the relocation of power transmission line</td>
</tr>
<tr>
<td>Bhutan Telecom</td>
<td>Should the project require relocation of telephone lines</td>
</tr>
<tr>
<td>Department of Roads</td>
<td>Should the project require access from highways and feeder roads</td>
</tr>
</tbody>
</table>

### 3.2 Institutional Arrangement for Implementation of Sectoral Environmental Management Framework Under RAP II

The overall responsibility of EMF Implementation will lie with the Department of Roads. However, it will be assisted by all stakeholders i.e. NECs, Project Coordination Unit of RAPII, Contractors, and GYT. The individual roles and responsibilities of these agencies for EMF implementation are described below:

#### 3.2.1 Project Coordination Unit

The overall responsibility implementation of EMF will lie within Project Coordination Unit of Rural Access Project II. However, this unit will take technical support from Environment Unit under Investigation and Design Division of DOR. The main responsibility of PCU will include but not limited to the followings:

- Preparation of Environmental Information in coordination with Project Management Unit at DYT level
- Conduct Screening Exercise and prepare Environmental Clearance related documents and forward for review and approval
- Prepare Terms of Reference for Conduction of EA studies
- Conduct EA studies either by involving consultants or from in-house staff and facilitate public consultation (notice, public hearing, etc)
- Review EA documents and forward for review and approval
- Incorporate recommendation of EA in project planning, design, contract documents, and construction activities
- Implement Environmental Management plan during pre-construction and construction phases of the project including land acquisition, compensation to affected population and households, etc
- Coordination with other agencies/stakeholders for the implementation of EMP covering various issues such as clearance of forest, etc.
- Conduct environmental monitoring (compliance and impact monitoring) as per the recommendation of EA report
- Address the complaints made by affected population and stakeholders
- Conduct Training and Capability enhancement of stakeholders relating to EA studies, review, and implementation of EMP.

3.2.2 Environmental Unit/Investigation and Design Division, DOR
This is core unit responsible for conservation of environment during the course of development and operation of Road related project across the country. The main responsibilities of this unit during the implementation of EMF are presented hereunder:

- Assist PCU/PMU in preparation of Environmental Information Documents as per RECOP
- Assist PCU/PMU for review and conduction of Screening Exercise as per the RECOP
- Assist PCU/PMU for preparation of Terms of Reference to conduct EA studies and engaging consultants or other professional
- Assist PCU for supervision and quality of EA studies
- Review of EI documents and recommend and forward for approval
- Review EA documents prepared by PCU (either by consultants or in-house professionals) with specific consideration of legal requirement such as submission of NOC, compensation arrangement to affected families, quality of studies covering impact identification, prediction, EMP, time schedule for EMP, and Monitoring Plan
- Conduct Environmental Monitoring with spot checking as per the EA recommendations
- Review of Monitoring Report prepared by PMU and PCU
- Facilitate in carrying out Environmental Auditing

3.2.3 Ministry of Works and Human Settlement
The Standards and Quality Control Authority (SQCA) under the Ministry of Works and Human Settlement will be responsible for the followings:

- Review of Environmental Information (EI Documents) as per the EMF and provide clearance if it is listed in annex - 2 of RECOP and forward the documents to NEC requiring EA level studies
- Review and recommend Terms of Reference for carrying out EA studies for approval by NEC
- Review EA Documents and forward to NECS for approval
- Monitor EMP implementation in coordination with NEC and DOR
- Evaluation of EMP implementation in coordination with DOR and NEC
- Report on the implementation of EAA to NEC and RGOB annually
3.2.4 National Environmental Commission Secretariat

NECS is the apex body responsible for overall management of environment in the country. For the RAP II project it will review and approve Terms of Reference of EA studies and allow conducting EA studies. Similarly, it will also review EA studies report along with Environmental Clearance applications and approve EA documents for all sub-projects. While reviewing EA document the NECS will use the same procedures as used by DoR. It will review TOR and EA Documents forwarded by MOWHS and where information provided are insufficient it will inform the DOR with clear indication of the additional information to be provided. If the NECS decides that a full blown EA is required for a project PCU will be informed about it with an instruction to submit the ToR for the detailed EA. NECS will review and approve the ToR. The EC will be issued based on the approved ToR for EA.

NECS will conduct periodic spot checks to the project site and determine whether environmental terms and conditions are being met or not. It will levy fines from defaulters as per RECOP and revoke/suspend EC if the proponent repeatedly fails to meet the requirements. It will also review the Compliance Report submitted by DOR and verify it with field visits as deemed necessary.

3.2.5 DYT/GYT

These are the local government institutions responsible for undertaking development activities within their areas. With respect to implementation of EMF, their responsibilities will be mainly focused to information dissemination, public consultation, management of disputes, and monitoring of implementation of EMP.

The summary of EMF implementation charts is presented in figure 3.1 and 3.2.

3.3 Recommendation for Institutional Strengthening

Based on the review of various institutions involved in EA process in terms of their roles, responsibilities, strength and limitation, the following recommendation are made:

3.3.1 Preparation of Environmental Information

RECOP and EA Act have made mandatory, the preparation of environmental information document together with the project report for screening exercise. Under RAP I, and other road related projects, this document was prepared by project engineers with limited involvement of environmentalist. This document is almost equivalent to the scoping document covering collection of environmental baseline information, identification, prediction and evaluation of environmental impacts, design of mitigation measures, and environmental monitoring. Under RAP I, such documents were limited only to a brief checklist. During the preparation of EI, it is recommended that the document should cover all issues as stated in RECOP (2002). For this, care should be taken to collect the required information from primary and secondary sources, identification and prediction of potential impacts and suggestion of suitable mitigation measures. Environment Unit of DOR should carryout the preparation of EI very carefully.

Accordingly, the screening exercise and Terms of Reference covering the major environmental issues will be prepared to facilitate the EA study.

3.3.2 Environmental Management Plan

The environmental management plan prepared as part of EA document needs to be properly implemented to ensure that mitigation measures suggested are incorporated in project activities.
The implementation of EMP is to be made by various stakeholders covering local government bodies, contractors, site engineers, project managers, design engineers, Department of Roads and others. A number of stakeholders involved in project execution do not have adequate human resources to undertake the implementation of EMP. To ensure the proper implementation of EMP, it is recommended that an EMP expert should be involved during the project implementation under RAP II. In this respect, the professionals available in DOR should be imparted training of EMP and made responsible for carrying out implementation of EMP. Private consultants can be involved when in-house experts are not trained or inadequate.
Figure 3.1: Flowchart for EA Application under RAP II

PMU requests PCU/DOR for its support on Project Feasibility Study & EA

PCU - prepares environmental report and EC application to DoR/EU, along with No Objection Certificates (NOCs) from affected parties

DOR - receives EI, and Screens for

MOWHS - receives EI and Screens for EA and forwards to NEC for approval

If environmental information is inadequate, additional information is sought from the PCU

PCU - prepares TOR for EA Studies

Preparation of EMP
PCU prepares EMP to ensure physical compliance with environmental terms and conditions; PMU will conduct regular Monitoring.

Public Discloser

Implementation of EMP
- PCU - DYT
- PMU - GYT
- DOR - DOF
- MOWHS
- NEC

NEC Approves EA Report

EA Required
PCU - prepares TOR for EA Studies

EA Requirement
PCU - prepares TOR for EA Studies

DOR / MOWHS - Reviews TOR and forwards to NEC

NEC - Approves

PCU - conduct EA studies

DOR/MOWHS reviews EA

Bhutan Consultants & Research (BHUCORE)
Figure 3.2: Flowchart of EMF Implementation Mechanism under RAPII

**NECS**
- Review EC application
- Review and approve ToR for full EA
- Issue EC
- Conduct spot checks
- Monitor EMP/MoU implementation
- Enforce EMP/MoU in coordination with DOR and PCU
- Report on the implementation of EAA to the RGOb annually

**MOWHS/SQCA**
- Review EC applications
- Forward EC applications to NECS
- Issue EC
- Conduct spot checks
- Evaluate EMP implementation
- Enforce EMP in coordination with PCU and PMU
- Evaluate EMP implementation
- Report on the implementation of EAA to the RGOb annually

**EUI&D, DOR**
- Assist PCU to prepare EI documents and Screening exercise
- Assist PCU to develop ToR for detail EA
- Submit EC applications to MOWHS/SQCA
- Assist to incorporate to include mitigation measures in BOQ
- Regular monitoring of EMP implementation
- Submit monitoring reports to MOWHS
- Submit Compliance Report to

**PMU/PCU/RAP**
- Conduct EI Study and conduct Screening exercise
- Prepare ToR for EA study
- Conduct public consultation on EA
- Conduct EA studies through consultants/in-house staff
- Submit EA/EC to DOR
- Incorporate EA recommendation in planning, Design, Contract document and project implementation
- Monitoring of EMP/ activities
- Submit regular monitoring reports to DEC
3.3.3 Review of Environment Related Documents in MOWHS

The ministry of works and human settlement is responsible for reviewing the environmental information prior to the approval of project and provide clearance if not required for EA level studies, review of Terms of Reference for EA studies, Review of EA report, conduct environmental monitoring. SQCA under MOWHS is responsible for carrying out all these activities on behalf of MOWHS including its other responsibilities. Hence it is recommended that EA units in SQCA should be strengthened to review, and scrutinize the environment related documents forwarded by concerned department for approval and recommendations.

3.3.4 Environmental Monitoring

The environmental monitoring is also a part of EMP to ensure that environmental mitigations measures are taken in accordance with the EA documents. It is noted that the environmental monitoring is still weak due to a number of reasons. The prominent among them include limited human resources and funds in institutions responsible for carrying out environmental monitoring. It is recommended that the environmental monitoring should be carried out by enhancing human resources capabilities in relevant institutions particularly in NEC and DOR.

The private consulting companies or private individuals can also be involved to carry out the environmental monitoring on behalf of NEC till in house human resources capability is enhanced.

In addition to enhancement of human resources capabilities, the DOR and other agencies should adhere with the Monitoring Plan suggested by EA report. The cost of monitoring should also be included in project cost to facilitate the effective monitoring. EMP expert designated in DOR should be made responsible for coordination among the stakeholders for monitoring related activities. Sample environmental monitoring sheet is provided in Appendix 3.

3.3.5 Environmental Auditing

The environmental auditing is one of the important tools, which should be carried out after some years of commissioning of projects to assess:

- The occurrence and extent of impacts forecasted during EA study,
- Whether or not the mitigation measures implemented are effective
- Overall impact of project in local economy and social setups

It is noted that practice of environmental auditing has not been started so far. It is recommended that NEC should initiate environmental auditing of environment friendly road project as per the mandate of RECOP and EAA.

3.3.6 Capability Enhancement of DOR/MOWHS Officials

Department of Roads has recently established environmental units (organization) with the deployment of two environment related professionals. Vis-à-vis DOR in the ninth Five Year Plan (9FYP) has provisioned to construct 77km new highway, 123 km of feeder roads (including RAP II roads) excluding the realignment of east-west and Thimphu – Phuentsholing highway. Considering the volume and nature of works, more professionals relating to environment should be deployed to adequately handle the volume of work. Furthermore, DOR is the implementing agency. Therefore, at least one EMP expert should be deployed in Environment Unit of DOR. In order to cope up the required volume of works, the following recommendations are made:
• Impart EMP training to at least two engineers, who are involved in design and construction supervision of RAP
• On-the-job training to carry out environmental information exercise, which is prepared during the course of project preparation prior to the approval of the project
• Training to at least two professionals for undertaking review and approval of EA reports
• On-the-job training for EA processes (EMP implementation and Monitoring) for at least two professionals of DOR/MOWHS
• Bio-engineering training for at least two professionals

3.3.7 Capability Enhancement of Private Sectors

The private sectors involved in road design, construction, EA studies mainly include contractors, individual consultants and consulting companies. The development of private sector in Bhutan is in its early stage and it is essential to enhance their capabilities. The capability development for implementation of environmental management for private sector mainly includes the followings:

• Training on Environmental Assessment Process for at least 10 professionals involved in consulting sectors
• EMP preparation and implementation training for 10 professionals each for consulting and construction sectors
• Training for design of bio-engineering for at least 10 professionals from consulting and construction sectors

These activities under the proposed RAPII can be implemented through Construction Development Board (CDB).

3.3.8 Grievance Redressal System

The main legal instrument for land acquisition in Bhutan is the Land Act of 1979. The Act provides the compensation mechanism for land and other properties affected by any activity including land acquisition for road construction. The Royal Government of Bhutan (RGOB) reviews the rates of compensation periodically. The latest rate is described in the Revised Land Compensation Rates, 1996 which includes both urban and rural areas.

In the absence of formal resettlement policy in Bhutan, the RGOB came up with the Policy Framework for Land Acquisition and Resettlement in 1999. The key features of the Policy are:

• Policy 2.1. The resettlement policy for this project addresses the impacts related to: (a) loss of assets, including land and house; and (b) loss of livelihood or income opportunities on an identified population.
• Policy 2.2. Includes an entitlement matrix that will be in the Action Plan, as shown in the table.
• Policy 2.8. Particularly in the case of landless families who suffer partial or total loss of livelihood as a result of the project, RGOB would, as part of its normal policy, allot land free of cost to such affected families.
• Policy 2.12. Vulnerable groups may include but not be limited to: poor or landless people; women headed households; Disabled and elderly or senior citizens.
• Policy 2.14. The squatters, encroachers and tenants are not eligible for compensation for the land occupied by them. However, they will qualify for the assistance and targeted support if they belong to the vulnerable groups.
There is an appeal procedure for affected entities to adopt if they are not satisfied with the
government approach in acquiring the land and property and the subsequent compensation package
offered or if the compensation is not made at all. In such situation, affected person makes an
appeal with the Gup (Head of Geog/Block) which then forwards his/or Dzongkhag Officials and the
concerned project authority to review the appeal made. If no agreement is reached then he/she
can appeal to the higher authorities of concerned Department or the Ministry for the resolution. If
no amicable solutions are found and he/she is still not satisfied, can seek legal action through
courts.

3.3.9 Summary of Institutional Responsibilities for EA Implementation

Based on the review of EA implementation process under RAPI and legal provisions, the summary of
institutional responsibilities are presented in appendix 4.
4 Environmental Management Guideline

4.1 Review of Environmental Issues and Environmental Assessment

4.1.1 Rural Access Project I

Rural Access Project is one of the endeavors made by Royal Government of Bhutan to increase the accessibility of rural population to basic services. This project was initiated from year 2000 and expected to be completed by end of June 2006. It is financed by the World Bank to construct about 129 Km Feeder Roads in four Dzongkhags. It aims to develop environmentally sound rural roads. The Royal Government of Bhutan has given high priority to balance environmental conservation with the expansion of development activities, as demonstrated in its policies and plans. The Staff Appraisal Report of Rural Access Project reiterates that the implementation of National Environmental Strategy of Bhutan will lead to sustainable development by integrating development and environmental conservation. The document also stresses the need of carrying out Environmental Assessment of Sub-projects to be implemented under RAP I, including the need for enactment of a number of legislations and policies. During the implementation of RAP I, Environmental Assessment Act, 2000, Regulation for Environmental Clearance of Project and Regulation on Strategic Environmental Assessment along with other guidelines were enacted to facilitate the EA process. Accordingly, Environmental Assessment of almost all sub-projects of RAP I was carried out and mitigation measures suggested were implemented in accordance with the Environmental Management Plan to the extent possible. However, it is noted that the environmental monitoring process was weak during the project implementation and subsequent operation and maintenance. Furthermore, no Environmental auditing has been made so far.

4.1.2 Environmental Friendly Road Construction

To balance increased accessibility to rural communities with preservation of natural resources as well as prevention of environmental degradation, Environmental Friendly Road Construction support project is being implemented under Department of Roads of Bhutan with the support of SNV (Netherlands Development Organization) from the year 2003. The project included eight components viz. Rural Access Project implementation support, further development of EFRC concept, Adoption of EFRC for all road works by DOR, Development of EFRC policy framework, introduction of EFRC to other road agencies, Capacity development of Dzongkhag and Communities, Capacity Building within private construction sector, and Dissemination of EFRC to technical training and educational institutions.

The EFRC stresses the following to practices:

- Adoption of engineering design with optimal balance between prevention of environmental damages and investment cost,
- Minimize possible cuts in mountain slopes, where slopes are fragile and prone to land slide,
- Adoption/encourage of benching when cut slope is high
- Avoid Box cut as far as possible,
- Minimize the cutting of trees (limited to road corridors),
- Dispose excavated material in selected disposal sites,
- Use the blasting in controlled manner to minimize damages in local environment
- Provide adequate drainages
- Reuse excavated materials such as boulders etc
• Adopt bio-engineering techniques for slope protections
• Adopt earth moving equipment for road construction and provide training opportunities for local people in mechanized road construction and avoid import of unskilled labors.

This EFRC technology has been widely incorporated in RAP I and lesson learned are encouraging.

4.1.3 Identification of Environmental Issues/Impact

Based on the review of Environmental Studies, Standard Bidding Documents and other relevant documents under RAP I, the environmental issues relating to road construction in Bhutan are presented in following paragraphs:

**Changes in Land Use** - The construction of road will change the existing land use pattern at least up to the width of right of the way (ROW). The ROW of Feeder road in Bhutan is 50 ft (15.25 meter) on either side of road center line. The changes of land use due to the construction of road mainly conversion of agricultural land, forest land, and other forms of land use into built up area bring about social and ecological problems. Prominent among them include reduction of communities’ fertile cultivated land leading to loss of livelihoods, loss of standing crops, etc. Change of land use due to road construction also results into relocation of private houses, losses of public places, grazing land, etc.

**Loss of Top Soil** - Prior to the initiation of earthwork, the site preparation may involve the top soil striping along the formation width of road. This process brings risks of erosion in nearby cultivated land or stored topsoil, increase in water run off and siltation of water courses. Consequently, there are likely chances of loss of productivity of land particularly within the cultivated area, which is very scarce in Bhutan.

**Earthwork Excavation and Disposal** - Earthwork is the major activity associated with road construction, which involves excavation, cutting of slopes and formation of embankment. Fresh cut invites landslides and erosion in the following monsoon. The inappropriate and unstable spoil disposal is the biggest environmental problem in road construction, particularly in hill ecological regions. The common likely problems from the inappropriate disposal of spoils are:

- Gullying and erosion of spoil tips, especially when combined with unmanaged surface water runoff,
- Slope overloading and resultant failure and mass wasting,
- Disruption of natural drainage pattern, causing scouring, erosion and landslide,
- Damage and destruction of existing vegetation,
- Damage to farmlands and crops through direct deposition, or indirectly as result of mass flow, and
- Water pollution and degradation of water quality.

**Use of Construction Equipment** - Considering the limited availability of labor force, RAPII intends to utilize the mechanical equipment for earth work in excavation and filling, gradation of road surface, compaction of road, concrete mixing, transportation of construction materials, extraction of construction materials from quarries etc. The likely impacts due to the use of equipments primarily include:

- Acceleration of slope instability due to vibration of equipment and subsequent problems of damages of nearby areas in terms of loss of land, crops, vegetation, etc.
- Emission of vehicle exhaust, toxic pollutants which are hazardous to the health of workers and people living in nearby areas.
Spillage/leakage of chemicals and oil and contamination of soil and water resources.
Injury to workers/others
Respiratory problems from dust and machinery emissions.
Hearing problems due to high level of noise.
Disturbance to protected areas and interference with park activities

**Instability, Landslide and Soil Erosion** - Instability, landslide and soil erosion are the major environmental issues associated with road construction in Bhutan. This is particularly as a result of hilly and mountainous terrain with weak and vulnerable geological areas. Removal of vegetation and open cuts with exposed surface to rain and wind cause erosion as well as landslides. The problem generally results from interaction between water flow and soil, both of which are disturbed by road construction. The situation gets worse if vegetation is also cleared. Fresh cut slopes and embankments are relatively more vulnerable to landslides and soil erosion, particularly due to improper water management in the vicinity. During the construction period, instability, landslides and soil erosion problems may result because of:

- steeper cut and fill (embankment) slopes and their construction qualities
- haphazard disposal of construction spoils
- unsuitable locations of quarry sites and borrow pits
- Fresh quarrying and borrowing activities
- construction carried out in rainy season without proper water control and drainage facilities;
- and
- improper construction methods which leave soils exposed unnecessarily, etc.

The degree of sliding increases during the road construction and offer regular sliding during later operational phase. It further, causes huge disaster by hitting houses and people dwelling in settlements that exist downhill.

The common causes of the problem are:

- deficiency of or improper drainage structures,
- modification of water paths leading to concentrated flows (may also be caused by blocked ditches),
- high gradient in cut or fill slopes, and
- cleared areas which have been left without re-plantation.
- improperly disposed construction spoil may worsen this situation.

**Quarrying of Construction Materials** - The construction of road, particularly the structures such as retaining walls, culverts, bridges, road surface works, require large quantity of boulders, gravels, sand, and other types of construction materials to be collected locally. Such materials are normally mined in nearby locations on local streams and places near the road alignment in order to save the transportation cost. The extraction of materials from inappropriate places or in excessive amount can seriously damage the local environment. For example, quarrying from a high slope and fragile area can result slope instability, extraction of sand and gravel in excessive amount from river can cause river bank cutting and erosion and changes in river regime. This will eventually affect the local environment in terms of erosion, flooding of cultivated land, community infrastructures, and eventually livelihood of local people.

**Stone Crushing Plants and Stockpiling of Materials** - Stone crushing plants are temporary phenomena, occurring during construction and rehabilitation of road. They are normally established in quarries and river beds from where the stones are quarried. In addition, stones are often broken for rural roads by hands in these locations by labor force working under sub standard working
Environmental Management Framework

conditions. The operation of crushing plants and stone breaking by labor causes inconvenience to nearby settlements in terms of air and noise pollution. Injuries in such activities are also likely.

Construction materials are usually stockpiled for relatively short period. It is often done on river beds despite being somewhat risky during rainy season. There have been examples of use of forest area, open spaces, and cultivated land for stock piling. This situation may lead to environmental degradation in terms of air pollution, land pollution, and permanent changes of land use if not rehabilitated after the completion of construction works.

**Disruption to Natural Drainage System** - The natural drainage in hill ecological regions of south Asia including Bhutan have evolved over thousands of years and in many areas have been adapted incrementally by local communities over generation to accommodate progressive changes in land use. These sensitive systems can be severely disrupted at micro level by wrongly designed/constructed road drainage structures, inappropriate disposal of spoil/debris without due consideration of surface water runoff pattern. The disruption of natural drainage can environmentally damage in following ways:

- The accumulation of surface water run-off in side drain, with subsequent diversion and collection into a concentrated flow in gully is potentially acute hazard. In absence of proper water management a concentrated flow can lead to scouring, gullying and soil erosion, which in turn can cause slope instable and landslides. Similarly, overloading of natural drainage system can lead to severe erosion, cause bank cutting and lead to creation of new gullies.

- In appropriate discharge of drainage into agricultural lands and forest, over fragile slope or near houses can cause damage as a result of scour and repeated flooding or water logging on productive land.

**Air and Noise Pollution** - Air pollution due to vehicle emission and noise are generally not major issues in rural roads since the traffic volume is extremely low. However, the dust raised and blown by vehicles may significantly pollute the air in the areas adjacent to construction sites or earthen/gravel roads. Direct effects of dust could be hazardous to road workers, residents adjacent to road and/or interference on plant/crop growth in the vicinity. Careful management of construction sites, storage of construction materials, management of road surface and simple dust control measures like water sprinkling in sensitive places can reduce this problem.

**Water Pollution** - Uncontrolled construction activities such as cutting and filling, disposal of construction waste and spoil, erosion and soil movement due to road construction activities like quarrying and borrowing, etc. cause increase in turbidity/silt content of streams and rivers. Improper sanitation of workers or local inhabitants, disposal from labor camps, open defecation, may also pollute water, particularly the drinking water sources.

During operation of road, the surface water may be polluted by road run-off containing oil, grease, lubricants and other chemical spills. Other water pollution sources include wastewater generated by the new activities (hotels, industries, settlements) and bad sanitation practices (open field defecation, discharging wastewater into water bodies, dumping solid wastes into or near to the water bodies, etc.).

Typical effect of water pollution could be health hazards to the downstream water users. Water may become unfit for bathing, drinking, animal consumption, irrigation, etc. or effect on fish and other aquatic life. Increased silt content could also cause unnecessary sediment deposition in downstream which causes the rising of river beds resulting floods in downstream areas.
Explosive, Combustible and Toxic Materials Management - During Road construction activities such materials are required. The use of explosives, if not done carefully, can lead to extensive environmental damages in terms of causing problem of instability. The safeguarding of explosive from theft is also a concern. Accident involving tankers of diesel and other fuel seem to occur quite often resulting into fire and causing injuries.

Encroachment into Forest and Disturbance to Wildlife - A road that passes through forest takes up forest land by clearing forest along the right of way, and may also disturb the activities of the wildlife. There is a high chance of occupying forest areas by a rural road as the cultivated land is relatively scarce in Bhutan. Road construction activities may contribute to increased hunting and poaching of wildlife as it provides easier access to its habitat. It may restrict movements and breeding of the wildlife, alter/destroy the existence of habitat. Accessibility made easier by road may also cause pressure on and encroachment to the forests (national parks, wildlife reserve areas, community forests, private forests, etc.). Activities of the work-force that create pressure on the forest and forest resources include firewood collection and hunting birds/animals. With the roads, the forests become easily accessible and render animal grazing, firewood collection, hunting, timber extraction (legal or illegal), illegal collection and export of medicinal plants etc., easier. Development stimulated by the road may promote activities such as use of firewood to meet the increasing energy demand of tourists/increased population that consumes forest resources and increases pressure on it. All these factors may cause significant deforestation and degradation of the forests.

Cultural and Historical Areas - Cultural and historic sites may be threatened by road construction and associated works such as, excavation, filling, and quarrying. It can destroy the sites or alter their character. Road may result in illegal occupation or encroachment of the culturally and historically important areas (temples, shrines, Dharamsala, religious sites, Public space, caves, graveyards, forts, palaces, etc.) or the land belonging to these sectors. On the other hand, the increased accessibility may attract visitors to these areas which encourage better use, care and conservation of the same. Road development works should, wherever appropriate, include measures to protect such sites.

Damages of Community Infrastructures - Experience has shown that road construction activities often disrupt community infrastructures such as irrigation canal, drinking water supply systems, water ponds, schools and trails. Disruption is caused by siltation or burial of irrigation canals, exposure and damages of water supply pipes, etc. Such situation may lead to inconvenience to rural population in terms of decrease in agricultural production, additional investment for rehabilitation of infrastructures, shortage of drinking water, etc.

Occupational Health and Safety - Occupational Health and Safety of workers is a relevant issue during construction. The occupational health and safety concern arise from the operation of stone crushing, bitumen use, operation of earth moving equipment, use of blasting materials, etc. In absence of adoption of Occupational Health and Safety (OHS), accidents may occur resulting into loss of life and injury to the workforce.

Road Safety - Ignoring road safety, both during construction and subsequent operation lead to serious negative social impacts on road users. The traffic operation may result in accidents because of careless driving, inadequate traffic signs, inappropriate road standards and designs, natural disasters, etc. One of commonest causes of accident is due to lack of delineation of bends, inadequate safety signals, etc.
**Development of Ribbon Settlements** - Road construction generally stimulates ribbon settlements along the alignment. Original settlements expand and new settlements develop usually in an unplanned manner once new road becomes operational. Temporary sheds and houses built during construction often become permanent and continued to be occupied during the operation period. Such uncontrolled growth of settlement result to numerous direct and indirect environmental problems in terms of generation of wastes, congestion of roads, accidents and numerous social problems.

**Increase in value of Land** - As a result of increase in accessibility, the land value along the road corridors and zone of influence will increase. This will eventually benefit to the local communities.

### 4.2 Environmental Management Framework

In accordance with Environmental Assessment Act 2000, and its regulations, Environmental Assessment (EA) and implementation of mitigation measures suggested by EA is mandatory for feeder road in Bhutan. More than just a legal requirement, the main intention of EA is to support integration of environmental factors in road development activities and attain sustainable delivery of related services. Like technical and economic feasibility studies and other forms of appraisal, environmental appraisal in the form of EA has the overall purpose of achieving a better project.

The purpose of the SEMF is to provide sectoral guiding principles for Environmental Assessment (EA) of all physical works to be undertaken under the proposed RAP II. It will help to systematically identify, predict, and evaluate beneficial and adverse environmental impacts, designing enhancement measures for beneficial impacts, and implement mitigating measures for adverse impacts. EA is an integral part of the project identification and feasibilities studies, as well as project implementation and operation. Table 4.1 provides how the EA fit in the project cycle for RAP II. Similarly, the generic project phase and EA steps are presented in figure 4.1 below:

**Figure 4.1: Integration of EA process in project cycles.**

- Detailed assessment of significant impacts. Alternate analysis
- Identification of mitigation needs.
- Input to cost/benefit analysis
- Detailed design of mitigation measures
- Implementation of mitigation measures and environmental strategy
- Monitoring and evaluation
- Monitoring
4.2.1 Environmental Integration for Optimum Benefits

The full benefits from environmental considerations can be obtained only if environmental aspects are considered from the project conceptualization and continued through planning and design. Late recommendations to revise and modify already taken decisions are likely to be neglected or resisted if environmental considerations are not adequately addressed from the beginning. Such a situation could also cause delays or incur additional costs.

In the project cycle, there are number of decision points, where opportunities to make environmentally better choices exist. It would be ideal to integrate and internalize the environmental considerations all through the project cycle right from very beginning to end and influence decisions/choices rather than react to decision already taken.

The greatest values of EA lie in the ability to help evolve and shape better project, not in producing nice report that has little influence on the project. Real benefits arise from the process of interaction, iterations, and consultation, rather than the product. The following two points need to be considered to maximize positive influence in rural road projects:

- Initiate and integrate environmental concerns right from the start and continue the process through all stages of project planning and design, and
- Maintain adequate level of interaction and feedback providing information needed to take decisions at each stage, thus promote utilization of every opportunity to internalize environmental inputs in planning and design.

In road development, main stages or decision points when inputs from an environmental appraisal can be critical and play positive roles are during:

- Route or corridor selection,
- Detail survey and Design, and
- Construction.

4.2.2 Consultation

Stakeholder consultations have an important place throughout the EA process. The greatest value of EA is derived from the process rather than the report. Consultation helps to obtain better insights, understand different concerns and identify opportunities and constraints. It provides a forum to initiate coordination for common objectives or complementary actions. It is a two way iterative communication with the stakeholders about project's nature, intention, its direction and possible consequences.

The Regulation for the Environmental Clearance of Project (RECOP), Royal Government of Bhutan, 2002, makes mandatory provision of public consultation and suggests means of stakeholder consultation through public notice, notice through news papers, public hearing, etc. The regulation also emphasizes that concerned stakeholders should be well informed and given adequate opportunities to express their views to be addressed by the projects.

4.2.3 Major Activities and Responsibilities on EA process

The activities to be undertaken during EA studies are summarized in table 4.1 and describes in subsequent sub-sections:
### Table 4.1: Major Activities and Responsibilities in Conducting EA Studies

<table>
<thead>
<tr>
<th>Project Stage</th>
<th>Activity</th>
<th>Description</th>
<th>Responsibility</th>
<th>Estimated Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening</td>
<td>Undertake Screening</td>
<td>Prepare a document containing environmental information covering potential environmental impacts, mitigation measures, evidence of public consultation, etc</td>
<td>DOR as proponent or Professionals accountable for RAP/DOR</td>
<td>4 weeks</td>
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<tr>
<td></td>
<td></td>
<td>Produce Environment related document to competent authority for approval</td>
<td>Proponent</td>
<td>1 week</td>
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<td></td>
<td></td>
<td>Decision by Competent authority for EA and non-requirement of EA, or as per Annex 2 of RE COP</td>
<td>Competent Authority</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Take no further action for projects, which do not require EA</td>
<td>Proponent</td>
<td>3 weeks</td>
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<tr>
<td></td>
<td></td>
<td>Public Announcement relating to decision (either EA or no EA) by Competent Authority</td>
<td>Competent Authority (MOWHS)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Terms of Reference for EA Studies</strong></td>
<td><strong>Pre-feasibility/planning</strong> Define the main environmental Concerns and issues related to proposed road, which must be addressed by EA</td>
<td>DOR/RAP</td>
<td>7 weeks</td>
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<tr>
<td></td>
<td></td>
<td>Provide Project Alternatives</td>
<td>DOR/RAP</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Approval of TOR Approve Terms of Reference, may be subject to changes</td>
<td>NEC</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Pre-feasibility and Planning</strong></td>
<td>Assigning the work Determine whether to conduct EA using in house staff, or whether to outsource it</td>
<td>RAP/DOR</td>
<td>8 weeks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EA Team Form Team as per TOR</td>
<td>EA Team</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Preparation of Work Plan</strong></td>
<td>Establish a work plan that gives appropriate weight to all activities</td>
<td>EA Team</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Undertake EA Studies</strong></td>
<td><strong>Desk Studies</strong> Collect and review appropriate published data, such as maps, reports, etc</td>
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<td></td>
<td>Initiation Interaction and Consultation Discuss the proposed Road and its potential environmental impacts with knowledgeable person and other stakeholders</td>
<td>EA Team</td>
<td>2 weeks</td>
</tr>
<tr>
<td></td>
<td>Planning and Design</td>
<td>Preparation of Information Summary Draft a summary of the information that is relevant to the project and its possible environmental effects</td>
<td>EA Team</td>
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<td></td>
<td></td>
<td>Selection of methods and techniques Determine the methods by which the field work for EA will be conducted</td>
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<td></td>
<td>Improve Work Plan Revise the work plan on the basis of desk studies</td>
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<tr>
<td></td>
<td><strong>Field Work</strong></td>
<td>Field Equipment Collect and Arrange field Equipment required for EA studies</td>
<td>EA Team</td>
<td>3 weeks</td>
</tr>
<tr>
<td></td>
<td>Planning and Design</td>
<td>Field Survey for Collection of Baseline Information Walk over survey, interacting with local communities, and investigate the issues identified during desk study Collect baseline environmental information in terms of physical, biological, and socio-economic and cultural aspects</td>
<td>EA Team</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data Analysis and Interpretation</td>
<td>Identification of Environmental Impacts Establish what environmental impacts will occur as result of interaction of environmental setting and road construction and operation activities</td>
<td>EA Team</td>
<td>4 weeks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Impact Prediction Establish the extent of environmental consequences of the road construction and operation</td>
<td>EA Team</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Significant Assessment Judge whether the consequences are significant enough to require action to be taken</td>
<td>EA Team</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mitigation Measures Design Mitigation Measures: to avoid, reduce and minimize adverse environmental and social impacts and enhance beneficial impacts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Planning and Design</td>
<td>Environmental Management Plan Prepare EMP covering Monitoring and Project Management to ensure the implementation of mitigation measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Project Appraisal/Approval of EA Report</td>
<td>Review and Approval of EA Report Check completeness, adequacy, credibility, facilitate the decision-making process; decide if project should proceed, or if further alternatives must be examined</td>
<td>NEC</td>
<td>6 weeks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Approval of EA Report/Rejection</td>
<td>NEC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Public Consultation Occurs at various stages in the assessment process to ensure quality, comprehensiveness and effectiveness, and that stakeholders' views are adequately addressed</td>
<td>EA Team, DOR, NEC</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Design, Implementation</strong></td>
<td>Implementation of EMP, Monitoring incorporation of recommendations in design, Bill of Quantity of Contract, specification, other relevant documents</td>
<td>DOR, MOWHS, NEC</td>
<td>Entire Construction period</td>
</tr>
</tbody>
</table>
The tentative time required to complete the complete EA study is estimated to be about 6-11 months starting from Scoping Exercise to final approval of EA report. Based on the experience of Bhutan and other neighboring countries, the estimated time is presented in table above against each activity of EA study. However, the time as presented above vary with the size of project, availability of secondary data and others.
4.3 EA Process

The steps to be followed for carrying out Environmental Assessment are presented in figure 4.2:

Figure 4.2: Generic steps of EA process

- **Project Screening**
  - Determines necessity for EA
  - Requirement (RECOB) (OP 4.02 Category B World Bank)
  - Identifies potential impact
  - Provides project alternatives
  - Provide basis for carrying out EA

- **TOR Formulation**
  - Describe all possible project alternatives, such as
    - Location
    - Scale
    - Process
    - Layout
    - Operating conditions
    - etc

- **Project Description and Consideration of Alternatives**

- **Impact Examination and Mitigation Measures**
  - Quantitative impact such as
    - Magnitude
    - Extent
    - Duration
  - Determine the impact
    - Significance
    - Important
  - To design system and for processes to avoid, reduce and minimize adverse impacts
  - To enhance beneficial outcomes
  - Identify impacts that require
    - Monitoring
    - Auditing

- **Stakeholders' Involvement**
  - Occurs over the entire EA process
  - Qualify, cooperate and effectiveness
  - That stakeholders' views are adequately considered

- **EA Report and Review**
  - Compiled information in report format including
    - Non-technical summary
    - Methodologies used
    - Results interpretation
    - Conclusions
  - Summarize, analyze and interpret information obtained
  - Assesses adequacy of issues addressed
  - Facilitate the decision making process

4.3.1 Screening

Every sub-project proposal to be funded under the project will undergo an environmental process before it is selected for implementation. The screening process will establish the level of
environmental Assessment required, as well as help the decision makers/ project officer to understand environmental issues related to the project before they are considered for implementation, and facilitate the decision making process. In accordance with the prevailing Environmental Assessment Act and its regulation, environmental screening will be done together with technical and economic screening. Any sub-project that falls within the negative list below will not be included under proposed RAP II for funding.

Figure 4.3: Project Screening Process

If the proposed project does not require EA level studies, the mitigation measures suggested should be integrated in project design, construction and subsequent operation and maintenance. For this a separate Environmental Management Plan should be prepared and incorporated in project process to ensure the environmental conservation.

Negative List of Activities-The following list of activities has been compiled based on the laws, regulations and guidelines of the RGoB and the WB safeguard policies.

These are the activities that should not be supported under the proposed project (RAP II):

- Any construction activity that has not been issued environmental clearance in accordance with the requirements of the EAA and RECOP;
Environmental Management Framework

- Any construction activity that does not include environmental management measures and associated costs necessary to comply with the environmental terms and conditions specified in the environmental clearance issued by the MOWHS or NECS;

- Any activity inside the core zone of a protected area or inside/nearby an area which is known to be a critical wildlife habitat (irrespective of whether or not inside a protected area). Critical wildlife habitats would essentially include habitats of globally threatened species as per the red list prepared by the IUCN and those that are listed as totally protected species in the FNCR. The various zones of protected areas and critical wildlife habitat are stipulated by the Nature Conservation Division;

- Any construction of Feeder road, inside a protected area if the proposed activity has not undergone a full EA;

- Any construction activity inside a Government Reserved Forest without written permit or authorization from the DOF in accordance with the requirements of the FNCR;

- Any activity that involves use of explosives and blasting without written authorization from all concerned agencies and technical guidelines for best and safe practices of blasting;

- Any activity that involves cutting of trees or land clearance within 100 feet on either side of the banks or edge of the rivers, streams, water courses or water sources kept as riparian reserve for conservation;

- Any activity that may adversely impact cultural property, including construction within 50 m distance of any cultural property, without written authorization from the Ministry of Home and Cultural Affairs and written consent of the DYT and GYT. The areas of cultural property are identified by the GYT and DYT.

The sub-project under RAP II is expected to have moderate to low environmental risks. As a whole, it can be identified as a Category B project based on WB classification for EA. In general, basic EA (equivalent to Initial Environmental Examination) will be adequate for the sub-project under RAP II. However, detailed EA (equivalent to Environmental Impact Assessment) will be necessary if:

- the proposed construction of Feeder Road under RAP II sited inside, or goes through, a protected area or an area recognized as critical wildlife habitat (even if outside a protected area);

- the proposed construction activity is likely to have significant geologic hazard;

- the proposed construction activity is likely to have significant adverse impact on existing infrastructure;

- the basic EA suggests the need for a detailed EA.

4.3.2 Terms of Reference

The Regulation for the Environmental Clearance of Project (2002) makes the proponent responsible for preparing draft Terms of Reference for submission to National Environmental Commission through competent authority for approval.

The environmental information documents prepared in accordance with RECP for screening exercise covers environmental settings of the project area, identification of potential impacts including prediction and evaluation in terms of its significance, major issues relating to
environment, and public consultation. This document should be made the basis for the preparation of Terms of Reference for EA studies. The Terms of Reference for EA study should contain adequate guidance, and is meant for:

- Listing of activities to be performed,
- Systematization of working procedures,
- Delineation of specific activities to be undertaken,
- Fitting the EA study into context of existing policies, rules and administrative procedures
- Setting out of time frame requirement of expert manpower
- Provide technical guidance to proponent/consultants

The TOR should answer the following questions:

- Why will it be done?
- How will it be done?
- When will it be done?
- Who will do it?

Sample Table of Content for Terms of Reference for EA Studies are presented here under:

I. General Background – Proposed Road and its objectives, Proponents name and Address, purpose of EA studies, its formal requirement, applicable policy, legislations and guidelines

II. Project Description – Project related information, alternative routes, construction and operation period, main activities during construction and operation, consumption of resources, and construction and operation schedule.

III. General Guidance to EA – Time Frame, Budget Limit, Appropriate Manpower, reporting requirement, payment schedule

IV. Issues and concerns – List of environmental issues, concerns and questions reflecting these concerns that have to be addressed by EA. Explain why these are considered important in relation with the proposed road and include in TOR. Group these into following categories:

- Issues/concerns/questions related to physical and chemical aspects (e.g. Landslide, water and air quality degradation, etc)
- Issues/concerns/questions related to biological aspects (e.g. Flora, Fauna, and habitat, etc)
- Issues/concerns/questions related to socio-economic and cultural aspects

All the issues, concerns and questions should be clear and specific as possible, for example what concern/issues and questions are related to which environmental receptors and/or which of the project activities.

List the EA tasks as clearly and specifically possible. Generic headings of EA tasks are presented below, under each of these headings specific tasks need to be defined in relation to the specific environmental features/factors, location and project activities.

- Establishment of Environmental Baseline Situation (Which environmental features and factors, specify location and subject area, what are the concerns and issues, level and type of data/information needed)
- Impact Identification, Prediction and Evaluation – Positive and negative impacts, identification, prediction, and evaluation of environmental impacts with necessary methods and techniques
Environmental Management Framework

- **Alternative Analysis** - What alternatives should be considered (example design, route alignment, technology, schedule, materials, etc)
- **Impact Mitigation and Environmental Management Plan** - Design of suitable mitigation measures, beneficial impact enhancement measures, Requirement of Environmental Management Plan including environmental monitoring with the identification responsible agency for implementation of mitigation measures with schedule, environmental monitoring in terms of determination of indicators, methods of monitoring, frequency, and responsible agencies
- **Institutional and Public Consultation** - how agencies and stakeholders and agencies are involved (explain with whom, at what stage and why)

The Terms of Reference also include the Report Format of EA studies.

**V. Approval of Terms of Reference** - After the preparation of Terms of Reference, the proponent is entitled to submit it to National Environment Commission through competent authority for approval. NEC reviews TOR and approves as is, or with improvement or minor modification. The formal EA study may begin as soon as the TOR is approved.

**4.3.3 Preparatory Work for EA Study**

**Assigning the Work** - The Environment Assessment Act (2000) and Regulation for the Environmental Clearance of Projects (2002) make the proponent (DOR for RAP II) responsible for carrying out EA studies of the proposed sub-project. DOR has a number of options for carrying out EA studies, for example:

- Out source the EA work to consultant (Individual, or an expert group or institutions)
- Form an in house EA team if there is adequate expertise in DOR or form a team comprising of experts from other RGOB's offices such as Department of Forest, Geology and Mines, etc.

**Environmental Assessment Team** - The EA team should be formed as soon as EA work is assigned. The exact field of expertise and their level of inputs will be known, when the TOR is finalized. Most commonly an EA of Rural Road requires the following expertise:

- Environment Expert with expertise on physical environment covering land systems (landslide, slope stability, erosion,) drainage, air and noise, etc.
- Environmental Expert with expertise in biological environment covering forestry, wild life, Aquatic life, etc
- Road Engineer
- Socio-economist with expertise in social, economic and cultural environment

The EA level environment appraisal requires simple inputs from those sectors. It is not necessary that a separate specialist be involved in each of the specialized subject that comes across. For example, the type of road engineering inputs needed for EA study may be obtained by having greater interaction with the engineering team involved in planning and design of sub-project if a road engineer is not included in EA team.

From the practical point of view, the EA team can typically consists of two to three persons representing different field of expertise for rural road. The team leader, besides being an expert in one of the related sector, must be well versed with environmental assessment process and procedures. All EA team members must have basic understanding and experience in Environmental Appraisal.
Preparation of Work Plan - In order to allocate adequate and reasonable time for each and every activity to be accomplished during EA studies, EA team should prepare a clear work plan indicating the main activities, schedule, methods, and resources, etc. This is not only necessarily to organize their work but also to ensure that the realistic amount of resources and time is allocated to ensure achieving the required volume and quality of work. Initial work plan can be prepared considering the main works involved taking into account of past experience. The main works involved in EA studies are:

- Data/Information collection from secondary sources as well as field visits
- Consultation throughout the process. Consultation with different stakeholders at centers and project locations, covering government offices, local bodies, communities, NGOs, etc.
- Analysis and interpretation, which include desk review, data processing, application of methods, for impact identification, prediction, evaluation, and design of mitigation measures, preparation of EMP
- Report writing

The format for preparation of work plan is presented in table 4.2.

### Table 4.2: Format for EA Work Plan

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Work Activity</th>
<th>% of Time</th>
<th>Duration in Months/Week</th>
<th>Involved in Person days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Desk Review</td>
<td>1 2 3 4 5 6 7 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Collection of Information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>Initial Consultation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>Information Summary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td>Preliminary Analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>Desk Review Impression</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Field Visits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Preparation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td>Walkover Survey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3</td>
<td>Consultation with stakeholders</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td>Conduction of Survey for Baseline information Physical, Biological, and Socio-economic aspects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>Field Visit Report</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Analysis/Interpretation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Data compilation, interpretation and analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2</td>
<td>Impact identification, Prediction, and Evaluation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3</td>
<td>Design of Mitigation Measures including Alternate Analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.4</td>
<td>Preparation of EMP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td>Preparation of Draft Report</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.6</td>
<td>Public Consultation/hearing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.7</td>
<td>Finalization of EA Report and Submission</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4.3.4 Desk Review

The desk review is the starting point for systematically analyzing and interpreting the interaction between project activities and its surrounding environment. It will already identify the potential environmental effects and impacts to local environment in terms of physical, biological and socio-cultural aspects in general. This process is initiated right from the screening and TOR preparation stages. The EA team should critically review all the available secondary information. The outputs of the desk review should include:

- Collection of relevant information/data from secondary sources
Initial interaction, consultation and discussions with stakeholders
Organization of information
Detailed work plan
Selection of methods and tools and techniques for carrying out the EA study.

A proper desk review and initial consultation lay the foundation for smooth and worthwhile EA

Secondary Sources of Information - The secondary sources of information can be collected from various sources including:

- Existing sources at Dzongkhag head quarters (for examples Forest office, Agriculture office, Irrigation and other line agencies)
- Screening Documents (Environmental Information Documents submitted together with project report)
- Documents related to proposed Road Sub-project
  - Project documents including engineering and other documents
  - Topographic Map
  - Land Use and Land System Maps
  - Regional Geological Map
  - Dzongkhag Maps
  - Socio-economic data of the project area (zone of influence of road)
  - Others if any

Initial Interaction and Consultation - In order to obtain concerns, insights and views of different stakeholders consultation is necessary throughout the EA process. During the desk review process, EA team needs to contact and meet, interact with relevant offices of RGOB at center and local level, NGOs, Social workers, other relevant entities. A workshop or meeting can be organized at Dzongkhag level. This type of interaction and consultation often provides important clues and insights related to project environment helps the EA team to capture different perspectives of the project.

Compilation of Information - The collection of information from secondary sources, initiation of consultation/interaction/discussion process, and desk review can run simultaneously. Based on these activities notes can be prepared summarizing information on the project and as well as the environment. Initial work plan should be detailed and modified accordingly. From the very beginning the information should be summarized and organized into two broad categories:

- Relating to Project
- Relating to Environment

Project Information - The EA team needs to fully familiarize with the project as known at current stage and update regularly as the project progresses. This can be done through review of the project documents, series of discussions and interaction with project officials and stakeholders.

Environmental Information - The EA team will collect the information relating to the local environment in accordance with the Terms of Reference. The generic issues to be collected from secondary sources are presented table 4.3. Attempts should be made to compile the information together with the maps.
Table 4.3: Checklist for Possible Environmental Features of Rural Road

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Environmental Features</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Information</td>
<td>General Characteristics of topography, Climate, drainage, geology, etc</td>
</tr>
<tr>
<td>2</td>
<td>Protected Area</td>
<td>National Park, Conservation Area, Wildlife Reserve, Hunting Reserve, etc</td>
</tr>
<tr>
<td>3</td>
<td>Forest Area</td>
<td>Types of Forest, Management Status (National, Community, Religious)</td>
</tr>
<tr>
<td>4</td>
<td>Difficult and Risky Area</td>
<td>Area prone to landslide, erosion, cliff, steep slope, flood prone area, drainage problem, etc</td>
</tr>
<tr>
<td>5</td>
<td>Development Potential Areas</td>
<td>Fertile Agricultural area suitable for cash crop cultivation, tourism potential, hydropower, mining, etc</td>
</tr>
<tr>
<td>6</td>
<td>Historical and Cultural Area</td>
<td>Sights for locally and regionally known for cultural and religious importance</td>
</tr>
<tr>
<td>7</td>
<td>Population, trade and service centers</td>
<td>Market area, major settlements, service centers, etc</td>
</tr>
<tr>
<td>8</td>
<td>Community infrastructures</td>
<td>Irrigation canal, Water Supply Systems, etc</td>
</tr>
<tr>
<td>9</td>
<td>Water bodies</td>
<td>Rivers, streams, drainage, lakes, wetland, etc</td>
</tr>
</tbody>
</table>

Comparison of Alternative Alignment – The EA team should compare the road alignment alternatives in terms of possible positive and negative environmental impacts. This will be made with respect to TOR. The generic checklists are provided in table 4.4

Table 4.4: Checklist for Comparison of Alternative Alignment

<table>
<thead>
<tr>
<th>Environmental Features</th>
<th>Route A</th>
<th>Route B</th>
<th>Positive and Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protected Areas</td>
<td></td>
<td></td>
<td>Negative</td>
</tr>
<tr>
<td>Forest Area</td>
<td></td>
<td></td>
<td>Negative</td>
</tr>
<tr>
<td>Water Body</td>
<td></td>
<td></td>
<td>Negative</td>
</tr>
<tr>
<td>Difficult and Risky Area</td>
<td></td>
<td></td>
<td>Negative</td>
</tr>
<tr>
<td>Development Potential Area</td>
<td></td>
<td></td>
<td>Positive</td>
</tr>
<tr>
<td>Historical and cultural sites</td>
<td></td>
<td></td>
<td>Negative</td>
</tr>
<tr>
<td>Population, Trade and Service Centers</td>
<td></td>
<td></td>
<td>Positive</td>
</tr>
<tr>
<td>Community infrastructures</td>
<td></td>
<td></td>
<td>Negative</td>
</tr>
<tr>
<td>Length of Road</td>
<td></td>
<td></td>
<td>Negative</td>
</tr>
</tbody>
</table>

Finalization of Methods and Techniques – After the accomplishment of above tasks, EA team should finalize the specific methods and tools to be applied for carrying out the study. There exist several checklists and matrices published by various agencies. However, such tools are of generic in nature and not necessarily suitable for all types of projects. Hence, the EA team should prepare project specific checklists, matrices, and other tools in accordance with the project specific requirement. This can be prepared by utilizing published generic checklists or project type checklists or thematic checklists, reviewing the experience of similar project and utilizing the information and insights obtained during desk study. Similarly, project specific matrices can be prepared with reference to generic and project specific issues of road sub-project. A simple interaction matrix for rural road is presented in table 4.5.
Table 4.5: Sample Interaction Matrices for Rural Road

<table>
<thead>
<tr>
<th>Planning &amp; design</th>
<th>Environmental Factor / feature</th>
<th>Biological</th>
<th>Physical</th>
<th>Human, Social cultural economic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route selection</td>
<td>Protected area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consultation, dissemination</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road details and layout</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquisition of land</td>
<td>Forest condition &amp; area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land clearing, grubbing and top-soil removal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilization of equipment</td>
<td>Wildlife and bird</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excavation/ slope cutting</td>
<td>Fishes and aquatic life</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filling</td>
<td>Crops</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipping</td>
<td>Livestock</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quarrying &amp; burrowing</td>
<td>Landslides and erosion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retaining structures</td>
<td>Water quality/ quantity</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Alteration of drainage line</td>
<td>Noise and vibration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drains and outfalls</td>
<td>Accidents, health, safety</td>
<td></td>
<td></td>
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<tr>
<td>Compaction</td>
<td>Irrigation canals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bio-engineering</td>
<td>Water supply lines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic sign-posts</td>
<td>Trails &amp; bridges</td>
<td></td>
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<tr>
<td>Construction</td>
<td>Religious sites</td>
<td></td>
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<tr>
<td></td>
<td>Cremation/burial ground</td>
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<tr>
<td>Operation and Maintenance</td>
<td>Diseases &amp; community</td>
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<tr>
<td></td>
<td>Employment</td>
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<td></td>
<td>Buildings</td>
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<tr>
<td></td>
<td>Agricultural lands</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Development potential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation and Maintenance</td>
<td>Ecological</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Action activities (direct or induced)</td>
<td>Ecological</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Included activities / actions</td>
<td>Extraction of sand/ gravel</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hunting, fishing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Logging, and NTFP harvesting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>New hotels/ lodges, shops</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use of chemical fertiliser/ pesticides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Encroachment into forest land</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Encroachment into common or marginal land</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>New settlements</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Once the project specific matrix is prepared, it can be used for various purposes during the course of EA studies viz. impact identification, prediction and evaluation.

**Detailing of Work Plan** - After the accomplishment of above task, the EA team will prepare detailed/revised work plan.

### 4.3.5 Field Work

The fieldwork in EA study is carried out to update or confirm the secondary information collected during desk study, collect primary information and conduct stakeholder consultations. The information to be collected during field work include environmental baseline in terms of physical, biological and socio-economic and cultural environment. The field work will be done with the help of checklists, and necessary survey equipment. Specific and agreed methodology should be adopted for carrying out field work.

During the field work, information, among others, mainly relating to the following will be collected and compiled:

**Protected Areas:** Including National Park, Conservation Area, Wildlife Reserve, Hunting Reserves, or other locally protected area. Name and size of area, location approximate boundary into topographic map, Dzongkhag boundary, main species (tree, wildlife, birds) medicinal plants, protected plant and animal species, present conditions (good, bad, degradation) and reason, local communities views on use, functions and problems.

**Forest Areas:** Including state or community or private forest. Name and size of forests, ownership, location with approximate boundary in topographic map, present condition (dense or thin, looked after or degrading or bad, pristine or regenerated or planted), and its reason, dominant or associated tree species, ground cover species and condition, main wildlife and birds, medicinal plant, protected plant and animal species, existing local use of forest, local communities views on importance, use, functions and problems, surveyors impression on significance, locally observed trend in the past years.

**Water/Drainage Features:** Type of water body - major springs, rivers, lake, and wetland. Name, and size, location in topographic map, Stream characteristics- perennial, intermittent, flood, high/low gradient, average winter and summer flow, Extreme flows, highest water level, watershed conditions, causes of damages, Description of water bodies-size, importance, existing conditions and problems, local usages/values, irrigation, drinking water, bathing, religious use, extraction of sand and gravel, who uses for what purpose, local communities views on importance and functions, surveyors impression on significance, locally observed trend in recent past, surveyors comments on what may happen as a result of road development.

**Unstable or erosion prone areas:** landside (active, old and passive, causes of landslide, recurring slides) areas of known landslide and erosion, geological features, very steep slope area combined with weak soil, other areas visibly unstable, local perception on causes and risks of land instability, human activities such as quarrying compatible or incompatible with slope instability and erosion risk, surveyors impression on instability and erosion risk, what happen when if the proposed road is built.

**Flood Risk Areas:** Flood risk/river cutting areas, low laying areas susceptible to water logging/drainage problems

**Development of Potential Areas:** Highly fertile agricultural land, areas suitable for cash crops/horticulture, tourism potential areas, known sites for hydropower, known mine deposits
including construction materials, Description-existing conditions and problems, importance, values, of these sites perceived by the communities, comment on what happen as a result of road development.

**Significant Historic, Cultural and Religious Sites:** Types- palace, Dzongs, monuments, temple, monastery, public buildings, Description- importance, values, as perspective of local community, existing condition and problem, Surveyors views and comments, what will happen as a result of road development.

**Settlement and Trade Centers:** Market centers, major settlements of special group of people, household and population, service available, importance of these centers for the locality, what may happen as a result of road development.

**Community Infrastructures and common property:** Type-irrigation, drinking water scheme, trail and bridge, power line, telephone line, water mill, hydropower, Description- extent of service provided such as area irrigated, population served, existing conditions and problem, importance, values, as perceived by the local communities. It could also include Common properties such as sites for market, common grazing land, cremation ground, etc.

### 4.3.6 Collection and Compilation of Environmental Baseline Information

The environmental baseline information is an important reference point for environmental assessment study in order to facilitate identification, prediction and evaluation of impacts so as to avoid and mitigate adverse impacts and enhance beneficial impacts of project in local environment. The baseline information refers to collection of physical, biological, socio-economic and cultural information of project area or the areas likely to be affected by the project activities.

The baseline data is collected with a view to:

- Know the status of environmental conditions of the project areas and indication of trend of resources use,
- Detect of resources likely to be affected by the project activities,
- Develop and important reference point(s) for environmental monitoring, and
- Provide important information for decision making process.

The baseline information should be sufficiently analyzed before identification, prediction and evaluation of environmental impacts.

**Physical Environment** - Topographical variation along the road alignment, climate (rainfall, temperature, wind speed and direction if possible), hydrology and drainage system, geology and seismicity, catchment condition, soil erosion, slope range, sediment rate, land use, use of earth moving and other type of equipment to be involved and its impacts on local environment, environmental pollution air quality, water quality, and noise level.

**Biological Environment** - Vegetation and forestry (forest type, major plants, estimated number of trees with right of way, categories of forest, standing timber volume, plant species, wildlife (mammals, birds, herpitofauna), fish, endemic, threatened and protected species, and sensitive areas.

**Socio-economic** - Population and demography, development needs and potential, infrastructure facilities, social service facilities, economic activities such as agriculture, livestock, trade, business, etc, different category of land and properties to be affected, possible land and properties acquisitions.
Cultural - location and condition of archeological, historical, religious sites, cultural and religious practices.

Data Sources - The environmental baseline data are collected from secondary sources and primary sources. The secondary data can be collected through review of published and unpublished data as stated earlier (Desk Review) and primary data can be collected through field survey as stated earlier (4.3.5).

Data Processing and Analysis – The baseline data collected from primary and secondary sources will be compiled and analyzed by EA team as discussed hereunder:

Physical Environment - The topographic information can be taken from topographic sheets. The trend analysis of climatic data can be made based on the time series data on temperature, rainfall and others. The geological maps and field survey will useful in locating the landslide, prone area. Similarly, land use map and field visit facilitate the land use relating information along the road alignment and zone of influence.

Data on air, water, and noise level could be linked with human health. For example, air and water quality can be analyzed in laboratory if it is indicated in TOR.

Biological Environment - The estimation of terrestrial flora can be estimated either by counting trees along the alignment or through sampling process. The volume of timber can be estimated by Quarter Girth formula, as follows:

\[
\text{Volume of Wood} = \frac{(Girth)^2 \times Length}{16}
\]

In order to estimate the wood volume, the tree height can be either estimated through ocular method or height measuring equipment and girth of the tree should be measured by tape.

The volume of timber can be estimated with respect to the species. Similarly, the protected, endemic, endangered, rare and threatened or vulnerable species will be compared taking into account the list of species published by government, academic and/or international organizations. Sensitive areas will be categorized based on national policy, law, national and international commitment on species conservation, and presence of type and number of protected, endemic, or endangered species of national or international importance.

Terrestrial Fauna - The information collected from primary and secondary sources in terms of mammals, birds and herpeto fauna will be compiled.

4.3.7 Identification, Prediction and Evaluation of Environmental Impacts

Basic Framework - An EA, the process of appraising the environmental consequences, has to analyze and interpret the interaction between the project activities and surrounding environment. In this process, EA team should analyze and interpret the following points:

Identification of Sources of Impacts - The sources of impacts are the project activities/actions during construction phase as well as project induced activities.

Receptors of Impacts - Receptor of impacts are the environmental component, or setting, or feature, living and non-living things situated within the project area or zone of influence of project. The examples of receptor include water, air, land, forest, fauna, flora, human beings, temples, structures, building, culture, etc.
**Impacts Pathway and Nature** - The way in which a project activity will have an impact on a receptor or multiple receptors, and multiple activities having impacts on receptor, or how receptors(s) might have on project and its activities. The resulting impacts can be categorized as direct, indirect, combined/cumulative, synergistic, short term, medium term, long term, reversible, irreversible, severe, moderate and insignificant.

The environmental impact identification exercise attempt to answer: **What changes may occur as a result of the proposed road construction and operation**

**Direct Impact** - It is referred as an alteration of the existing environmental conditions as a direct consequence of project activity. These are site specific impacts such as if the road passes through forest and trees or vegetations are cleared as part of site clearance.

**Indirect Impacts** - Such impacts occur when the effect of project activity on one component produces repercussions on other components. A direct impact may also induce indirect impacts on environment. For example landslides that occur due to construction of road may lead to damage of cultivated land and eventually loss of agricultural production.

**Cumulative Impacts** - This is referred as the combination of impacts of two or more projects or combination of impacts of several activities of one project.

**Reversible Impacts** - It is referred as the impacts generated by particular action of project can be minimized through mitigation measures or by nature itself.
**Irreversible Impact**- The impacts generated by project action can not be replaced by mitigation measures or by nature itself over the time.

**Beneficial Impacts**- Many projects will generate beneficial impacts on environment and society and will contribute to improve the quality of human life. For example, the road construction will increase the quality of life in terms of decrease in transportation cost, time and improve safety.

**Adverse Impacts**- Many projects or actions will pose significant negative impacts on the environment and local population will face difficult in using environmental resources. For example loss of forest for site clearance may lead to increase in time for collection of fuel and fodder for local communities.

**Magnitude of Impacts** – The magnitude is defined as the severity of each potential impact. This can be categorized in terms of high, medium and low.

**Extent**- Impacts may range from its origin to different place depending upon the type and nature of project. The extent of impacts can be categorized as site specific, local, regional, national and trans-boundary.

**Duration**- Environmental Impacts may have temporal dimensions that should be considered during impact assessment. The duration of impacts can be categorized in terms of short term, medium terms, and long term.

**Identification of Impacts**- The impact identification during EA studies for rural road project can be carried by adopting the following steps:

**Project Description**- The first and foremost step is to identify the project activities and to understand how these will be implemented or managed in practice. A list of project activities for construction and operational period needs to be prepared together with the list of activities that are likely to be induced by the project. A sample interaction matrix is presented in table 4.5. However, specific interaction matrix should be prepared with respect to the project specific issues and activities.

The following information related to project description for impact identification of rural road needs to be compiled:

- Alternative Alignment of Proposed Road (in map and description),
- Construction technology (machine, labor based, mixed, etc),
- Resources consumed including possible sources (sand, gravel, clay, timber, bitumen, etc)
- Implementation Mechanism (through local institutions, users' committee, contractors, mixed, etc)
- Institutions Involved in Project Implementation (roles, strength and weakness)
- Construction Period
- Operation Period
- Maintenance Approach (fund, institutional mechanism, human resources, etc)

The EA team must be aware of changes, revision and modification in project planning, design and implementation arrangement if any. The impact sources and their natures should be summarized in the form of project description.

**Understanding of Environmental Settings**- The second step to impact identification is to understand the environmental settings with respect to possible receptors that are likely to be affected due to project activities. This can be prepared with the help of analysis of environmental
baseline information (primary and secondary sources). For this, table 4.3 needs to be improved based on the environmental baseline information collected during the course of study. After the understanding of potential receptors, the information on each receptor should be summarized:

- The present state of likely receptors (size, condition, species, function, utility, pressure)
- How their conditions have been changing over the time
- Probable reasons or factors for the current state and changes/trend

**Identification of Candidate Impacts** - After the accomplishment of above steps, the next step is to find out, which project activities may positively or negatively affect the receptors. The impact identification can be made through various methods, which primarily include checklist method (simple, descriptive, scaling) questionnaires, Interaction Matrix (Simple Matrix, Leopard Matrix, Modified Graded Matrix), Network Method, Overlay Methods (GIS or manual). The sample of simple checklist is presented in table 4.6.

**Table 4.6: Simple Checklist for Impact Identification**

<table>
<thead>
<tr>
<th>Potential Impacts</th>
<th>Construction Stage</th>
<th>Operation Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adverse</td>
<td>Beneficial</td>
</tr>
<tr>
<td>Physical Environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land slide, Erosion, loss of topsoil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrology and Drainage System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Quality and Dust</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise and Vibration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impacts due to use of Equipments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological Environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protect Areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forest Condition and Area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wildlife and Birds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish and Aquatic Life</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crops</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Livestock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rare and Endangered Species</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-Economic and Culture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accident, Health and Safety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irrigation Canals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Supply System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trail and Bridges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Religious Sites</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burial/Cremation Ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural Land</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Health</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development Potential</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Culture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Historical and Cultural Sites</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The sample interaction matrix is provided in table 4.5. This matrix should be improved in accordance with the project specific issues.

**Prediction of Environmental Impacts** - The prediction of impacts help to understand what will happen on the environmental resources during and after the implementation of project in a given area. As EA is a predictive tool, it must provide information on possible modifications on environment. It focuses on prediction of significant environmental modification, forecasting of quantity and/or spatial dimension of change in the environment, and estimation of probability that impact will occur over the period of time. Quantitative and qualitative techniques may be used for making predictions in particular subject. These techniques range in complexity from those that are totally intuitive to complicated models based on assumed nature of environmental process. All prediction techniques, by their nature, involve some degree of uncertainty since environmental processes are very complex and may not behave as assumed in models. For EA of Road to be
constructed and operated under RAPII the complex prediction technique are not necessary and following sample process may be used:

- Simple processing of information to establish the current condition (area of a forest, or total number of households at a settlements, etc)
- Estimate the future condition with and without project. Such estimation may be made by simple quantitative methods such as extrapolation and interpolation of present trend to take account of proposed action or qualitative by professional judgment.
- Use past experience gained in similar situation elsewhere (modified to suit the proposed action) for example spoil tipping may trigger slope failure, or improved physical access coupled with market link to promote vegetable farming.

The impact prediction should indicate the followings:

**Magnitude of Impacts** - which can be major, moderate, minor, depending upon the scale or severity of change. The definition of major, moderate, and minor should be defined in project context.

**Geographic Extent** - which can be site specific, local, regional, national, and trans-boundary.

**Duration** - which can be short term, medium term, and long term.

The example of rural road impact prediction is presented in table 4.7 and 4.8.

### Table 4.7: Sample Beneficial Impacts on Rural Road Project

<table>
<thead>
<tr>
<th>Likely Impacts</th>
<th>Environmental Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction Phase</strong></td>
<td></td>
</tr>
<tr>
<td>Employment opportunity and increase in income level (7728 man days)</td>
<td>Direct</td>
</tr>
<tr>
<td>Increase in Trade and Business</td>
<td>Direct</td>
</tr>
<tr>
<td>Enhancement of Skill (one to three training per year)</td>
<td>Indirect</td>
</tr>
<tr>
<td><strong>Operation Stage</strong></td>
<td></td>
</tr>
<tr>
<td>Increase in land value</td>
<td>Indirect</td>
</tr>
<tr>
<td>Improvement in Accessibility</td>
<td>Direct</td>
</tr>
<tr>
<td>Increase in Productivity</td>
<td>Indirect</td>
</tr>
<tr>
<td>Promotion of small scale industries</td>
<td>Indirect</td>
</tr>
<tr>
<td>Enhancement of Social Services</td>
<td>Indirect</td>
</tr>
<tr>
<td>Availability of Forest Product from site clearance (20663 cft)</td>
<td>Direct</td>
</tr>
</tbody>
</table>

### Table 4.8: Sample Adverse Impacts on Rural Projects

<table>
<thead>
<tr>
<th>Likely Impacts</th>
<th>Environmental Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction Phase</strong></td>
<td></td>
</tr>
<tr>
<td>Loss of Top soil due to stripping of Construction site</td>
<td>Direct</td>
</tr>
<tr>
<td>Impact due to Earthwork Excavation and Disposal (189567 m³)</td>
<td>Direct</td>
</tr>
<tr>
<td>Impact due to Operation of Quarry Sites</td>
<td>Direct</td>
</tr>
<tr>
<td>Impacts due to use of equipment</td>
<td>Direct</td>
</tr>
<tr>
<td>Impact due to Change in Land Use (Cultivated irrigated land - 9.5 ha, Cultivated un irrigated - 28.1 ha, forest - 5, Bush 5.6 ha and Barren -5.9 ha)</td>
<td>Direct</td>
</tr>
<tr>
<td>Impact on Water Resources Damage on irrigation System, Water supply System, and river water quality degradation</td>
<td>Direct</td>
</tr>
<tr>
<td>Slope Instability and Erosion ( specify the change in and locations of road)</td>
<td>Indirect</td>
</tr>
<tr>
<td>Air and Noise Pollution</td>
<td>Direct</td>
</tr>
<tr>
<td>Water Pollution</td>
<td>Direct</td>
</tr>
<tr>
<td>Loss of Forest (2087 cft)</td>
<td>Direct</td>
</tr>
</tbody>
</table>
Environmental Management Framework

<table>
<thead>
<tr>
<th>Likely Impacts</th>
<th>Environmental Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nature</td>
</tr>
<tr>
<td>Pressure on Forest Product</td>
<td>Indirect</td>
</tr>
<tr>
<td>Disturbances on Wildlife</td>
<td>Indirect</td>
</tr>
<tr>
<td>Rare and Endangered Species</td>
<td>Indirect</td>
</tr>
<tr>
<td>Impact on Aquatic Life</td>
<td>Indirect</td>
</tr>
<tr>
<td>Pressure on Social Service and Facilities</td>
<td>Indirect</td>
</tr>
<tr>
<td>Occupational Health and Safety</td>
<td>Direct</td>
</tr>
<tr>
<td>Health and Sanitation</td>
<td>Indirect</td>
</tr>
<tr>
<td>Impact on Local Culture</td>
<td>Indirect</td>
</tr>
<tr>
<td>Conflict, Law and Order Situation</td>
<td>Indirect</td>
</tr>
</tbody>
</table>

**Operation Stage**

<table>
<thead>
<tr>
<th></th>
<th>Nature</th>
<th>Magnitude</th>
<th>Extent</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Stability and Management</td>
<td>Direct</td>
<td>Medium</td>
<td>Site Specific</td>
<td>Long Term</td>
</tr>
<tr>
<td>Road Accident</td>
<td>Direct</td>
<td>Medium</td>
<td>Local</td>
<td>Long Term</td>
</tr>
<tr>
<td>Air and Noise Pollution</td>
<td>Direct</td>
<td>Medium</td>
<td>Local</td>
<td>Long Term</td>
</tr>
<tr>
<td>Water Pollution</td>
<td>Indirect</td>
<td>Low</td>
<td>Local</td>
<td>Long Term</td>
</tr>
<tr>
<td>Road Safety Measures</td>
<td>Direct</td>
<td>High</td>
<td>Local</td>
<td>Long Term</td>
</tr>
<tr>
<td>Development of Ribbon Settlement</td>
<td>Indirect</td>
<td>Medium</td>
<td>Local</td>
<td>Long Term</td>
</tr>
<tr>
<td>Depletion of Forest Resources</td>
<td>Indirect</td>
<td>Medium</td>
<td>Local</td>
<td>Long Term</td>
</tr>
<tr>
<td>Socio-economic and Other Issues</td>
<td>Indirect</td>
<td>Low</td>
<td>Local</td>
<td>Medium</td>
</tr>
</tbody>
</table>

**Evaluation of Environmental Impacts** - The evaluation of environmental impacts is referred in order to answer whether the predicted impacts are significant enough or not. The evaluation of impacts for EA studies for rural road should follow the following steps:

- Establishment of importance/values of each environmental resources, features, component or factors that is likely to be affected. EA team should perform this by interpreting environmental baseline information and taking into account of the utility, functions, linkages with other sector and relevant factors.
- Consideration of characteristics of changes in terms of magnitude, duration, direct, indirect, reversible, etc and its implication on the value/qualities, or importance of the different environmental features.

In order to evaluate the impacts, it is essential to prepare clear and agreeable criterion. In its absence, the evaluation of impact may be controversial. The criteria may be developed by considering the following elements:

- Consideration to impact characteristics such as magnitude, duration, extent, duration, etc
- Consideration of prevailing legislation, policies, standards, etc
- Comparison of impacts with accepted standard and norms
- Public sensitivity, social, cultural and economic implications,
- Ecological functions and importance, and
- Professional judgment

The outcome of impacts may be summarized in writing as well as in matrix indicating significant, and insignificant.

**4.3.8 Mitigation Measures**

Mitigation refers to the measures that are designed to cope with adverse consequences and to enhance the positive impacts on the environment as a result of the Project implementation. Mitigation measures are recommended actions that reduce, avoid or offset the potential adverse environmental consequences of the Project activities. The mitigation measures are of Avoidance, Rectification and abatement measures or Compensation types.

**Avoidance Measures** - For example changing a road route or prohibiting blasting.
**Rectification and abatement Measures** - Planting vegetation on cut slope, use retaining walls to protect slope failure, restoring disturbed natural drainage line or damages resources, landscaping, etc.

**Compensation Measures** - For example afforestation to compensate forest land occupied by a project or paying cash compensation, off-site program to enhance some other aspect of environment, etc.

Mitigation measures have to be developed following some common approaches such that the development project indeed is viable, practical, and cost effective, which in turn would supplement its environmental and social sustainability. The approaches for mitigation measures are presented in Table 4.9

### Table 4.9: Approaches of Mitigation Measures

<table>
<thead>
<tr>
<th>SNo</th>
<th>Mitigation Measure</th>
<th>Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Seek alternatives to avoid particular impacts.</td>
<td>Consider alternatives to a proposed project activity. Examine alternative ways to achieve the objectives to maximize benefits and minimize undesirable impacts.</td>
</tr>
<tr>
<td>2</td>
<td>Arrange compensation where particular impacts are unavoidable.</td>
<td>Restore damaged resources, such as, water source, irrigation system, forest. Proper rehabilitation scheme, such as, skills training, new employment. Adequate compensation payments to affected persons for damage or loss of property, livelihood and provision of rehabilitation measures.</td>
</tr>
<tr>
<td>3</td>
<td>Take Corrective Measures to reduce unavoidable effects.</td>
<td>Consider corrective measures to reduce adverse impacts to acceptable standards, such as, remove spoil material during construction, replace or relocate community water source, assist in school expansion to handle influx of laborers' children, and others.</td>
</tr>
<tr>
<td>4</td>
<td>Implement Preventive Measures to avoid some impacts altogether.</td>
<td>Pre-preparation for minimizing adverse impacts, such as, implement health education program, initiate public awareness programs.</td>
</tr>
</tbody>
</table>

Realizing the impacts, potential problems and effects, and taking into consideration the above mitigation approaches, the generic mitigation measures suitable to the RAP II is presented in the Table 4.10.

### Table 4.10: Approaches of Mitigation Measures

<table>
<thead>
<tr>
<th>Category</th>
<th>Potential Problem</th>
<th>Appropriate Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stripping of Construction Site</td>
<td>Loss of Top soil</td>
<td>Extract carefully and secure the top soil within 25 cm from the surface. Careful disposal of topsoil after striping.</td>
</tr>
<tr>
<td>Slope stability</td>
<td>Landslides or other forms of mass instability on the slopes</td>
<td>Geological/geo-morphological studies conducted to investigate and recommend best available options. Civil engineering structures and bio-engineering measures used. Measures taken to avoid undercutting of slope toes. Quarrying prohibited in river beds, where flood discharge is significant. Selection of appropriate construction equipment.</td>
</tr>
<tr>
<td>Road crosses major areas of deep-seated instability</td>
<td>Development of erosion or gullying</td>
<td>Check dams and bio-engineering measures used as necessary.</td>
</tr>
<tr>
<td>Road crosses major areas of deep-seated instability</td>
<td>Increase in flood stage</td>
<td>Water management structures required, including check dams and other protection measures constructed as necessary. Cascade constructed, to be as long as necessary.</td>
</tr>
<tr>
<td>Water management</td>
<td>High volume of waste/spoil</td>
<td>Minimize spoil by balancing cut and fill wherever possible.</td>
</tr>
<tr>
<td>Water management</td>
<td>Spoil tipped away from designated areas</td>
<td>Safe tipping areas identified and enforced.</td>
</tr>
<tr>
<td>Water management</td>
<td>Spoil failure or being washed on the farmland</td>
<td>Spill traps constructed. Land owner compensated.</td>
</tr>
<tr>
<td>Water management</td>
<td>Scour and erosion below unprotected drainage out falls</td>
<td>Mattresses check dams and other protection measures constructed as necessary. Cascades constructed, to be as long as necessary.</td>
</tr>
<tr>
<td>Water management</td>
<td>Disruption of drinking or irrigation water</td>
<td>Measures to resolve these problems incorporated into project works, or compensation paid.</td>
</tr>
<tr>
<td>Land use</td>
<td>Houses need to be removed</td>
<td>Compensation paid to house owners.</td>
</tr>
<tr>
<td>Land use</td>
<td>Loss of agricultural land</td>
<td>Compensation paid to land owners.</td>
</tr>
</tbody>
</table>
### Environmental Management Framework

<table>
<thead>
<tr>
<th>Category</th>
<th>Potential Problem</th>
<th>Appropriate Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plants and wildlife</td>
<td>Loss of forest land</td>
<td>Forest User Groups compensated for trees and products lost. Check impacts are limited to compensated trees and products.</td>
</tr>
<tr>
<td></td>
<td>Large numbers of trees being removed</td>
<td>Felled trees replaced, using the same species if appropriate. Trees planted wherever land is available.</td>
</tr>
<tr>
<td></td>
<td>Disturbance to wildlife</td>
<td>Damage to wildlife habitats avoided as far as possible. Habitats re-created on marginal roadside land.</td>
</tr>
<tr>
<td>Quaries and borrow pits</td>
<td>Pollution, disturbance and danger from quarry operations</td>
<td>Construct bunds to screen noise and dust. Enforce access restrictions.</td>
</tr>
<tr>
<td></td>
<td>Safety risks from abandoned quarries or borrow pits</td>
<td>Quarries made safe by re-grading slopes and installing structures as necessary.</td>
</tr>
<tr>
<td></td>
<td>Land seriously disturbed or lost from production</td>
<td>Quarry and borrow areas rehabilitated to productive plantations using bio-engineering techniques.</td>
</tr>
<tr>
<td></td>
<td>Quarries continue to be used by unauthorized persons</td>
<td>Unauthorized quarrying stopped, where necessary by working with the Dzongkhag Authority</td>
</tr>
<tr>
<td>Use of Construction</td>
<td>Increase slope instability, noise, vibration, deteriorate air, water quality, land degradation, etc</td>
<td>Select the equipment with less vibration such as use excavator rather than dozer for track opening, use trippers and other trucks having less emission in accordance with the EURO Standards, maintain the equipment to minimize gaseous wastes, etc. In addition, encourage the contractors to use new equipment as far as possible.</td>
</tr>
<tr>
<td>Equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stone crushing &amp; asphalt</td>
<td>Dust and noise pollution</td>
<td>Plants re-sited or compensation arranged if pollution is caused. Large earth bunds constructed and vegetated to reduce hazard.</td>
</tr>
<tr>
<td>plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazardous materials</td>
<td>Spills, leaks or injuries from any type of hazardous material (e.g. bitumen, cement, paint, explosives, fuels, lubricants)</td>
<td>Checks to ensure that storage is good and that there are no losses or leaks. Checks to ensure that protective clothing and safety measures are used.</td>
</tr>
<tr>
<td></td>
<td>Bleeding bitumen</td>
<td>Appropriate chippings spread and rolled into the affected areas.</td>
</tr>
<tr>
<td>Camp operation</td>
<td>Pollution from work and labor camps</td>
<td>Checks to ensure that camps are not polluting neighboring areas, especially from sewerage and rubbish disposal.</td>
</tr>
<tr>
<td></td>
<td>Laborers cut trees for firewood</td>
<td>Kerosene stoves and kerosene provided to laborers.</td>
</tr>
<tr>
<td></td>
<td>Land remains damaged after construction</td>
<td>Checks to ensure camp areas are fully restored, including re-top soiling and tree planting if appropriate.</td>
</tr>
<tr>
<td>Dust and noise</td>
<td>Dust generated from construction works</td>
<td>Speed controlled using speed bumps. If water is available, the road surface can be sprayed on a frequent schedule.</td>
</tr>
<tr>
<td></td>
<td>Dust from a road with an earth or gravel surface</td>
<td>Permanent speed bumps installed in villages and bazaars to reduce traffic speeds in inhabited areas. Bitumen surface constructed in bazaars, with speed controls. Dense vegetation planted on roadside.</td>
</tr>
<tr>
<td></td>
<td>Noise from large work sites</td>
<td>Large earth bunds constructed and vegetated to reduce noise. Work schedule to minimize disturbance.</td>
</tr>
<tr>
<td>Social issues</td>
<td>Positive impact of road confined to wealthier sections of society</td>
<td>Other agencies encouraged to develop activities beneficial to poor and excluded sections of society.</td>
</tr>
<tr>
<td></td>
<td>Local people excluded from project activities</td>
<td>Designs incorporate methods within the skills of local people. Contractors encouraged using local labor wherever possible.</td>
</tr>
<tr>
<td></td>
<td>Promises were made to local people during feasibility and planning phases</td>
<td>Checks to ensure that the promises are fulfilled; if they prove to be not possible, reasonable alternatives must be negotiated.</td>
</tr>
<tr>
<td></td>
<td>Significant disparities emerge in levels of compensation</td>
<td>Compensation levels rationalized to ensure reasonable parity.</td>
</tr>
<tr>
<td></td>
<td>Road Safety: faster traffic resulting from a new, smoother road surface</td>
<td>Traffic safety measures installed, such as warning signs, delineators and barriers. Awareness of road safety raised among affected communities. Road safety audits carried out and recommendations implemented.</td>
</tr>
</tbody>
</table>

**4.3.9 Bio-engineering as Slope Stabilization Measures**

The bio-engineering is the use of living plants for engineering purposes particularly for slope protection as well as to improve surface drainage and reduce slope failure. It is extensive low cost technique. It is normally used in combination with civil engineering works. The examples of usefulness of bio-engineering in road development include:

- Prevention of scour around drain and culvert discharge point
- Prevention of scour around civil engineering structures
- Protection against slope debris coming on to the carriage way

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- Protection against debris blocking side drains
- Protection of un-compacted spoil
- Protection of embankment and fill areas,
- Protection of base cut slope
- Protection of base surface on rehabilitated landslides
- Protection of slope toes from erosion, where undercutting and over steeping may arise
- Stabilization of gullies
- Rehabilitation of quarries and borrow pits
- Prevention of shallow slumps
- Reduction of minor rock falls in weak and shattered rock
- Reduction of debris creep on steep, unconsolidated colluvial soil

This is the most favored mitigation measures, which can be adopted for above mentioned effects due to road construction and consequent adverse impacts. The sample line diagram of bio-engineering for slope protection is presented in figures 4.5 and 4.6.

Figure 4-5: Possible slope failure plains around a road on hill slope

Source: Roadside Bio-engineering, Department of Road, HMGN, Nepal
Environmental Management Framework

Figure 4-6: Hypothetical site requiring civil and bio-engineering works serving different functions

**Existing situation**

- Risk of surface erosion: armoring is required
- Potential failure plane
- Low risk of saturated flow: reinforcement is required
- Risk of planar failure: support and anchorage are required
- Road and side drain
- Risk of debris falling into drain: catching is required

**Possible solution**

- Shrubs planted at intervals: anchorage through the potential failure plane
- Dense line of shrubs: catching debris
- Planted grasses: armoring and providing reinforcement to 0.5m

Source: Roadside Bio-engineering, Department of Road, HMGN, Nepal

4.3.10 Implementation of Mitigation Measures

The mitigation measures should be integrated into project design and tender documents. Using this approach, the mitigation measures will automatically become part of the project construction and operation phase. By including mitigation measures in the contract or in specific items in the Bill of Quantities, monitoring and supervision of mitigation implementation could be covered under the normal engineering supervision provisions of the contract.

**Project Design:** The mitigation measures should be integrated in the design of the project itself. Such a step will enhance the mitigation measures in terms of specific mitigation design, cost estimation of the mitigation measure, and specific implementation criteria. Integration of mitigation measures in the design phase will also help in strengthening the benefits and sustainability of the project.
**Project Contract:** The project contractor should be bound by the parameters identified in the environmental and social assessment pertaining to specific mitigation measures in the contract. The final acceptance of the completed works should not occur until the environmental clauses have been satisfactorily implemented.

**Bill of Quantities:** The tender instruction to bidders should explicitly mention the site-specific mitigation measures to be performed, the materials to be used, labor camp arrangements, and waste disposal areas, as well other site-specific environmental requirements. Such a definition would clearly exhibit the cost requirement to undertake mitigation measures, which otherwise might be lost as the bidders in an attempt to be more competitive may not include the price realistic enough to fund mitigation measures and other protection measures.

**Supervision and Monitoring:** The purpose of supervision is to make sure that specific mitigation parameters identified in the environmental and social assessment and as bound by the contract is satisfactorily implemented. Likewise, monitoring is necessary such that the mitigation measures are actually put into practice.

A categorized mitigation measures (generic), and its implementation responsibility is given in the table 4.11 below.

### Table 4.11: Approaches of Mitigation Measures

<table>
<thead>
<tr>
<th>SNo</th>
<th>Mitigation Activity</th>
<th>Implementation Responsibility</th>
<th>Project Design</th>
<th>Contract</th>
<th>Bill of Quantity</th>
<th>Monitoring*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slope stability</td>
<td>Specify bio-engineering and relevant techniques. Contractor shall comply with clauses pertaining to mitigation in the contract. Identify stabilization area. Provide list of vegetation to be planted.</td>
<td>Adequacy, quality of vegetation. Survival rate of plants.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Spoil disposal</td>
<td>Identify mass balance techniques. Safe tipping areas identified and enforced. Design spoil traps.</td>
<td>- do -</td>
<td>Quantity disposal and extraction volume.</td>
<td>Presence of scouring, erosion, damage to property, water supply disruption. Complaints from local people</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Water management</td>
<td>Design safe discharge drainage and techniques (check dam) to natural water course.</td>
<td>- do -</td>
<td>Physical works for safe discharge drainage listed.</td>
<td>Evidence of fresh surface erosion, presence of gullies, increase in water turbidity, loss of agriculture forest land. Slope condition. Public complaints.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Land use</td>
<td>Explore use of marginal land. Check impacts are limited to compensated trees and products.</td>
<td>- do -</td>
<td>-</td>
<td>Quantify actual land use pattern for construction and other activities. Public complaints.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Plants and wildlife</td>
<td>Consider construction affecting forests and productive plots.</td>
<td>- do -</td>
<td>-</td>
<td>Check habitats re-created on marginal roadside land.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Quarries and borrow pits</td>
<td>Design bunds to screen noise and dust.</td>
<td>- do -</td>
<td>Quantity restoration costs and present technical specifications.</td>
<td>Check for water ponding, formation of gullies, water turbidity. Check unauthorized quarrying activities.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Proper Selection of Construction Equipment</td>
<td>Select proper equipment having less vibration characteristics, encourage new equipment or maintain properly to minimize the gaseous and liquid wastes.</td>
<td>Do</td>
<td>Include in Specification</td>
<td>Inspection of equipment being used, maintenance history, etc</td>
<td></td>
</tr>
</tbody>
</table>
Monitoring and evaluation is important during all stages of project implementation. The monitoring and evaluation system is described in subsequent section with necessary institutional mechanisms for RAP II subprojects implementation.

4.3.11 Alternative Analysis of the Project

Alternative analysis has been considered as an integral part of EA study, which involves an examination of alternative ways of achieving the objectives of a proposed project. The aim of alternative analysis is to arrive at a development option, which maximizes the benefits while minimizing the unwanted impacts. Alternative analysis is also a form of mitigation measures. The Regulation for Environmental Clearance of Project has also stressed the alternative analysis of the project during the course of EA study. The aim of proposed road project is to improve the transportation network for the enhancement of safe and faster connectivity of rural areas into market centers and eventually improve the living condition of people living in the zone of influence. The EA study should consider various alternatives to achieve the above project objectives with minimum environmental degradation mainly include the followings:

- Project Alternative
- Alternative Route
- Alternative Design and Construction Methods
- Alternative Resources (alternative construction materials)
- Do nothing Alternatives

4.3.12 Environmental Management Plan

A project's environmental management plan (EMP) consists of the set of mitigation, monitoring, and institutional measures to be taken during implementation and operation to eliminate adverse environmental impacts, offset them, or reduce them to acceptable levels. The plan also includes the actions needed to implement these measures. To prepare a management plan, the DOR and its EA and design team (a) identify the set of responses to potentially adverse impacts; (b) determine
site-specific, detailed requirements for ensuring that those responses are made effectively and in a timely manner; and (c) describe the means for meeting those requirements. Any construction will not begin before an EMP is prepared and approved by the project management team.

The EMP includes the following components:

**Mitigation** - The EMP identifies site-specific, cost-effective and detailed measures that will reduce the identified adverse environmental impacts to acceptable levels. The Plan should include compensatory measures if mitigation measures are not feasible, cost-effective, or sufficient.

**Capacity Development and Training** - To support timely and effective implementation of environmental project components and mitigation measures, the EMP draws on the EA’s assessment of the existence, role, and capability of environmental units on site or at the agency and ministry level. If necessary, the EMP recommends specific, targeted training for project staff, contractors, and community groups, to ensure the implementation of EA recommendations. In addition, the EMP, when necessary, should provide specific recommendations for operational arrangements to carry out mitigation and monitoring measures.

**Implementation Schedule and Cost Estimates**. For all mitigation, monitoring, and capacity development, the EMP provides (a) an implementation schedule for measures that must be carried out as part of the project, showing phasing and coordination with overall project implementation plans; and (b) cost estimates and sources of funds for implementing the EMP. These figures are also integrated into the total project cost tables.

A sample of Generic and detail EMPs are presented in appendix 1 and 2.

**4.3.13 Environmental Monitoring**

Monitoring is an important element of environmental and social management, as well as the socio-economic and cultural environments. This section provides the Monitoring and Evaluation (M&E) Framework to be used under RAPII for environmental aspects of the project.

**Principles of Monitoring and Evaluation**: To improve the implementation of mitigation measures, the following activities must be undertaken during environmental monitoring.

- Determine indicators to be used.
- Collect important and relevant information.
- Apply quantifiable criteria with respect to prescribed indicators.
- Conduct objective analysis of the information collected.
- Work out clear conclusions based on above points.
- Draw rational conclusions and recommend improved mitigation measure to implementing agencies.

**Types of Monitoring**: Monitoring activities for the project are to be divided in three types:

- Baseline and Pre-Construction Monitoring;
- Construction Phase Monitoring; this is generally sub-divided in two related activities:
  - Compliance Monitoring
  - Impact Monitoring
- Operational Phase Monitoring.
  - Compliance Monitoring
  - Impact Monitoring
Pre-Construction Monitoring

In the pre-construction monitoring, it will be necessary to confirm that all procedures regarding land acquisition and compensation have been properly set out and followed, and that the construction mitigation plan is in place. Priorities in this regard will include:

- verification that the EA mitigation recommendations relevant to the Contractor’s responsibility are incorporated in the tender and specifications;
- verification that all government permits and approvals are in place prior to construction;
- verification that land, property and crop and livestock disturbance compensation valuations have been completed prior to construction;
- verification that all the necessary sub-plans within the framework of the environmental mitigation plan have been identified and prepared, such as:
  - Acquisition, Compensation, and Rehabilitation Plan (ACRP) or Resettlement Plan,
  - Indigenous People Development Plan,
  - Restoration and Re-vegetation Plan (RRP),
- verification that all necessary activities regarding the job opportunities, giving priority to the local communities and school leaver youths, have been completed prior to construction and hiring.

Baseline Monitoring: The primary concern during this phase will be to collect field data needed to enhance the knowledge of baseline conditions in order to assist in designing and estimating the cost of mitigation measures. Detailed information on the type of materials to be used, material collection site and methodology, design for drainage management, slope/erosion control and disposal of excess construction materials will be collected. Priorities in regard to baseline monitoring include:

- Maps of sensitive areas, including protected areas, community forests, settlements and unstable slopes, should be prepared and cross referenced with proposed EA measures.
- Survey and Documentation of Existing Agriculture Practices. Further analysis of the crops and livestock practices in the areas to be directly affected by the project is needed. This will provide information on precise measures to minimize disturbance and loss of cultivated and grazing land, as well as measures to increase agriculture intensity to replace the yield lost from land take.

Construction Phase Monitoring

Construction phase monitoring is more comprehensive and multi-faceted. Compliance monitoring will be done by the RAPII or DOR/MOWHS and by NEC at the central level to ensure that EMP recommendations are being complied.

Impact monitoring will focus on key indicators to assess whether the impacts have been accurately predicted, and whether the mitigation measures are sufficient and effective. The main parameters for measurement will likely include:

- water bodies at critical areas like crossing of major water bodies;
- quality of potable water supply to work camps and affected villages;
- state of forests, including community forests;
- re-vegetation and slope stabilization monitoring;
- public safety and security monitoring;
- health and sanitation monitoring;
- status of flora and fauna monitoring;
• social impact monitoring;
• monitoring disposal areas and hazardous waste dump areas for leaching or run-off; and
• employment monitoring.

**Operation Phase Monitoring**

The proponent or developer will have the primary responsibility for operation phase monitoring. Same as the construction phase monitoring, there will be compliance monitoring and impact monitoring. The compliance monitoring will focus on determining that the prescribed mitigation and enhancement measures are being carried out. The responsibility of operation phase monitoring lies with DOR, MOWHS and NEC.

The impact monitoring will again focus on key indicators to assess whether the impacts have been accurately predicted and whether the mitigation measures are sufficient and effective. The main parameters for measurement will likely include:

• adaptation of resettlement households to their new homes and communities;
• quality of potable water supply to worker colony and affected villages;
• reconnaissance forest and land use change monitoring;
• community forest monitoring;
• effects of access and control measures on wild lands, wildlife habitats and wildlife populations;
• illegal hunting, trapping and tree felling monitoring;
• public safety and security monitoring;
• health and sanitation monitoring.

**Central and District Level Monitoring**

Environmental monitoring will be carried out at Dzongkhag level as well as central level. An independent team constituted by the DYT will carry out the district level environmental and social monitoring tri-mesterly (once every four-month). The Monitoring Team will walk through the road sub-project, make observation and hold discussion with communities, and submit a written report to DYT and RAP Implementation Unit at sub-project level. DOR/Central RAPII Implementation Unit will constitute a Monitoring Team with representation from, NEC, MOWHS (SQCA) Environment Section and DOR environmental section. Central monitoring will take place once in six months, and the team will visit sample subprojects. The team will prepare monitoring report and discuss it in a joint meeting of NEC, MOWHS (SQCA) Environmental Section, RAPII Central Implementation Unit and DoR. The report will be submitted to Central RAPII Implementation Unit with copies to DOR and MOWHS Environment Section (SQCA). The Central RAPII Implementation Unit will sent relevant parts of the monitoring report to the concerned DYT and Sub-project Implementation Unit of RAPII for information and to take actions.

Taking into consideration the principles and various monitoring phases of a project, following framework has been suggested, which may be implied for RAP domain.

**Environmental Monitoring Framework**

Taking into consideration the principles and various monitoring phases of a project, following framework has been suggested, which may be implied for RAPII domain.

**Table 4.12: Framework for Monitoring Environmental Issues**

<table>
<thead>
<tr>
<th>Integration of local people's</th>
<th>Review of study and design</th>
<th>During the study and RAP II/DOR</th>
</tr>
</thead>
</table>

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<table>
<thead>
<tr>
<th>SN</th>
<th>Issue</th>
<th>Procedure</th>
<th>Timing</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Environmental concerns</td>
<td>Reports, discussion with local residents, representatives, and designers</td>
<td>Design process and prior to approval</td>
<td>Environmental Unit</td>
</tr>
<tr>
<td>2</td>
<td>Undertaking required level of environmental assessment</td>
<td>Review of screening, scooping, and IEE/EIA documents</td>
<td>Prior to project approval</td>
<td>RAP II/DOR Environmental Unit</td>
</tr>
<tr>
<td>4</td>
<td>Construction and location of drainage facilities</td>
<td>Site inspections at places where such drains are required</td>
<td>During active construction</td>
<td>DOR Environmental Unit, Contractor, DYT</td>
</tr>
<tr>
<td>6</td>
<td>Selection of Construction Equipment</td>
<td>Site observation, records of equipment being used</td>
<td>Monthly basis</td>
<td>DOR Environmental Unit, Contractor, Project, DYT</td>
</tr>
<tr>
<td>7</td>
<td>Care and safe storage of top soil for later use</td>
<td>Inspection of site clearance practices, top soil storage sites</td>
<td>Monthly during construction</td>
<td>DOR Environmental Unit, Contractor, Project, DYT</td>
</tr>
<tr>
<td>10</td>
<td>Safe disposal of excavated materials and other construction wastes</td>
<td>Disposal site observation and disposal practice</td>
<td>Weekly</td>
<td>DOR Environmental Unit, Contractor, Project</td>
</tr>
<tr>
<td>12</td>
<td>Proper reclamation of disposal sites</td>
<td>Observation of finished disposal sites</td>
<td>Periodically</td>
<td>DOR Environmental Unit, Contractor, Project</td>
</tr>
<tr>
<td>15</td>
<td>Timely construction of other slope protection measures, such as, retaining walls</td>
<td>Site observation</td>
<td>Immediately after construction</td>
<td>DOR Environmental Unit, Contractor, Project</td>
</tr>
<tr>
<td>17</td>
<td>Quality of surface water</td>
<td>Use field kit/visual observation</td>
<td>Weekly or when construction taking place</td>
<td>DOR Environmental Unit, Contractor</td>
</tr>
<tr>
<td>SN</td>
<td>Issue</td>
<td>Procedure</td>
<td>Timing</td>
<td>Responsibility</td>
</tr>
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<td>----------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>-----------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>18</td>
<td>Air pollution near settlements</td>
<td>Observation or construction practices and discussion with residents and workers</td>
<td>Periodically</td>
<td>DOR Environmental Unit, Contractor, Project DY, GYT</td>
</tr>
<tr>
<td>19</td>
<td>Risk to private properties.</td>
<td>Observation and discussion with property owners</td>
<td>Periodically</td>
<td>DOR Environmental Unit, Contractor, Project DY, GYT</td>
</tr>
<tr>
<td>21</td>
<td>Operation and closure of quarries and borrow pits confirmed to the requirements related to location, vegetation protection, soil conservation, erosion control, siltation and stability concerns.</td>
<td>Site inspection, discussion with workers and local people.</td>
<td>During quarry operation or bi-weekly.</td>
<td>DOR Environmental Unit, Contractor, Project DY, GYT</td>
</tr>
<tr>
<td>23</td>
<td>Encroachment into common property.</td>
<td>Discuss with local people, mapping</td>
<td>Annually</td>
<td>DOR Environmental Unit, Contractor, Project DY, GYT</td>
</tr>
<tr>
<td>25</td>
<td>Surface flow interruption and its consequences</td>
<td>Visit the area, mapping, discussion with local people</td>
<td>Half Yearly</td>
<td>DOR Environmental Unit, Contractor, Project DY, GYT</td>
</tr>
<tr>
<td>27</td>
<td>Maintenance of road and road structures</td>
<td>Inspection of road and road structures, check maintenance record.</td>
<td>Annually</td>
<td>DOR Environmental Unit, Contractor, Project DY, GYT</td>
</tr>
<tr>
<td>SN</td>
<td>Issue</td>
<td>Procedure</td>
<td>Timing</td>
<td>Responsibility</td>
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<td>----</td>
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<td>---------------------------------------------------------------------------</td>
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<td>--------------------------------------</td>
</tr>
<tr>
<td>A. During Construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Employment of local labor including women and children and wage rates</td>
<td>Site observation, attendance record, interaction with Project &amp; contractors.</td>
<td>Weekly</td>
<td>DOR Environmental Unit, Contractor, Project, DYT, GYT</td>
</tr>
<tr>
<td>2</td>
<td>Employment of local economically weak section of population (unemployed youths)</td>
<td>Site observation, attendance record, interaction with Project &amp; contractors.</td>
<td>Weekly</td>
<td>DOR Environmental Unit, Contractor, Project, DYT, GYT</td>
</tr>
<tr>
<td>4</td>
<td>Development of new or expansion of old settlements/business establishments/slum development along the roadside</td>
<td>Observation, recording of sites, takes photograph (photo point survey).</td>
<td>Half Yearly</td>
<td>DOR Environmental Unit, Contractor, Project, DYT, GYT</td>
</tr>
<tr>
<td>5</td>
<td>Migration to the roadside/displacement of local people</td>
<td>Review of land holding records, discussion with local people/groups.</td>
<td>Annually</td>
<td>DOR Environmental Unit, Contractor, Project, DYT, GYT</td>
</tr>
<tr>
<td>7</td>
<td>Incidence of communicable diseases e.g. respiratory diseases, HIV/AIDS, TB etc. and new or upgrading of health facilities</td>
<td>Discuss with local people, health workers/health post/center records.</td>
<td>Annually</td>
<td>DOR Environmental Unit, Contractor, Project, DYT, GYT</td>
</tr>
<tr>
<td>8</td>
<td>Upgrading of old and establishment of new schools/colleges along the road and vicinity.</td>
<td>Discuss with local people, political leaders and local groups.</td>
<td>Annually</td>
<td>DOR Environmental Unit, Contractor, Project, DYT, GYT</td>
</tr>
<tr>
<td>10</td>
<td>Changes in the land price, land use and agricultural practices, productivity and crop export</td>
<td>Discuss with farmers and extension workers, agricultural statistics of District Agriculture Office, Geog and Dzongkhag land record office, land use maps.</td>
<td>Annually</td>
<td>DOR Environmental Unit, Contractor, Project, DYT, GYT</td>
</tr>
<tr>
<td>11</td>
<td>State of social harmony and social security (e.g. alcoholism, narcotism, prostitution)</td>
<td>Police records, discussion with local residents.</td>
<td>Annually</td>
<td>DOR Environmental Unit, Contractor, Project, DYT, GYT</td>
</tr>
<tr>
<td>13</td>
<td>a) Classified Traffic (volume) count! b) Displacement of traditional employment (porters, traditional mode of transportation, such as mules, carts, etc.)</td>
<td>Discuss with local residents, GYT, community</td>
<td>Annually</td>
<td>DOR Environmental Unit, Contractor, Project, DYT, GYT</td>
</tr>
</tbody>
</table>
Environmental Management Framework

Environmental Management Cost - It is noted from consultations with various stakeholders that more often it was not possible for contractors to implement the environmental management measures as no budgetary provision is made to cover the extra costs involved in carrying out environment management works. Considering the emergence of sustainability of road projects under RAP, the cost of mitigation measures and environmental monitoring should be incorporated within the project cost estimates.

Furthermore, if the in-house DOR and NEC staff are not adequate to carry out environmental monitoring, the project should hire the professionals from private sector to ensure the compliance and impact monitoring activities at least during construction period.

Environmental Auditing - Environmental Auditing should be carried out about after 2 years of project in operation. Information from monitoring should be utilized for carrying out Environmental Auditing. In general, the environmental auditing should gather information on the following areas:

- The condition of natural/social/economic resources prior to the project implementation and after project construction is completed,
- Whether impacts forecasted by EIA occurred and, if so, the extent of these impacts,
- Whether or not mitigation measures implemented are effective to control adverse impacts or enhance beneficial impacts,
- Whether or not all landscape degraded due to project implementation have been restored to their original/better conditions,
- What are the impacts on general conditions among the work forces involved in the project implementation and local economy, and
- To overall effect on the local economy of project implementation.

Specifically, the following activities, and others as deemed necessary, need to be addressed for environmental auditing:

- How have the environmental conditions changed from the baseline conditions?
- Are there problems relating to slope stability in the project area?
- How slope stability and erosion control measures adopted by the project been effective in minimizing slope stability, erosion and landslide?
- Are there any bare or degraded areas around the project? What is the condition of the quarry sites, borrow areas, and spoil disposal areas?
- What are the conditions of local forest?
- How are the families resettled by project adapting to their new host communities?
- How have the local construction workers adapting to their new host communities?
- How have the local construction workers adapted to the loss of their jobs following the end of construction activities?
- What is the attitude of the local people towards the project?
- What has been the impact of the project on local and national economy?

A sample Auditing Plan is presented in Appendix 5

4.3.14 Public Consultation and Disclosure

In accordance with World Bank's Operational Manual, the project will prepare the project related relevant materials in a form and language that are understandable and accessible to the groups being consulted.
Environmental Assessment if a transparent process, it always encourages to participation of interested public and stakeholders particularly the individuals, families and institutions likely to be affected by the project activities. The public consultation process offers the opportunities to express the interest of affected population and institutions their concerns about the project and environment and facilitate in decision making process. This process in EA has a number of benefits, which primarily include bridge the conflict, minimize misunderstanding and hostility, reduces the disruption of project activities due to conflict, develop sense of belonging among the stakeholders, etc.

Considering the importance of public consultation in EA process, the Regulation for Environmental Clearance of Project (2002) in its section 31 has made mandatory provision of public consultation for significant projects. The minimum procedures to be followed for consultation process include:

- Written notice to local communities
- Public notice to through newspaper
- Public hearing

In addition, in accordance with World Bank’s Operational Manual, the project will prepare the project related relevant materials in a form and language that are understandable and accessible to the groups being consulted.

In carrying out public consultation during EA of sub-projects under RAP II, the proponent should comply with the provision made in Regulation for Environmental Clearance. The steps to be followed include:

- Conduct public consultation during the preparation of sub-projects prior to the screening process. During this period, the proponent should prepare environmental brief in accordance with section 28.1 and 28.2 of regulation including the views, comments and suggestion of stakeholders and affected population.
- During the consultation under project preparation stage, the proponent should inform the local communities and stakeholders about the project and its possible impacts to local environment. During this, the major issues should be identified and included in environmental information (Environmental brief).
- During EA process, the proponent should also conduct public consultation and include major concerns relating to the project in EA study and make suitable mitigation measures.
- After the submission of EA report, the regulatory authority should make public the EA document for review and comments and suggestions.

The entire public consultation process should be carried out in cooperation with local government DYT, and GYT.

**Methods for Engaging Public Participation** - There are many effective methods to engage the participation of stakeholders, especially for the mandatory process of public involvement. In accordance with the RECOP, it is made mandatory that the proponent should prepare a plan of public consultation and should be submitted to competent authority and obtain approval prior to the initiation of public consultation process. Some suggestions for conducting public consultation are presented hereunder:

**Public Notice** - The public notice is one of the criterions suggested by RECOP. It is an announcement or advertisement posted on national newspaper (Kuensel) to provide information to the public about the proposed development activities. It solicits public reaction, comments and suggestions. The public notice in newspaper should be accurate, clear, and concise. The language
should be simple and without technical jargon. The attempts should be made to publish in local language. The public notice should be published during the preparation of environmental information and later during EA process.

**Public Hearing and Community Meetings** - It is also the mandatory as per RECOP. A public hearing is a gathering of interested and affected people, groups or whole communities at which information is exchanged and views are expressed. The EA team members should facilitate but not dominate the public hearing and community meetings. During this process, project related details are public involvement process should be informed and discussed. During this process, the representatives of local governments (DYT, GYT) should be invited. The public hearing should be carried out during EA process.

The community meetings are additional gathering of the project affected population that should be held periodically in the project impact area and through out the project cycle.

Each public hearing and meetings should include mention how the issues are raised by the public will be addressed. Where involuntary resettlement is necessary, meetings of affected families should be held to discuss the option- the types and expected values of compensation and rehabilitation, and other social, economic, cultural and environmental issues arising including location, and new opportunities available at the new sites.

### 4.3.15 Code of Ethics for Environmental Management Framework

Following is a list of environmental parameters, which has close links with social and cultural outfit of the area, which require critical thinking while planning, implementing, and operating rural access infrastructure development. These procedures, if followed, would yield benefits for longer period in terms of financial and environmental sustainability. Table 4.14 presents environmental code of Conduct for RAP.

#### Table 4.14: Framework for Monitoring Social Issues

<table>
<thead>
<tr>
<th>SNo</th>
<th>Environmental Issue</th>
<th>Pre-construction/Construction Phase</th>
<th>Codes of Conduct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Land Use</td>
<td>▪ Road alignment may pass through cultivated and forested land resulting in a permanent loss of the resources. ▪ While the landowner has to part away with his land ownership, the environmental effects can amplify if proper operation and maintenance schedules are overruled.</td>
<td>▪ Plan road alignment to minimize loss of resources. ▪ Avoid width of road of more than 5.1 m in hilly area. ▪ Demarcate Row to avoid encroachment.</td>
</tr>
<tr>
<td>2</td>
<td>Loss of Top Soil</td>
<td>▪ Erosion in nearby area, ▪ Increase in water run off ▪ Loss of productivity</td>
<td>▪ Extract carefully and secure the top soil within 25 cm from the surface. ▪ Careful disposal of topsoil after striping</td>
</tr>
<tr>
<td>3</td>
<td>Material Use</td>
<td>▪ Excess extraction of local resources, such as wood, sand, soil, boulders, etc. ▪ Degradation of forests, erosion and landslide at steep locales due to boulder, stone extraction. ▪ Change in river/stream ecosystem due to unchecked sand extraction.</td>
<td>▪ Extract materials only on need basis. ▪ Avoid sensitive areas, such as steep slopes and water-ways.</td>
</tr>
<tr>
<td>4</td>
<td>Slope Stability</td>
<td>▪ Extraction of forest products and cutting of trees in the steep slopes increases soil erosion/landslide due to loss of soil binding materials. ▪ Wrong alignment can trigger slope failure ▪ Haphazard disposal of construction waste can disturb slopes ▪ Improper drainage facilities can result in erosion and landslides</td>
<td>▪ Limit down grading of the road to 5 %. ▪ If down grading exceeds 7 %, construction of side drainage is necessary. ▪ Keep optimum balance in extraction and filling of soil works. ▪ geo-hazardous assessment and mapping ▪ Use designated disposal site and avoid side casting of spoil ▪ Provide proper drainage ▪ Use bio-engineering on exposed slopes</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>SNo</th>
<th>Environmental Issue</th>
<th>Potential Impact</th>
<th>Codes of Conduct</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Use of Construction Equipment</td>
<td>* Increase slope instability, noise, vibration, deteriorate air, water quality, land degradation, etc.</td>
<td>* Select the equipment which create less vibration, use excavators as far as possible in place of dozers. * Engage the biggers and trucks, which have less emission characteristics as per EURO Standards. * Maintain equipment periodically or engage only new equipment. * Dispose liquid waste carefully.</td>
</tr>
<tr>
<td>6</td>
<td>Wildlife</td>
<td>* Wildlife habitats at forests, shrub land along road alignment are affected from the road construction activities. * Wildlife and human conflicts increase as wildlife might destroy the crops or attack the construction worker.</td>
<td>* Avoid as much as possible areas with high biodiversity. * Efficient movement of machinery and other traffic. * Control poaching activities and regulate movement of labor force and their dependents into the forest area. * District Forest Office and its subsidiary body should be involved in monitoring the activities of the construction workers and officials to minimize wildlife harassing, trapping and poaching.</td>
</tr>
<tr>
<td>7</td>
<td>Drainage</td>
<td>* Higher flow rate of surface water and water logging induce land slides, erosion. * Quality of road diminishes due to poor drainage such as water logging, immense flow rate of surface water.</td>
<td>* It is strongly recommended that the cross drainage outlets must be channeled to the confirmed natural drains. * If slope exceeds 5%, construction of flow control device necessary every 20m.</td>
</tr>
<tr>
<td>8</td>
<td>Protection of Vegetation</td>
<td>* Protected areas and highly forested areas. * Degradation of forest areas. * Degradation of agricultural land.</td>
<td>* Use minimum and efficient use of wood products for construction. * Initiate plantation at damaged and damage prone areas. * Increase liability of local forest user groups. * Avoid protected areas or densely forested areas.</td>
</tr>
<tr>
<td>9</td>
<td>Disposal of Construction Wastes</td>
<td>* Dumping of wastes along the road or elsewhere.</td>
<td>* Selected spoil dumping sites should be used. * After disposal, the area should be leveled and compacted. * It is recommended to conserve the soil by planting indigenous plants including grasses. * Wastes could also be used as leveling materials along the roadside.</td>
</tr>
<tr>
<td>10</td>
<td>Disposal of Sanitary Wastes</td>
<td>* Unmanaged sanitary waste disposal creating health problems and public nuisance.</td>
<td>* Proper sanitation area needs to be demarcated. * Check for hygiene of work force.</td>
</tr>
<tr>
<td>11</td>
<td>Impacts on amenities along RoW</td>
<td>* Road crossings at water supply, irrigation lines may be disturbed / damaged.</td>
<td>* Avoid as much as possible the crossing over such amenities.</td>
</tr>
<tr>
<td>12</td>
<td>Pollution</td>
<td>* Dust generation from construction activities, construction vehicular movement increases air pollution. * Noise pollution likely from construction machinery operation and vehicular movement. * Sanitary problems likely at the construction and workforce quarters.</td>
<td>* Possibly construction period should be during September to February when soil moisture content is most. * Consider construction of road at 50 m from settlement. * Enforce speed limit of vehicles and construct the road according to volume and size of traffic movement.</td>
</tr>
</tbody>
</table>

**Operation Phase**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Impact</th>
<th>Codes of Conduct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Encroachment</td>
<td>* Unmanaged settlement, construction along the RoW.</td>
</tr>
<tr>
<td>2</td>
<td>Interruption of Water Flow along RoW</td>
<td>* Concentrated flow left unattended might have severe impact at the downhill alignment of the road.</td>
</tr>
</tbody>
</table>

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4.3.16 Exclusion Principles

In addition to the above code of conduct in executing the Road Development Project, the environmental factors need to be considered in selecting the road alignment. Such information can be obtained either from secondary or primary sources. The issues to be addressed in selecting the alignment are presented hereunder:

- **Forest and Protected Area that are nationally, regionally and sub-regionally Important**

Road construction is generally excluded from protected forest or other conservation areas. Large and dense forests are important for bio-diversity, wild life habitat and other ecological regions. A forest which is relatively thin and appears ecologically damaged, may yet be important as migration route for wild life from one area to other. As far as possible, a road corridor should not pass through or provide access to these important forest areas. On the other hand, a mature forest or commercial forest may be desirable to promote sustainable exploitation of the resources for improvement of local livelihoods. In practice, therefore, it is necessary to establish whether a forest is important principally for conservation or commerce.

- **Stable/Unstable Zone that are Nationally, regionally or sub-regionally Conspicuous**

As the mountain of are geologically weak and young. Consequently, all the hilly terrain may be considered unstable, fragile and erosion prone. However, by considering certain feature relatively stable and unstable zones may be identified in a region or sub-region. If possible, a road corridor should avoid unstable areas and follow relatively stable zones. The steepness to terrain is critical in many areas, but has to be correlated with geology to ensure meaningful measures: for instance, hard rocky slope may be stable even when almost vertical, but weak, weathered rock may be unstable on slope.

- **Sensitive Human Settlement, Religious and Cultural Sites**

The road alignment should pass through development potential area, settlements, and religious and cultural area to promote the economic activities by enhancing accessibility. However, the alignment should avoid the destruction of human settlements (houses, cottages, and other in fractures) as far as possible and religious and cultural properties.

4.3.17 EA Report Preparation and Approval

EA report is essential for its approval from NEC. **Table 4.15** below summaries the content as prescribed in Annex 3 of Regulation for the Environmental Clearance of Project.

<table>
<thead>
<tr>
<th>SNo</th>
<th>Subject Matter Required in EA Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Name and address of individual or institution preparing the report</td>
</tr>
<tr>
<td>2</td>
<td>Summary of the proposal</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Name and location of project</td>
</tr>
<tr>
<td></td>
<td>Brief description of project</td>
</tr>
<tr>
<td></td>
<td>List of development permits or public financial assistance</td>
</tr>
<tr>
<td></td>
<td>Summary of alternatives</td>
</tr>
</tbody>
</table>
## Detailed Description of Project

1. **Type, size, and proposed use of project**
2. **Objective and anticipated benefits of the project**
3. **Description of physical characteristics of the project and its surrounding, illustration with location map and site plan in appropriate scale and level of details**
4. **A time table, approximate cost, and methods and timing of construction of the project.**
5. **Other necessary matters**

## Alternatives of Project

1. **Project Alternative**
2. **Alternative Route**
3. **Alternative Design and Construction Methods**
4. **Do nothing Alternatives**

## Existing Environment – A description and analysis of physical, biological, chemical, economic, and social condition of project site and immediate surroundings and the region.

1. **Physical**
   - Topography, geology, hydrology (surface and ground water), climate, air quality, and noise.
2. **Biological**
   - Plant, animal and habitats, national parks, sanctuary, rare and endangered species etc.
3. **Socio-economic and cultural**
   - Population, settlement, community infrastructures (irrigation, drinking water, schools, etc), Agricultural land, Potential for development (cash crop, industry, etc), recreational resources, scenic qualities, open spaces, historical, cultural and religious sites.

## Impact Identification, prediction and Evaluation – positive, negative, direct, indirect, extent, duration, and magnitude

1. **Physical**
2. **Biological**
3. **Socio-economic and cultural**

( The impact should be identified in terms of construction, and operation stages)

## Mitigation Measures

1. **Beneficial Impact (in pre-construction, construction, and operation phases of project)**
   - **Physical**
   - **Biological**
   - **Socio-economic and Cultural**
2. **Adverse Impacts (in pre-construction, construction, and operation phases of project)**
   - **Physical**
   - **Biological**
   - **Socio-economic and Cultural**
3. **Implementation schedule of Mitigation Measures**

## Environmental Management Plan

1. **General**
2. **Environmental Monitoring Plan (compliance and impact monitoring)**

## Disclosure of the Environmental Clearance

The MOWHS/DOR or the NECS, who ever issues the environmental clearance, will disclose the information to the public in accordance with the EAA and RECOP. Only after the public disclosure requirement has been fulfilled, the environmental clearance will become effective.

## References

**BHUCORE/RAP 2002 * Environmental Assessment of Thrimshing Dungkhag Office-Tsangpo School Road, Trashingang, Drongkha* Department of Roads, Royal Government of Bhutan. Environmental Unit, Infrastructure Department, Asian Development Bank, Manila**

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Environrnenral Management Framework


RAP/DFID, Nepal, 2001 *Documented Procedures and Guidelines for Initial Environmental Examination of Rural Road under Rural Access Program in Nepal* Department of Local Infrastructures and Agricultural Road, His Majesty's Government of Nepal


SILT 2002 "Initial Environmental Examination of Dipayal Sakarlek District Road" Rural Access Program, Nepal


DOR/NSNV, 2004 "Road Sector Development and Environmental Friendly Roads in Bhutan" Ministry of Works and Human Settlements/NSNV

NEC, 1999; "The Middle Path, National Environmental Strategy for Bhutan" Royal Government of Bhutan.

BHUCORE, 2000, "Environmental Assessment, Feeder Road under Trashi Yangtse" DOR, MOC, Thimphu

NEC, 1993, "Environmental Impact Assessment Guidelines for Bhutan" NEC RGOB, Thimphu


IUCN, 1996 "EIA Training Manual for Professionals and Managers" The World Conservation Union-IUCN Kathmandu


MOA, 2004 "Environmental Assessment Report and Environmental Management Framework for Decentralized Rural Development Project" RGOB, Thimphu


APPENDIX 1 - GENERIC ENVIRONMENTAL MANAGEMENT PLAN
## Generic Environmental Management Plan

<table>
<thead>
<tr>
<th>Environmental Aspect/Issue</th>
<th>Management Measure</th>
<th>Technical Specification</th>
<th>Payment Method</th>
<th>Conditions Precedent</th>
<th>Compliance/Monitoring Indicator</th>
</tr>
</thead>
</table>
| **Site Clearance and Removal of Vegetation** | - Extract carefully and securely the top soil within 25 cm from the surface.  
- Careful disposal of topsoil after stripping | As per clause C. Site Clearance of Technical Specification, Bidding Document for Rural Access Road, DOR | Item .... Of BOQ of contract documents | Prior to stripping the top soil, all trees, shrubs etc. are removed along with their roots | Statement of stock quantities |
| | | | | Pre-identification of stock piling site cleared by Engineer and sites secured | Compliance of pile specs. and maintenance |
| | | | | Topsoil utilization plan approved by Engineer | Topsoil utilization record |
| | | | | | |
| **Spoil Disposal** | - Minimize spoil by balancing cut and fill wherever possible.  
- Safe tipping areas identified and enforced.  
- Spoil traps to be constructed.  
- Compensate Land owner | As per clause D. Earthworks of Technical Specification, Bidding Document for Rural Access Road, DOR | Item .... Of BOQ of contract documents | Identification of Disposal site prior the initiation of earth work | Compliance of disposal management |
| | | | | | Vegetation of Disposal Site |
| | | | | | Compaction status |
| | | | | | Erosion from disposal area |
| | | | | | |
| **Slope Failure** | - Geological/geo-morphological studies conducted to investigate and recommend best available options.  
- Civil engineering structures and bio-engineering measures to be used.  
- Measures to be taken to avoid undercutting of slope toes.  
- Quarrying prohibited in river beds, where flood discharge is significant.  
- Selection of appropriate construction equipment  
- Keep optimum balance in extraction and filling of soil works.  
- Use designated disposal site and avoid side casting of spoil  
- Provide proper drainage | As per clause C. Site Clearance, D. Earthworks and F. Water Management of Technical Specification, Bidding Document for Rural Access Road, DOR | Item .... Of BOQ of contract documents | Adoption of proper design and planning prior to start of earthwork in vulnerable slope | Slope Stability  
Condition of bio-engineering |
| | | | | | |
| **Drainage Congestions** | - Cross drainage outlets must be channeled to the confirmed natural drains.  
- Mattresses check dams and other protection measures constructed as necessary.  
- Cascades constructed, to be as long as necessary.  
- If slope exceeds 5%, construction of flow control device necessary every 20m.  
- Side drains must be designed and | As per clause F. Water Management of Technical Specification, Bidding Document for Rural Access Road, DOR | Item .... Of BOQ of contract documents | Adoption of proper design and planning prior to start of earthwork in slope and agricultural land | Damages of crops and properties, Diversion channels |
### APPENDIX 1 - Sample of Generic Environmental Management Plan

<table>
<thead>
<tr>
<th>Environmental Aspect/Issue</th>
<th>Management Measure</th>
<th>Technical Specification</th>
<th>Payment Method</th>
<th>Conditions Precedent</th>
<th>Compliance/Monitoring Indicator</th>
</tr>
</thead>
</table>
| Earthwork in excavation    | • Balanced cut & fill,  
• spoil to fill eroded gullies,  
• reclaim land, make earthen bund,  
• protect spoil with vegetative cover,  
• keep spoil away from agri field, water source, irrigation canal  
• adoption of log barriers, check dams etc. | As per clause D, Earthworks of Technical Specification, Bidding Document for Rural Access Road, DOR | Item ...., Of BOQ of contract documents | Adoption of proper design and planning prior to start of work  
Status of cut and fill  
Adoption of log barriers  
Loss of properties due to ENV |                                |
| Quarries, borrow pits and stock pile | • Extract construction material in safe quantity  
• Avoid the steep slope  
• Design bunds to screen noise and dust.  
• Design re-grading slopes.  
• Design bunds to screen noise and dust.  
• Design re-grading slopes.  
• Use bio-engineering techniques for rehabilitation.  
• Use safety gears by workers,  
• operate at stable area far from agri field, settlement, water bodies etc.,  
• discourage clearing vegetation,  
• drainage management. | As per clause E, Structures, E1 Extraction of Materials, 1 Quarries of Technical Specification, Bidding Document of Rural Access Road. | Item ...., Of BOQ of contract documents | Identify suitable quarry site, stock piles, and borrow pits  
Check for water ponding, formation of gullies, water turbidity.  
Check unauthorized quarrying activities. |                                |
| Hazardous materials        | • Practice of only controlled blasting using fewer charges where possible.  
• Use Acconex near habitations and protected areas.  
• Provision of well equipped first aid kits, health facilities and fire fighting equipment on construction site.  
• Allowing only trained or certified blasters to carry out all blasting activities and provision of appropriate documents by contractor to authenticate the experience of their blasters.  
• Coordination with the local Dzongkhag Administration, Police and Gup on the schedule for blasting and ensure that nearby community people are informed and prepared.  
• Use of appropriate warning signals by using whistles, red flags and megaphones to ensure safety of travelling vehicles or people passing by.  
• Provision of workers with construction helmets, face masks, ear plugs, gloves, eye goggles etc. | As per Blasting Manual, DoR and Explosive Rules, Ministry of Home and Cultural Affairs | Item ...., Of BOQ of contract documents |                                |
APPENDIX 1 – Sample of Generic Environmental Management Plan

<table>
<thead>
<tr>
<th>Environmental Aspect/Issue</th>
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<th>Compliance/Monitoring Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blasting only</strong> during the day-time to minimize disturbance to nearby communities and wildlife.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Transportation, handling and storage of explosives according to the “Explosives Rules of the Ministry of Home Affairs”</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage of explosives in steel containers, “Magazines” kept under lock and key which are water, fire and theft proof.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gelatin, detonators and Cortex should never be stored together</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Disposal of all toxic wastes safely by burying them in 5 – 8 feet deep pits. Safe Handling, safe storage, notification to local police, record of use, etc</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>As per clause B. Contractor/ Item .... Of BOQ of contract documents</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Item .... Of BOQ of contract documents</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Identify suitable camping site</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Latrine construction and effective waste disposal. Check disruption in water supply. Replantation, rehabilitation of site.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Camp operation

- Provision of cooking gas or kerosene to construction workers.
- Briefing of labourers on local cultures, all illegal activities such as cutting trees, hunting and fishing and other prohibited activities.
- Provision of proper waste disposal facilities such as dustbins, garbage pits, drains.
- Provision of adequate health facilities or first aid facilities and evacuation facilities for times of emergency.
- Health screening of imported workers before reaching the contract site.
- Adequate sanitation facilities should be provided to the camp sites such as pit latrines and drinking water supply.
- Provision of appropriate and adequate fire fighting equipment.
- Camp houses should be secure and be able to protect the inhabitants from rain, snow, excessive sunshine and other extreme conditions.
- Establishment of camps at appropriate distances away from settlement areas and in areas that are safe without risks of landslides, flash floods, wildlife attack etc.
- Prior identification of water resources in consultation with nearby communities.
- Ensure clean area left behind when shifting camp.
## APPENDIX 1 – Sample of Generic Environmental Management Plan

<table>
<thead>
<tr>
<th>Environmental Aspect/Issue</th>
<th>Management Measure</th>
<th>Technical Specification</th>
<th>Payment Method</th>
<th>Conditions Precedent</th>
<th>Compliance/Monitoring Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust and noise</td>
<td>Indicate use of safe pollution level equipment.</td>
<td>As per Environmental Discharge Standard, NEC</td>
<td>Item .... Of BOQ of contract documents</td>
<td>Identify the suitable equipment prior to the mobilization at site</td>
<td>Accidents, Human health, erosion, etc</td>
</tr>
<tr>
<td>Operation of stone crushing plant and transport of stones/boulders</td>
<td>• Water sprinkling of stone crushing site regularly to minimize issues of dust. • Provision of face masks, goggles, earplugs etc. to workers • Proper covers for vehicles transporting stone and materials • Regular maintenance of machinery and vehicles to prevent emission of abnormal and excessive exhaust. • Confine stone crushing and transportation activities to day times • Restoration of site after completion of operation with appropriate bio-engineering measures such as spreading top soil, broadcasting seeds, grass slips and planting of seedlings/wildlings.</td>
<td>As per... of Technical Specification Item .... Of BOQ of contract documents</td>
<td>Identify the suitable equipment prior to the mobilization at site</td>
<td>Dust Emission Rate, Health of Labor force and local population, accidents, etc</td>
<td></td>
</tr>
<tr>
<td>Operation of machinery and equipments and general activities of labourers</td>
<td>• Engage the equipment with least vibrating character such as Excavator in place of Dozer • Use the equipment with less emission character such as use the trucks with EURO Standards • Regular maintenance of vehicles • Proper storage and handling of chemicals and oil. • Provision of well equipped first aid kits and health facilities to the construction camps as well as sites. • Provision of workers with construction helmets, face masks, ear plugs, gloves, goggles etc. • Adhere to park rules and regulations • Constant communication with park officials</td>
<td>As per... technical specification As per... of BOQ</td>
<td>Identify the suitable equipment and other management</td>
<td>Dust Emission Rate, Health of Labor force and local population, accidents, etc</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX 2 - DETAIL ENVIRONMENTAL MANAGEMENT PLAN
# Detailed Environmental Management Plan of the Jangchucholing – Tashidingkha Road

<table>
<thead>
<tr>
<th>Activities/Issues</th>
<th>Potential Impacts</th>
<th>Adverse Impacts</th>
<th>Mitigation Measures</th>
<th>Location</th>
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<th>Responsible Monitoring Agency</th>
<th>Schedule/Frequency</th>
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</thead>
<tbody>
<tr>
<td>A. Pre-construction Stage</td>
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<tr>
<td>Selection of Alignment as per EA Study</td>
<td>Physical, biological, social and cultural adverse impacts</td>
<td>Select best among the alternate route in consideration with minimize the adverse impacts and maximize the beneficial impacts (Please refer section 3.3.3 and 3.5 of EA main report)</td>
<td>Project Area</td>
<td>Review of alternate analysis, and incorporation of EA recommendation</td>
<td>Walk through along the road corridor</td>
<td>RAP/PMU</td>
<td>DOR/IMOW HS</td>
<td>Prior to detail survey and design</td>
<td></td>
</tr>
<tr>
<td>Implementation of EA recommendation in project planning and design</td>
<td>Physical, biological, social and cultural adverse impact</td>
<td>Incorporation of EA recommendation in project planning and design</td>
<td>Road Corridor</td>
<td>Incorporation of EA recommendation into project design</td>
<td>Review of final design document, technical specification, bid document</td>
<td>RAP/PMU</td>
<td>RAP/IMOW HS/NEC</td>
<td>Following the completion of design</td>
<td></td>
</tr>
<tr>
<td>Inclusion of Mitigation Measures in Project Cost, Bid Documents, and contract</td>
<td>Physical, biological, social and cultural adverse impact</td>
<td>Incorporation of EA recommendation in Bid Documents and Contract</td>
<td>Along the Road Corridors</td>
<td>Incorporation of EA recommendation in Bid Documents and Contract</td>
<td>Review of Bid Documents and Contract</td>
<td>RAP/PMU</td>
<td>RAP/IMOW HS/NEC</td>
<td>Following the award of contract</td>
<td></td>
</tr>
<tr>
<td>Construction Logistics</td>
<td>Adverse impacts on local environment, delay in construction, etc</td>
<td>Arrangement of logistics in time including necessary precautions for storage,</td>
<td>Construction Camps, sites</td>
<td>Status of logistics in terms of equipment, materials, storage facilities, precautions, labor camps, etc</td>
<td>Field Observation</td>
<td>Contractor/P MU</td>
<td>RAP/DOR</td>
<td>Prior to the beginning of constructions</td>
<td></td>
</tr>
<tr>
<td>Land and Properties Acquisition</td>
<td>Loss of Land properties, loss of livelihoods, hardship to affected families</td>
<td>Compensation and rehabilitation to 6 affected households suggested in table 6.2 of EA main report</td>
<td>Specific locations (please refer 6.3.1.9 of EA main report</td>
<td>Amount paid to affected family, Other form of compensation paid, Rehabilitation Work</td>
<td>Review of records, interaction with affected families and other stakeholder</td>
<td>RAP/DOR/G YTI/ Wangdue Dzongkhag Land Record Office</td>
<td>MOWHSN EC</td>
<td>Prior to construction work</td>
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</tbody>
</table>

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## APPENDIX 2—Detailed Environmental Management Plan

<table>
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<tr>
<th>Activities/issues</th>
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<tbody>
<tr>
<td>Site Clearance/removal of vegetation</td>
<td>Loss of 4.4 ha of vegetation cover, Loss of micro level ecosystem, Loss of habitat for Black Bear, Leopard and other animals including ground dwelling birds, Loss of standing crops (1.1 ha of agriculture land), Soil erosion, Scarring of Landscape</td>
<td>Removal vegetation within 5.1 m formation width only, Bio-engineering with native plants (Alnus nepalensis, Erythrina arborescens, Saxif babylonica and other suitable native species), Avoid felling matured trees particularly oak trees which is one of the main source of Bear food, Compensatory plantation within road corridors to restore lost habitat, Tree felling shall be done parallel to road alignment, Log barrier/Check dams to be installed to prevent debris from rolling down and damaging the vegetation cover</td>
<td>Along the road alignment/Specific location (8+500 – 13+000 km)</td>
<td>Volume of forest product and species of plant removed, area of compensatory re-plantation, bio-engineering application locations in length</td>
<td>Review of document, Field visit, interaction with contractors, project officials, and local communities</td>
<td>PMU/RAP/ Nobding Forest Beat Office</td>
<td>DOR/NEC/ Divisional Forest Office (DFO), Lobesa</td>
<td>Every month during construction</td>
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<tr>
<td>Construction, operation and shifting of camps</td>
<td>Deforestation and poaching by labourers, Improper waste disposal and loss of aesthetic beauty, Health problems within camps and nearby settlements due to lack of hygiene, Damage to construction camps and injury to workers due to unsafe location and lack of safe facilities, Disturbance to nearby settlements, Resources competition</td>
<td>Briefing labourers/construction workers on local culture and rules and regulations of kingdom on illegal activities such as felling of trees, fishing and hunting, Camps to be placed in secure location and be able to protect inhabitants from rain, excessive sunshine and other extreme condition, Providing cooking gas or kerosene to discourage use of scarce firewood, Waste disposal facilities such as dustbins and garbage to be provided, Health screening for labourers, Fire fighting equipment to be provided, Separate clean drinking water to be supplied to reduce water use competition and for proper sanitation, Adequate Pit latrines to be constructed at the campsites</td>
<td>Labour camps to be constructed nearby takeoff and at chainage 7+600 and 9+000</td>
<td>Status of Camp site, availability of drinking water, cooking gas or kerosene, waste disposal bin &amp; garbage, pit latrine, fire fighting equipment, illegal hunting and felling of timber</td>
<td>Field observation of campsite, interaction with workers, local community and other stakeholders</td>
<td>PMU/Contra ctor</td>
<td>DOR/NEC/ RAP</td>
<td>Every month during construction</td>
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### APPENDIX 2 – Detailed Environmental Management Plan

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</table>
| **Management of Harvested Forest Product** | Loss of Forest Resources/generate revenue (loss of forest product - 6147 m³) | • Sell/Auction the harvested forest product (timber/fuel wood) if feasible  
• Local should be given opportunity to buy timber at subsidized rate  
• Trees felled in Sokshing area could be given to the owner as compensation for their resources lost. | Along Road Corridor where forest is to be cleared (8+000 - 14+300 km) | Volume of Forest Product sold/auctioned, amount of revenue generated | Review of documents/reports, site visits | RAP/DOF | DOF/DOR/NEC | During the Site Clearance |
| **Compensatory Plantation** | Increase in forest area | Plantation of tree at least 5 times in Nos. of destruction in suitable area in nearby the project area. (Note: RAP could support and fund Dangchu Geog in tree plantation specially on 2nd June social forestry Day observed every year on HM’s Coronation Day) | Along chainage 6+500 - 14+300 km | No of trees planted, area planted, mode of protection | Review of documents, observation at site | RAP/DOF/P MU/Contractor/ Dangchu Geog Community | DOF/DOR/NEC | Every four months |
| **Change in Land Use** | Loss of Cultivated and Forest land (Agricultural Land -1.1 ha, Forest land -3.96 ha, and Sokshing - 0.48 ha)  
• Loss of agricultural production,  
• Reduction in income to farmers,  
• Avoid fertile agricultural land,  
• Provide compensation and rehabilitation to 6 households that falls within the ROW as suggested in Table 6.4, Section 6.3.1.9 of the EA main report | Road Alignment Chainage (4+500 - 14+300 km) | Criteria developed for alternate alignment, Criterion for compensation, | Review of alternate analysis, and compensation and rehabilitation criterion | RAP/DOF/Wangdue Dzongkhag Land Record Office & Beat Office | NEC/DSLDR | Every six months |
| **Spoil Disposal** | • Lost of topsoil  
• Damage of farmland,  
• Using spoils for reclaiming the degraded land in consultation with local community | All along the road corridor, Spoil should | Planning for Spoil deposition, Current Practices | Review of planning and practice of spoil | Contractors/PMU | DOR/NEC/RAP | Every 15 days by RAP, and Every month by NEC |

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## APPENDIX 2 – Detailed Environmental Management Plan

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<tr>
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<th>Responsibl e Monitoring Agency</th>
<th>Schedule/Frequency</th>
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</thead>
<tbody>
<tr>
<td><strong>Earthwork and Excavation</strong></td>
<td>- Loss of nutrient rich top soil</td>
<td>- Damage to farmland</td>
<td>- Soil Erosion and slope failure, Disruption of the natural flow of streams, rivers etc of the project area due to excavation or construction</td>
<td>- Selection of proper alignment avoiding unstable and fragile zone</td>
<td>All along road alignment but specifically at location of unstable zone of chainages: 0+000 – 4+080 6+340 – 14+300</td>
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<td>Every month during construction</td>
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<td></td>
<td>- Top soil shall be scrapped and stored for future reuse for bioengineering application</td>
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<td></td>
<td>- Slope cutting activities carried out during dry season</td>
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<td>- Slope cutting to be limited to 1:1 (details provided in table 6.2 of the EA report)</td>
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<td>- Slope cutting to be done with excavators</td>
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<td>- Log barriers/ Check dams to be built to avoid damage of vegetation, properties and injuries to passerby</td>
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<td></td>
<td>- Apply appropriate Bioengineering technique such spreading top soil, broadcasting seeds, grass slips, seedling of local plants such as Alnus nepalensis, Erythrina arborescens, Salix babylonica and other appropriate and natively available species.</td>
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<td>- Gabion retaining walls with</td>
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<td>- No disposal shall allowed in the areas of fragile slopes, floodways, farmland, forest areas, natural drainage path, religious and cultural sites, canal and other infrastructures</td>
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<td>be dumped at specified disposal site between chainage of 6+850 – 7+500 and 13+000 – 13+200 km</td>
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<td>- Dispose spoils in the designated sites</td>
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<td></td>
<td>- Build many spoil benches for filling disposal area rather than few larger ones to avoid slope overloading</td>
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<td></td>
<td>- Compact spoil benches at every 0.5 m thickness</td>
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<td></td>
<td>- Site shall be rehabilitated with appropriate bioengineering works and provide proper drainage</td>
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<td></td>
<td>- Damage to properties</td>
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<td>- Injury to people or wildlife passing by</td>
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</tr>
</thead>
</table>
| **Slope Instability** and Erosion | • Soil erosion and land slides due to slope instabilities and thereby damaging or losing entire road  
• Clogging of drains and irrigation canal  
• Loss of fertile top soil  
• Damage to the natural vegetation and the habitat  
• Siltation of streams, river and other water bodies  
• Damage to aquatic lives and downstream users due to siltation |  | • Select an appropriate road alignment as recommended by EA & Geological and Geotechnical studies. In this case, select alignment I of alignment option II.  
• Cut & fill approach shall be applied as far as possible. The recommended slope gradient for different cut slope height is provided in table 6.2 of EA report.  
• Revegetate cut & fill slopes or exposed areas as soon as possible by using local plant species such as *Alnus nepalensis*, *Erythrina arborescens*, *Salix babylonica* and other appropriate and natively available species  
• Slope cutting to carried out only during dry season  
• Proper drainage as recommended by Geological and Geotechnical Studies shall be adopted  
• Adoption of appropriate bioengineering technique along with civil structures such as breast and retaining wall for slope stabilization. (For detail refer 6.3) | All along the chainage. Specifically at Chainages:  
• 0+000 – 4+080  
• 5+020 – 14+300 | No of slope failures, Arrangement for Slope Stabilization, design and implementation of bio-engineering, Involvement of trained technicians | Site Visit, Review of design and contract documents interaction with stakeholders | Contractors, PMU, RAP | DOR/NEC | Every month during construction |
| **Quarries, borrow pits and stock pile**  (Note: As per geological & geotechnical study, RAP II, March 2006) | • Loss of top soil  
• Instability of slopes  
• Land slides/ rock falls, causing injury to workers  
• Changes in river/stream |  | • Selection of quarry site away from critical habitat, settlements, cultivated area as far as possible  
• Separate clearance from DGM is necessary for Quarrying activities  
• Quarrying operation to be done from crown of the slope and gradually | Specific location of quarrying and stock piling Chubachhu Stream | Site Selection for quarrying, Protection measures adopted, Rehabilitation of sites | Review of contract document, site visit, and interaction with local communities | Contractors/ PMU | DOR/RAP/ DGM | Every 15 days by site engineer and every month by DOR/NEC/DGM |

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</tr>
</thead>
<tbody>
<tr>
<td>there are no regime moving down-slope in a phased manner</td>
<td>Scanning of landscape</td>
<td>Provision of appropriate safety gadgets such as gloves, helmets, face masks, ear plugs, goggles, safety ropes to be tied around the waist, etc., to workers</td>
<td>Generally all sites, from Chainage 0+000 – 14+300 km</td>
<td>Criteria developed for alternate analysis, review of principle adopted for avoidance of forest, endangered species, and habitats of wildlife</td>
<td>Review of alternate analysis, review of principle adopted for avoidance of forest, endangered species, and habitats of wildlife</td>
<td>PMU/Contractors/Forest Beat Officer, Nobding</td>
<td>DORNEC / DFO Lobesa</td>
<td>Prior to design and planning, and during construction. Surprise monitoring visit</td>
</tr>
<tr>
<td>there are no regime moving down-slope in a phased manner</td>
<td>Disturbance to wildlife and nearby communities from drilling and blasting activities</td>
<td>Restoration of quarry site and access road using appropriate bioengineering measures (Planting Alnus nepalensis which grows in plenty around Chubachhu). Top soil shall be scraped and stored in a safe place for future reuse in bioengineering application</td>
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<tr>
<td>there are no regime moving down-slope in a phased manner</td>
<td>Dust pollution effects health of workers, communities and surrounding vegetation</td>
<td>Dust pollution effects health of workers, communities and surrounding vegetation</td>
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<tr>
<td>there are no regime moving down-slope in a phased manner</td>
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<tr>
<td>Wild life and its habitat</td>
<td>Reduction in forest cover, disturbance to wildlife habitats, Loss of endangered species, Black Bear and Leopard (found along the alignment from Peljorling – Tashidingkha village)</td>
<td>Road shall be designed as per following criteria: With minimum road with of 5.1m for easier wildlife movement and to discourage unwanted vehicular parking which discourages unnecessary interference to surrounding forest. Cut slope shall be limited to 1:1</td>
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<tr>
<td>Wild life and its habitat</td>
<td>Fleeing of wildlife due to excessive noise from construction machineries and workers</td>
<td>Road shall be designed as per following criteria: With minimum road with of 5.1m for easier wildlife movement and to discourage unwanted vehicular parking which discourages unnecessary interference to surrounding forest. Cut slope shall be limited to 1:1</td>
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<td>Wild life and its habitat</td>
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<th>Responsible Monitoring Agency</th>
<th>Schedule/Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Disruption of wildlife migratory route and movements * Poaching and trapping wildlife by labourers * Fragmentation of wildlife habitat or biological corridor * Isolation of both wildlife and plant communities</td>
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<td>accidental or intentionally</td>
<td>especially from 8+300 – 13+500</td>
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<td>o Animal crossing signage shall provided (refer figure 6.2, 6.3, 6.4, &amp; 6.5)</td>
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<td>o Application of appropriate bioengineering technique to improve or recreate lost habitat</td>
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<td>o Installation of strong log barrier/check dams to prevent debris from rolling downhill and damaging the vegetation cover.</td>
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<td>o Felling of Oak trees shall be strictly prohibited as it is one of the main sources of food for Himalayan Black Bear.</td>
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<td></td>
<td>o No labour/construction camps, crushing/batching plants siting shall be allowed within the habitat area between Peljorling – Tashidingkha village</td>
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<td></td>
<td>o Only Acconex shall be used along the sensitive or critical habitat are to reduce disturbance to wildlife</td>
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<td></td>
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<td></td>
<td>o No spoil shall be dumped in the habitat area except at designated site provided (refer table 6.1 of EA report)</td>
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<td></td>
<td>o No fire shall be permitted and fire break shall be implemented to prevent fire outbreak. Fire fighting equipment shall be made available to prevent any accidental fire hazard.</td>
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<td></td>
<td>o Contractor/Construction Supervisor will ensure the minimum level of</td>
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</tr>
</tbody>
</table>

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# APPENDIX 2 – Detailed Environmental Management Plan

<table>
<thead>
<tr>
<th>Activities/issues</th>
<th>Potential Impacts</th>
<th>Mitigation Measures</th>
<th>Location</th>
<th>Monitoring Indicators</th>
<th>Monitoring Methods</th>
<th>Responsible Implementing Agency</th>
<th>Responsible Monitoring Agency</th>
<th>Schedule/Frequency</th>
</tr>
</thead>
</table>
| Noise to reduce disturbances to wildlife | • Contractor/Construction Supervisor will be responsible for controlling illegal activities by the construction workers  
• Contractor shall install check point to prevent illegal logging during construction period in the name of the project  
• Awareness campaign on forest rules and regulations will be conducted for labourers and project officials in coordination with Lobesa Divisional Forest Office and Beat Officer of Nobding to discourage & prevent unlawful act.  
• Nobding Forest Beat Officer will make a surprise visit to the camp sites and other work areas to discourage the workers and others from illegal hunting and indiscriminate tree fellings. | Road Chainage 10+100 and 11+900 km where rock cutting by blasting materials is required. | Amount of Blasting Material used, handling process, incidences of accidents, and other types of damages | Review of Records, Observation, consultation with stakeholders etc | Contractor/P MU | RAP/DOR/ NEC/ MOHCA | Every week by DOR, and Every month by NEC / MOHCA |

**Handling and Use of Blasting Materials**  
- Creation of excessive noise and vibration, which may weaken the geology, cause damages to community infrastructures, religious places and monuments,  
- Risk accident and injury to workers and other people living in close vicinity,  
- Disturbance to

- Transportation, handling and storage of explosive should follow the prevailing rules (Explosive rules of the Ministry of Home & Cultural Affairs),  
- Store explosive in steel container, which are fire and theft proof,  
- Do not store gelatin, detonators, and cortex, together,  
- Dispose waste safely by burying them in 5-8 feet deep pits,  
- Adopt controlled blasting practice with limited charge where possible,  
- Use Acconex near habitation and protected areas,  
- Make provision of well equipped first

Bhutan Consultants & Research (BHUCORE)
### APPENDIX 2 – Detailed Environmental Management Plan

<table>
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<tr>
<th>Activities/Issues</th>
<th>Potential Impacts</th>
<th>Mitigation Measures</th>
<th>Location</th>
<th>Monitoring Indicators</th>
<th>Monitoring Methods</th>
<th>Responsible Implementing Agency</th>
<th>Responsible Monitoring Agency</th>
<th>Schedule/Frequency</th>
</tr>
</thead>
</table>
| Disruption of Erosion, landslide, creation of new gullies and rills | - Wildlife pollution of ground and surface water due to leakage of toxic materials and wastes endangering the health of people as well as aquatic, and wildlife.  
- Risk of theft and misuse of explosive by unauthorized or miscreants. | - Provide adequate numbers of drainage structures in order to have minimum interference with and impact on natural drainage pattern of the area.  
- Construct side drains, lined drain to tap excessive water and dispose of to natural drain.  
- Planting of fast growing plant species Alnus nepalensis, with high water absorptive capacity in marshy area to lower the water table and reduce surface drain, avoid surface water discharge into farmland or risky locations. | Along the road alignment 0+000 – 14+300 | Length of water management structures constructed, (drain, culverts, bridges, etc) | Review of design, construction drawings, observation at site | PMU/RAP | DOR/MOW HS/NEC | Every three months |
| Disruption of Drainage System | - Wildflie pollution of ground and surface water due to leakage of toxic materials and wastes endangering the health of people as well as aquatic, and wildlife.  
- Risk of theft and misuse of explosive by unauthorized or miscreants. | - Adapt side drain as irrigation channel and provide four hune piped crossing along the road crossing  
- Avoid indigenous spring water | Chainage (Irrigation at 4+200, Spring at) | No of system rehabilitated and restored | Observation, Review of records | PMU/Contractors | DOR/MOW HS/NEC | Every three months |

Bhutan Consultants & Research (BHUCORE)
## APPENDIX 2—Detailed Environmental Management Plan

<table>
<thead>
<tr>
<th>Activities/issues</th>
<th>Potential impacts</th>
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<th>Location</th>
<th>Monitoring Indicators</th>
<th>Monitoring Methods</th>
<th>Responsible Implementing Agency</th>
<th>Responsible Monitoring Agency</th>
<th>Schedule/Frequency</th>
</tr>
</thead>
</table>
| Road Surfacing/graveling work | Air and noise pollution | - Sprinkle water twice a day particularly nearby settlements to control dust pollution,  
- maintain equipment and vehicles | Along the road corridors near Ridhang Goenpa, Peljorling & Tashidingkha | Air and noise level measurement, or complain of local residents, | Observation | Contractors/PMU | DOR/MOW HS/NEC | Every month by DOR, and in every six months by NEC |
| Air Pollution | Problem of human health, vegetation, | Adopt mitigation measures as suggested in earthwork excavation, spoil disposal, quarrying and stock piling | Along the road corridors | Air and noise level measurement | Observation | Contractor/PMU | DOR/MOW HS/NEC | Every three months |
| Water Quality | Problem of public health, aquatic life, etc | Adopt mitigation measures as suggested in earthwork excavation, spoil disposal, quarrying and stock piling | Along the road corridors | Air and noise level measurement | Observation | Contractor/PMU | DOR/MOW HS/NEC | Every three months |
| Noise Pollution | Problem of public health, aquatic life, etc | Adopt mitigation measures as suggested in earthwork excavation, spoil disposal, quarrying and stock piling | Along the road corridors | Air and noise level measurement | Observation | Contractor/PMU | DOR/MOW HS/NEC | Every three months |
| Pressure on Community Infrastructures | Inconvenience to local population for water supply, etc | Make separate water supply arrangement if required | Construction Camp site, etc | Complaints from local communities | Observation, interaction with local communities | Contractors | DOR | Every three months by DOR |
| Adoption of Occupational Health and Safety | Accidents, loss of life, etc | Adoption of OHS | Construction site | Adoption level of OHS, No of accidents occurred | Observation and interaction | Contractor | DOR | Every three months |
| Disruption of Religious and Cultural | Damage to local cultural and religious sites (holy) | - Road hitting directly holy tree has been realigned but needs protection wall to avoid slope failure | Construction Site (Ruin stupa at Status restoration, or realignment | Observation and interaction with local | RAP/DOR | MOWHS/Dangchu Geog | Every Six months |
### APPENDIX 2—Detailed Environmental Management Plan

<table>
<thead>
<tr>
<th>Activities/issues</th>
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<th>Responsible Implementing Agency</th>
<th>Responsible Monitoring Agency</th>
<th>Schedule/Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources</td>
<td>Tree and ruin stupa at Peljorling Village, erosion of local culture and beliefs, loss of faith towards the project.</td>
<td>* Realigned the road section to avoid hitting the ruin stupa and provide retaining wall to protect the stupa.</td>
<td>8+040 km and religious tree at 7+840 km</td>
<td>Communities</td>
<td>DOR/MOWHS/NEC</td>
<td>Wangdue Dzongkhag Administration</td>
<td></td>
<td>Every six months</td>
</tr>
</tbody>
</table>

#### C. Operation Stage

| Slope Instability     | Landslide, disruption of road services, etc                                      | Correct maintenance of the slope protection measures and drainage works should be adopted, minor landslides, erosion, and mass wasting should be immediately cleaned and slope restored with appropriate technology (preferably bioengineering), promote and support soil conservation activities in the right of way and beyond, organize environmental awareness programmes for local communities, road users, and decision makers. | Landslide prone area      | Frequency of occurrence of slide, Frequency of maintenance, awareness programs implemented | Review of document, records and observation | DOR/MOWHS/NEC | Every six months |
|-----------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------|----------------------------------------|--------------------------------------------------------|-------------------------------|-------------------------------|---------------------|
| Road Accident         | Loss of life and properties                                                        | Adoption of Road safety measures, road signals to be places,                        | Along the road            | Frequency of accidents                  | Review of records and observation                       | DOR/MOWHS/NEC | Every six months |
| Development of Ribbon Settlement | Road Congestion, Accidents                                                        | Restriction of development of ribbon settlement through Implementation of Road Act 2004 | Along the road corridors  | No of houses built along the road alignment | Observation                                           | DOR/MOWHS | Every year |
| Depletion of Forest Area | Inconvenience to local communities, loss of forest resources,                     | Protection of forest resources by imposing strict rules                              | Along the road corridors  | Incidences of harvesting of forest product, losses of trees, etc | Observation                                           | DOR/DOF/MOWHS/MOA/NEC | Every year |
| Maintenance of Road   | Inconvenience to road users, accumulation of damaged maintenance                  | Adoption of regular maintenance practices                                           | Along the road             | Maintenance budgets, progress of maintenance work | Review of reports, documents, observation              | DOR/MOWHS/NEC | Every six months |

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APPENDIX 3 - EMP MONITORING SHEET
**APPENDIX 3 – EMP Monitoring Sheet**

**Field EMP Monitoring Sheet** *(Adapted from EFRC guidelines for preparation of Environment Management Plan)*.

Month: .................................  Year: .................................

(Contents based on Sample Detail EMP in Appendix 2)

<table>
<thead>
<tr>
<th>Activities/Issues</th>
<th>Impact</th>
<th>Mitigation measure carried out</th>
<th>Date of implementation</th>
<th>Issues Problems faced/ Modifications made</th>
<th>Verification by internal or external Monitoring Agency (Print Name, Date and Signature and Provide remarks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Site Clearance, removal of vegetation and top soil | • Loss of 4.6 ha of vegetation cover  
• Loss of micro level ecosystem  
• Loss of standing crops (1.1 ha of agriculture land)  
• Soil erosion  
• Scarring of Landscape | • Removed vegetation only within formation width  
• Bio-engineering done with native plants *(Alnus nepalensis, Erythrina arborescens and Salix babylonica or Weeping willow)*  
• Direction of tree felling parallel to road alignment with the road corridor  
• Compensation for crop lost has paid to households | 6-8-05 to 30-8-05 | Delays in processing of Forestry clearance. So site clearing is initiated only between 8 – 9+500 km where there is hardly any trees | Verified by Sangay, Site Engineer, DOR, Jangchucholing on 15 August 2006. Site clearing for only 8 km – 9+500 km. Tree felling yet to be done. Verified by Tshering Namgay, Beat Officer, Territorial Forestry Division, Dangchu Geog, Wangdue on 16 August 2006 |
APPENDIX 4 - INSTITUTIONAL ARRANGEMENT FOR RAP II
# Overview of Institutional Mechanisms for Environmental Management

<table>
<thead>
<tr>
<th>ACTIVITY PHASE</th>
<th>(1) NECS, MOWHS, DOR</th>
<th>(2) DOR/RAP, CONSULTANTS</th>
<th>(3) CONTRACTORS Construction</th>
<th>(4) LOCAL AUTHORITY GYT, DYT</th>
<th>(5) COMMUNITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Construction: Project Identification &amp; Pre-feasibility studies, Environmental Screening Initial Social Assessment</td>
<td>Preparation of ToR: Establish coordination committees, Preparation of Environmental Information Screening</td>
<td>Environmental: Conduct field survey, Conduct EA study, Identify potentially affected persons, Identify potential compensatory, resettlement &amp; rehabilitation requirements, Involve user groups and potentially affected persons in information gathering and verification of data</td>
<td>Conduct public construction, Enable &amp; encourage local resident inputs, Seek feedback from GYT, DYT, Assess project request &amp; GYT programs, Ensure people’s awareness about the project, Identify resettlement requirements, Participate in road alignment planning</td>
<td>Identify major issues of public concern regarding project</td>
<td></td>
</tr>
<tr>
<td>Feasibility Study Environmental Assessment Social Assessment</td>
<td>Review and approval of ToR for EA (If required)</td>
<td>Conduct EA Study: Collect baseline data, Ensure continuing public consultation &amp; participation, Mobilize GYT &amp; communities, Identify &amp; predict impacts, Prescribe/develop mitigation measures with local inputs, Prepare EA report &amp; submit to MoWHS, NEC</td>
<td>Conduct participatory planning, Assist land acquisition, compensation &amp; rehabilitation processes, Ensure that action plans are prepared with local involvement</td>
<td>Participate in public hearings &amp; enable public participation &amp; community construction, Strengthen people’s awareness to increase involvement &amp; reduce community anxieties, Continue periodic local involvement in all EA planning activities</td>
<td></td>
</tr>
<tr>
<td>Engineering Design</td>
<td>Review detailed design and accord technical sanction</td>
<td>Monitor EMP &amp; other impact mitigation</td>
<td>Ensure EMP compliance regarding appropriate labor management, social service delivery &amp; dispute resolution, Involve GYT, DYT</td>
<td>Monitor labor, social service delivery &amp; conflict resolution procedures</td>
<td>Involve GYT, DYT representatives</td>
</tr>
<tr>
<td>Project Appraisal &amp; Approval</td>
<td>Review/Approve of EA</td>
<td>Conduct Survey &amp; Design</td>
<td>Implement EMP Establish &amp; maintain support</td>
<td>Co-ordinate between contractors &amp; other concerned agencies</td>
<td>Mediate any conflicts between local people &amp; project</td>
</tr>
<tr>
<td>Implementation Contract</td>
<td>Determine the loss of properties &amp; entitlement awards/compensation</td>
<td>Prepare EMP</td>
<td>Supervise &amp; monitor EMP implementation</td>
<td>Supervise &amp;Monitor EMP</td>
<td>Supervise &amp; Monitor EMP</td>
</tr>
<tr>
<td>Awarding Construction</td>
<td>Supervise monitoring &amp; management of road construction</td>
<td>Active (in health, education &amp; other services &amp; infrastructural facilities for laborers &amp; communities</td>
<td></td>
<td></td>
<td>Public ownership of the road</td>
</tr>
<tr>
<td>Construction</td>
<td>Contracts Consultants &amp; contractors</td>
<td>See the environmental damages are avoided</td>
<td></td>
<td></td>
<td>Monitor local laborer, Monitor laborers, road</td>
</tr>
</tbody>
</table>

Bhutan Consultants & Research (BHUCORE)
## APPENDIX 4 – INSTITUTIONAL ARRANGEMENT FOR RAP II

<table>
<thead>
<tr>
<th>ACTIVITY PHASE</th>
<th>(1) NECS, MOWHS, DOR</th>
<th>(2) DOR/RAP, CONSULTANTS</th>
<th>(3) CONTRACTORS</th>
<th>(4) LOCAL AUTHORITY</th>
<th>(5) COMMUNITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Manage financial accounting</td>
<td>Environmental, Social, Legal, Technical/Engineering, etc.</td>
<td>stakeholders participate in constructing &amp; implementing EMP</td>
<td>employment, especially potentially affected peoples &amp; vulnerable groups</td>
<td>communities - neighbor relationship, etc.</td>
</tr>
<tr>
<td></td>
<td>Prepare work schedule</td>
<td>See that beneficial impacts are taken identified and enhanced</td>
<td>Manage labor arrangements</td>
<td>Monitor project activities</td>
<td>Observe/monitor quality of life of local people</td>
</tr>
<tr>
<td></td>
<td>Monitor &amp; review reports</td>
<td></td>
<td></td>
<td></td>
<td>help reduce local anomalies (due to project activities)</td>
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<tr>
<td></td>
<td>Encourage contractors to employ local laborers</td>
<td></td>
<td></td>
<td></td>
<td>Monitor EMP</td>
</tr>
<tr>
<td></td>
<td>Check the ToR &amp; ensure that environmental action plans are followed</td>
<td></td>
<td></td>
<td></td>
<td>Play a key role in mediating all stakeholder conflicts.</td>
</tr>
<tr>
<td>Monitoring Compliance Monitoring</td>
<td>Monitor technical works</td>
<td>Prepare monitoring report for client</td>
<td>Maximize employment of local laborers</td>
<td>Assist in the monitoring of consultants Participate in monitoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitor social &amp; environmental works</td>
<td>Conduct impact monitoring</td>
<td></td>
<td></td>
<td>Assist in the monitoring of consultants Participate in monitoring</td>
</tr>
<tr>
<td>Operations &amp; Maintenance</td>
<td>Conduct post-construction evaluation</td>
<td>Observe maintenance &amp; compliance with contract norms safety measures compliance Evaluation construction works conformity with standard specifications Conduct final audit</td>
<td>Maximize employment of local laborers Employ local petty contractors for patchwork Employ locals/migrants in construction to reduce unemployment</td>
<td>Monitor local employment Monitor resolution of claims &amp; other outstanding matters Facilitate employment of affected persons in maintenance works</td>
<td>Facilitate conflict resolution between contractors &amp; other stakeholders Assess local employment situation</td>
</tr>
<tr>
<td>Post-Construction Monitoring</td>
<td>Involve in-house consultants</td>
<td>Conduct post-construction impact assessment</td>
<td></td>
<td></td>
<td>Participate in impact monitoring activities</td>
</tr>
</tbody>
</table>

Bhutan Consultants & Research (BHUCORE)
APPENDIX 5 - ENVIRONMENTAL AUDITING PLAN
Environmental Auditing

Rural Access Project

Environmental Auditing should be carried out about after 2 years of project in operation. Information from monitoring should be utilized for carrying out Environmental Auditing. In general, the environmental auditing should gather information on the following areas:

- The condition of natural/social/economic resources prior to the project implementation and after project construction is completed,
- Whether impacts forecasted by EA occurred and, if so, the extent of these impacts,
- Whether or not mitigation measures implemented are effective to control adverse impacts or enhance beneficial impacts,
- Whether or not all landscape degraded due to project implementation have been restored to their original/better conditions,
- What are the impacts on general conditions among the work forces involved in the project implementation and local economy, and
- To overall effect on the local economy of project implementation.

Specifically, the following activities, and others as deemed necessary, need to be addressed for environmental auditing:

- How have the environmental conditions changed from the baseline conditions?
- Are there problems relating to slope stability in the project area?
- How slope stability and erosion control measures adopted by the project been effective in minimizing slope stability, erosion and landslide?
- Are there any bare or degraded areas around the project? What is the condition of the quarry sites, borrow areas, and spoil disposal areas?
- What are the conditions of local forest?
- How are the families resettled by project adapting to their new host communities?
- How have the local construction workers adapting to their new host communities?
- How have the local construction workers adapted to the loss of their jobs following the end of construction activities?
- What is the attitude of the local people towards the project?
- What has been the impact of the project on local and national economy?

Auditing Plan/Schedule

The following is an example of a plan for carrying out an environmental auditing. The example used is that of road project, for the purpose of illustrating the auditing activities:

Table 1.1: Environmental Auditing Plan

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Indicators</th>
<th>Location</th>
<th>Method</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Physical Environment</td>
<td>Disposal of Construction Spills</td>
<td>Initiated Erosion, affected aesthetic value, forest, and agricultural land</td>
<td>Designated Sites</td>
<td>Observation/Interview</td>
</tr>
<tr>
<td></td>
<td>Side Casting of Excavated Soils and Wastes</td>
<td>Initiated Land Erosion, local drainage</td>
<td>Along the road alignment</td>
<td>Observation/Interview</td>
</tr>
<tr>
<td>Erosion and Slope Stability</td>
<td>Erosion and unstable areas on natural slope</td>
<td>Adequate drainage facilities such as side drain, catch drain, and others</td>
<td>Along the road alignment</td>
<td>Observation and Measurement</td>
</tr>
<tr>
<td></td>
<td>Air Quality</td>
<td>Total Suspended Solid, Sox, Nox, dust from construction activities in houses, vegetation, surrounding areas</td>
<td>Along the road alignment</td>
<td>Visual inspection, measurement, analysis of Data, information from local people</td>
</tr>
</tbody>
</table>

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### APPENDIX 5 – SAMPLE ENVIRONMENTAL AUDITING PLAN

#### A. Physical Environment

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Indicators</th>
<th>Location</th>
<th>Method</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td>Noise level and their comparison with ambient standards</td>
<td>Along the road alignment</td>
<td>Measurement</td>
<td>Measurement and information</td>
</tr>
<tr>
<td>Vibration on Structures</td>
<td>Any case of hearing impairment, crack existed in houses, and compensation</td>
<td>Construction sites, location of cracked buildings</td>
<td>Interview, observation</td>
<td>Local People, observation</td>
</tr>
<tr>
<td>Water Quality</td>
<td>Temperature, TSS, DSS, Sodium, Oil, grease,</td>
<td>Major Drainage</td>
<td>Water Sample collection and testing</td>
<td>Analysis of Data</td>
</tr>
</tbody>
</table>

#### B. Biological Environment

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Indicators</th>
<th>Location</th>
<th>Method</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Timber</td>
<td>Volume of fuel wood trade, location of timber depot, fuel wood sale, in project area</td>
<td>Project site market, and settlement areas</td>
<td>Records, Observation</td>
<td>Local people, available information, observation</td>
</tr>
<tr>
<td>Alternative Energy for cooking for labor</td>
<td>Volume and type of fuel used in the project area</td>
<td>Project site</td>
<td>Record from contractors</td>
<td>Local People, observation</td>
</tr>
<tr>
<td>Harvesting and trade of medicinal plants</td>
<td>Sale of medicinal herbs increased</td>
<td>Project site and market</td>
<td>Information from contractors</td>
<td>Local People, observation</td>
</tr>
<tr>
<td>Physical Condition of forest</td>
<td>General Condition of forest in nearby</td>
<td>Forest in nearby the project</td>
<td>Observation</td>
<td>Information, local people</td>
</tr>
<tr>
<td>Wildlife</td>
<td>Wildlife hunting, tipping, poaching, by work force</td>
<td>Forest area near the project site</td>
<td>Interview with local people, Observation, Interview with local people</td>
<td></td>
</tr>
<tr>
<td>Trading of wildlife product (dried meat, hides, and furs)</td>
<td>Project site and market</td>
<td>Observation, Interview</td>
<td>Local people</td>
<td></td>
</tr>
<tr>
<td>Frequency of birds, mammals seen in the project area</td>
<td>Project area</td>
<td>Observation</td>
<td>Local People</td>
<td></td>
</tr>
</tbody>
</table>

#### C. Socio-economic and Cultural Environment

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Indicators</th>
<th>Location</th>
<th>Method</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment opportunity</td>
<td>Number of local labor employed in the project construction</td>
<td>Project site</td>
<td>Analysis of records and interview</td>
<td>Records from contractors and local people</td>
</tr>
<tr>
<td></td>
<td>Nos. of women in work forces</td>
<td>Project site</td>
<td>Records</td>
<td>Records, local people</td>
</tr>
<tr>
<td>Trade commerce and industry</td>
<td>Number of industries in vicinity of project</td>
<td>Project site and surrounding</td>
<td>Records, interviews, Observation, local people</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nos. of industries in project</td>
<td>Project site and market</td>
<td>Records, interviews</td>
<td>Observation, local people</td>
</tr>
<tr>
<td></td>
<td>Rental of houses, land spaces after the project</td>
<td>Local Area</td>
<td>Interview</td>
<td>Local tenants, local people</td>
</tr>
<tr>
<td>Compensation</td>
<td>Use of compensation received</td>
<td>Local area/out of area</td>
<td>Interview</td>
<td>Local people</td>
</tr>
<tr>
<td>Occupational Health and Safety</td>
<td>Types and number of accident occurred during construction</td>
<td>Project site</td>
<td>Interview, records</td>
<td>Records from contractors and local people</td>
</tr>
<tr>
<td></td>
<td>Adequacy of occupational safety measures</td>
<td>Project Site</td>
<td>Record Review</td>
<td>Records from Contractors and local people</td>
</tr>
<tr>
<td></td>
<td>Facility of first aid emergency services provided</td>
<td>Project Site</td>
<td>Interview, records</td>
<td>Records from contractors and local people</td>
</tr>
<tr>
<td>Compensation to the loss of life or disability</td>
<td>Project Site</td>
<td>Interview, records</td>
<td>Records from contractors and local people</td>
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### Damages and Complaints

<table>
<thead>
<tr>
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<th>Indicators</th>
<th>Location</th>
<th>Method</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damages and Compensation</td>
<td>Types of damages on personal properties</td>
<td>Project site and its vicinity</td>
<td>Interview and observation</td>
<td>Local People, observation, records</td>
</tr>
<tr>
<td></td>
<td>Damages to local infrastructures such as foot trail, irrigation, etc</td>
<td>Within the project area</td>
<td>Interview and observation</td>
<td>Local People, observation, records</td>
</tr>
<tr>
<td></td>
<td>Compensation for maintenance and rehabilitation of infrastructures</td>
<td>Project Area</td>
<td>Interview and Records</td>
<td>Local People, observation, records</td>
</tr>
<tr>
<td></td>
<td>Losses caused by blinding, vibration and noise compensation paid</td>
<td>Project Area</td>
<td>Interview and Records</td>
<td>Local People, observation, records</td>
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### Coordination and Communication

<table>
<thead>
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<th>Indicators</th>
<th>Location</th>
<th>Method</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordination and Communication</td>
<td>Coordination among DYT, GYT, projects, contractors, labor, etc</td>
<td>DYT Headquarters</td>
<td>Records</td>
<td>DYT and other stakeholder</td>
</tr>
<tr>
<td></td>
<td>Information Dissemination to local people about the project</td>
<td>Project Site and vicinity</td>
<td>Meetings</td>
<td>Local People</td>
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### Economic Condition

<table>
<thead>
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</thead>
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<tr>
<td>Socio-economic Change</td>
<td>Change in land use pattern</td>
<td>Project Area/GYT</td>
<td>Interview/survey</td>
<td>Local people</td>
</tr>
<tr>
<td></td>
<td>Change in local economy (changes in standard of living)</td>
<td>Project Area</td>
<td>Interview/survey</td>
<td>Local people</td>
</tr>
<tr>
<td>Price Rise</td>
<td>Rise in price of essential commodities as compared to before the project</td>
<td>Local Market</td>
<td>Market Survey</td>
<td>Local people</td>
</tr>
</tbody>
</table>
CONCEPT OF ENVIRONMENT ECOLOGY, AND THEIR RELATIONSHIPS WITH DEVELOPMENT

1. ENVIRONMENT

Environment is originally a French word, which means encircle or surround. Environment is defined as:

- the condition or circumstances that surrounds under which any individual or things exists, lives or develops, and
- social and cultural conditions that affect individual or community.

Since human inhabit the natural world as well as the built or technological, social and cultural world, all constitute important part of environment.

Any condition, influence or external forces that affect the organism become the factors of environment. These factors are also called environmental factors or ecological factors. The sum of these factors is known as environment.

The environmental factors are divided into abiotic and biotic factors. Abiotic factors are non-living factors, which include temperature, light, air, water, soil etc. Biotic factors include plants, animals and decomposers and therefore they are called living factors.

The biophysical systems interact with social and economic aspects of man, and this makes human being as one of the entities of the environment. Hence environment can be broadly defined as "the natural and social conditions that process around all the organism, which include mankind and future generations"

2. ECOLOGY

Ecology was coined by combining two Greek words, oikos (meaning house or dwelling place) and logos (meaning the study) to denote relationship between organism and environment. Thus it is the study of organism at home. In broader sense, ecology is study of interrelationship between organism and environment. It can also be defined as the study of structure and function of ecosystems.

2.1 BIOSPHERE

The living environment, known as biosphere, which consists of land, water, and air is the basis for the sustenance and continuance of life. The plants animals and all organisms live together, interacting among them and with the environment. The biophysical environment include plant and animal (biotic) that interact with the physical elements (abiotic) through the process of material and energy cycling involving lithosphere (soil and rock), atmosphere (air and other vital gases) and hydrosphere (water) as well as radiation from sun. The interaction of biotic components interaction with abiotic elements of the natural environment constitutes the complex system of biosphere: a system, which sustains life.

Food and energy, which are essential for life, are obtained from the surrounding environmental resources. Local environmental condition depends on variety of factors such as the nature of soil, rainfall, temperature, wind pressure, land, water bodies, vegetation, length of the day. Environmental conditions and utilization of environmental resources are not the same in various parts of the world. As living conditions vary, different types of habitat exist.

2.2 ECOSYSTEM

The biotic and abiotic components of nature interact structurally and functionally giving rise to a system called an ecosystem.
Ecosystems are unique living locations. There are basic structural and functional units of nature. Several communities exist in a particular area, under similar climatic and environmental conditions. Each group of organism has a specific living space and interacts with other groups. The input into an ecosystem is water, air, soil, and solar energy. Ecosystems are not independent, separate entities but are interrelated. Energy and nutrient flow from one system to another system. They have unique quality of regeneration and self-purification for maintaining equilibrium condition in the total system under natural conditions.

The biosphere contain many ecosystem contain numerous ecosystem viz. forest, water, grass land, marine, etc each of them are able to perpetuate itself.

Human beings, as component of environment, receive numerous services from ecosystem, provide vital life support element (air, water, food), provide material inputs, in the form of natural capital and also provide sink function to all waste produced through the economic activities.

Natural capital are referred as a stock of environmentally provided assets such as soil, forest, water, oil etc., that flow from ecosystem to economic system, they are either renewable or renewable.

Ecosystems are capable of providing specific services to human beings. They provide limited amount of resources and absorb limited amount of wastes, without their function impaired and ultimately degraded. However, with increasing human population growth of economic development, there is over exploitation of certain resources, which affect the productive capacity of environment, especially at local and regional level. Similarly, the disposal of increasing amount of wastes has begun to overload the assimilative capacity of ecosystem causing additional degradation of structural and functional integrity of the ecosystem.

2.3 CLASSIFICATION OF ENVIRONMENT

The environment can be broadly classified into two categories viz. Natural Environment and Manmade Environment. Figure below presents the Environmental components.
2.3.1 NATURAL ENVIRONMENT

Natural Environment contains all the living and nonliving components of nature. Living components are plants, animals and decomposer (micro-organism). Non-living components are soil, air, water, minerals, light, temperature etc. The combination of plant, animal, and other physical environment is called biophysical environment because the interaction of them create life support system. These components of environment are natural resources.

a. Living Environment

Living environment includes all the living organisms of environment covering micro-organism, plants, animals and human beings. These are interdependent. None of these can survive alone. Green plants make their own food in presence of sunlight by taking carbon dioxide gas from atmosphere, water and nutrient from the soil. Living animals feed on the plants are called herbivores. Some animals feed from herbivorous animals are called carnivorous. When plants and animal die, their dead bodies get decomposed by micro-organism and they are called decomposer. Human beings also depend on plants and animal to receive food.

b. Non Living Environment

Non-living environment or abiotic environment consists of physical and chemical environment. Sunlight, temperature, precipitation, wind, soil, water etc are under physical environment. Living organism cannot survive without physical environment. Example of chemical environment is oxygen gas, phosphate, nitrate, calcium, magnesium etc, which are required for life support system.

2.3.2 MANMADE ENVIRONMENT

Human beings have gone too far in simplifying and modifying nature to suit their purposes. Human beings make an artificial environment by using their knowledge and skill, conscience and energy. Such environment is called man-made environment or artificial environment. The man made environments are divided into two groups:

a. Social and Economic Environment

Social and economic environment include social services and economic development activities to meet requirement of human beings. Various types of social activities/works are carried for welfare of human beings and included under social environment. Similarly, economic activities which include industries, transportation, energy, national parks etc are economic environment.

b. Religious and cultural Environment

Religious and cultural environment include different aspects and activities of societies religion and culture. Religious and cultural activities are interrelated with each other.

Our belief, value, faith, custom, tradition, festival, recognitions etc are religious and cultural aspects. Similarly, religion, language, literature, art, music, dance, dress, living style, conduct
etc. are also religious and cultural aspect. All religious and cultural aspects and activities are included in the religious and cultural environment.

3. BASIC ENVIRONMENTAL ISSUES

There is a direct link between the developments, which is essential to match the requirement in terms of food and other basic services of ever increasing population and environmental degradation. The developments primarily attributed at the cost of utilization of environmental resources resulting into its depletion of natural capital, and generate wastes through economic or development activities. The excessive utilization of environmental resources for economic activities may affect into regeneration capacity of nature in case of renewable resources and exhausts in case of non-renewable resources. Similarly, the excessive generation of wastes from economic activities may result into degradation of self-purification or sink function of nature. The depletion of environmental resources and disposal of wastes can be maintained through technology and human efforts to some extent. However, excessive exploitation of environmental resources and generation of wastes can result into degradation of environment in terms of physical, biological (living), chemical and socio-cultural environment and eventually make difficult for human living.

The basic environmental issues in present day in home, work place, and neighborhood are listed below:

- Pathogens or Pollutants in Human environment
  - Air, Soil, Food and Water
- Shortage of Natural Resources to Human Health
  - Fresh Water, Air, etc
- Physical Hazards
  - Landslide, Flood, Volcano and steep slope

**Indoor Environment at Home**
- Water and Sanitation,
- Over Crowding,
- Accident,
- Indoor Air Pollution, and
- Health Impacts

**Work Place**
- Toxic Chemical,
- Dust,
- Inadequate Lighting,
- Ventilation and Space,
- Protection of Workers, and
- Noise and Machinery

**Environment in the Neighborhood**
- House site,
- Garbage,
- Vector Disease, and
- Drainage.

**City Environment**
- Toxic Hazardous Waste (Arsenic, asbestos, benzene, lead etc)
- Export of toxic wastes or polluting,
- Industries,
- Water Pollution,
APPENDIX 6 – BASIC CONCEPT OF ENVIRONMENT & DEVELOPMENT

- Air Pollution,
- Natural and Human Induced Hazard,
- Noise Pollution,

3.1 Basic Environmental Issues of Project Area

Rural Environment
- Soil Erosion,
- Watershed Degradation,
- Deforestation,
- Loss of bio-diversity,
- Overgrazing,
- Indoor air pollution,
- Misuse of pesticides,
- Unsafe water supply,
- Open defecation (near the water sources and supplies)

Urban Environment
- Physical Congestions,
- Air Pollution,
- Water Pollution,
- Municipal wastes,
- Poor sanitation,
- Inadequate Sewerage,
- Loss of public open spaces,
- Loss of cultural Properties,

Industrial Environment
- Discharge of untreated wastewater into river or stream, (which are used for livelihood activities)
- Stack Emissions are blown directly to the atmosphere,
- Solid wastes are burned, buried or dumped into rivers or public places,
- Raw Materials and energy are used in highly inefficient manner,

4. CONCEPT OF SUSTAINABILITY

The most commonly used definition of Sustainable Development is that given by the World Commission of Environment and Development (WCED) in their report popularly known as Our Common Future:

"Development that meets the needs of the present generation without compromising the ability of future generation to meet their own needs" (WCED, 1990 page 87)

This means that economic activity, which is carried out now to meet current requirement should not degrade or deplete the environment so much that people will not be able to meet their needs in future. The future generation might not be able to meet their needs if the soils are degraded, natural resources such as forest, mineral and fisheries are used up or water bodies are badly polluted. Similarly, the needs of human beings are difficult to define and shaped by cultural, communal and individual values.

Growing environmental problem, especially land degradation, natural resources depletion and environmental health problems are appearing as the major threat to economic development. The development endeavors to be shifted towards the sustainable economic growth with the proper management in natural resources and improvement in environmental quality.

The majority of people in developing country live below the poverty line and the growing natural resources and environmental degradation will seriously affect their livelihood. In this context, the sustainable development in operation terms can be defined as "development, which will
enable the country at least to fulfill basic needs without further curtailing the level of
capital consumption and further depletion and degradation of natural resources and
environment".

Sustainable Development

Poverty

Resource Depletion

Environmental Problems

Pollution

Land Degradation

Climate Change

Development

Resource Depletion

Poverty Alleviation

Meeting Basic Needs (Health, Education, Shelter)

Productive Employment

Control over Common Properties

Population Control

Reduction in Income Gaps

Integration of Environment and Development

EIA of Development Projects

Technology for Development

Rural Urban Migration

Renewable Energy

Regional and International Cooperation

Bhutan Consultants & Research (BHUCORE)
APPENDIX 7 - TERMS OF REFERENCE
1. General Context

The Department of Roads (DoR) under the Ministry of Works and Human Settlement (MoWHS) is entrusted with the responsibility of road construction and maintenance in Bhutan. The DoR plans to take up construction of about 65 to 75 km feeder roads under a follow up next credit of the World Bank. The roads to be studied are:

(a) Jangchucholing - Tashidingkha Road (14.3 km) in Wangdue Dzongkhag
(b) Kothakpa – Khar - Tsebar Road (10 km) in Pemagatshel Dzongkhag
(c) Drujegang-Balung (42.5 km) in Dagana Dzongkhag

The main objective of the proposed road project is to provide the connectivity to different places. These connections will attempt to improve the socio-economic status of the rural population of those villages which lies along the proposed roads by providing access to marketing and other essential services (like education, markets and health). While the benefits of the project are noteworthy and clearly evident from the Rural Access Project (RAP I), the biodiversity, forest resources and natural/wildlife habitats and general ecological fragility/sensitivity of the region is a major concern and would be affected by road construction. While the Sectoral Guidelines and Environmental Assessment (EA) procedures established by NEC provide the framework to address the impacts, the various environmental measures integrated in road projects, and EAs conducted as part of RAP I has streamline the EA process for rural access roads. Thus, the experience of conducting and implementing EA for RAP I should be consolidated to simplify the EA for the current follow-up project RAP II.

2. Sectoral Environmental Framework (SEF) Objectives

The proposed EMF is expected to be carried out covering sectoral assessment and project level assessment. The objectives of EMF thus include the following:

The sectoral assessment shall focus on consolidating EA experience of the Environmental Friendly Road Construction Support Project (EFRC-SP) and RAP I providing specific outputs with a specific objective to institutionalizing the environmental aspects, covering:

a. The applicable RGOB’s environmental policies and World Bank’s safeguard policies in the form of a regulatory framework
b. The existing institutional capacity to implement Environmental Management Measures and the future requirements of strengthening.
c. The environmental framework which provides key environmental issues, management measures and implementation mechanism. The framework should be a ready reference guide for addressing the typical issues in rural access projects.

3. Sectoral Environmental Framework (SEF)

As defined in the objectives, the EMF shall essentially draw from preparation and implementation experience of the borrower and the bank in implementing RAP I and EFRC. The specific tasks to be undertaken as part of EMF include:

Task 1: Review of Legal and Regulatory Framework

Under this task, the consultants shall review RGOB’s environmental management of World Bank Safeguard policies applied and expected to be triggered for environmental management of RAP. The output of this task will be a succinct description (matrix structure could be effectively used for this purpose) of regulations/standards/norms/clearances applied for implementing RAP I and any additional requirements to be considered for RAP II. As per of regulatory review, the
consultants shall assess the existing responsibilities, legal mandates and performance across environmental and relevant sector agencies to identify effectiveness of coordination, gaps and overlaps. The output of review shall be a statement of regulatory framework and necessary reforms if any.

**Task 2: Institutional Arrangement for Implementation**

The consultants shall document and assess the current institutional mechanism for environmental management with specific reference to EFRC and RAP I. The institutional assessment shall cover presence and function of public, private and civil society intuitions in environmental management and their relevance in project implementation. As part of this effort the consultants shall ascertain the merits and possible improvements of implementation effectiveness of EFRC and RAP I (if any) through review of documents, supervision/monitoring reports, World Bank Aid Memories, etcetera; field visits to selected sites; and consultations with different stakeholders covering:

a. The project development process/procedures followed by institutions in integrating the environmental concerns. This shall include the disclosure of safeguard documents and management plans and the process of issuance of site permits.

b. Extent of involvement of project stakeholders at various stages (planning, design, implementation, and maintenance) and process of stakeholder involvement (like consultations, information dissemination, and disclosures).

c. Supervision. Monitoring, evaluation and reporting mechanisms and effectiveness thereof.

d. Grievance redressal mechanisms and procedures for accessing the legal system to resolve complaints.

The outcome of this task shall provide guidance in setting up an institutional mechanism for effective implementation of environmental management measures in spirit and letter. Such guidance should be responsive and shall cover:

a. Relevance of current institutional setup, constraints and limitations, opportunities to utilize the potential of existing institutions and specific recommendations for mainstreaming environmental management.

b. Areas of improvement such as enforcement and integration environmental measures/regulations, updating monitoring and reporting systems.

c. Capacity strengthening measures covering the existence, role, and capacity of implementing agency and Line Departments, environmental units (nodal or on-site) as well as private contractors, consultants and NGOs.

**Task 3: Environmental Management Guidance Manual**

Based on RAP I EAs, ECOPs, Standard Binding Documents developed for EFRC/RAP projects, bio-engineering manuals developed under EFRC/RAP, DFID supported land slides and environmental management guidelines, and any other secondary sources of information, the consultants shall ascertain the current sectoral environmental issues and effective management measures associated with the Rural Access Projects in Bhutan. As far as possible the assessment shall cover different regions of the country with necessary supporting data. The outcome of sectoral level analysis shall present a succinct description of environmental issues and feasible environmental management practices. The outcome assessment shall present: (a) environmental issues associated with rural access projects (b) data/information and regulatory/institutional structures to be followed for preparing detailed EAs for sub-projects; and (c) sectoral environmental management framework in the form of generic EMPs. This output should be developed in the form of a ready to refer guidance manual should facilitate minimizing the effort to develop sub-project specific EAs / EMPs. The guidance manual should be disclosed for inputs from various stakeholders prior to finalization.

**4. Reporting and timing of the assignment**

The consultancy work including reporting is estimated to take about two months.
The consultant shall submit the draft report (in five fold) at the end of these months. The comments on the draft report from DoR, SNV and other stakeholder agencies shall incorporated in the Final Report.

The final reports in five hard copies and a soft copy in CDs shall be submitted to DoR and SNV in two week’s time after receipt of comments from DoR, SNV and other stakeholder agencies.

5. Qualification & Experience of the consultant

Minimum Masters Degree in Environmental Management or Law with at least 5 years of professional experience in with environmental issues and management and preferably working experience under Himalayan conditions, and ability to train other persons.

6. Submission of Proposal and criteria for award of the assignment

The consultant’s proposal for the assignment shall include, but not limited to, the following:

a. Copies of relevant documents like valid Trade License, (CDB) Registration Certificate, and Tax Clearance Certificate providing the firm’s eligibility to carry out the assignment;

b. The company profile demonstrating the firm’s ability to carry out the assignment. The information on the firm’s experiences in similar projects in the recent past should also be provided;

c. Details of the personnel proposed to be deployed for performing the assignment. Copies of Academic & Training Certificates, experience Certificates and Curriculum Vitae should be attached;

d. Tentative work plan/schedule and methodology proposed to be adopted for carrying out the assignment;

e. Financial Proposal (in separate sealed envelope), indicating the cost for carrying out the assignment. The financial proposal should be inclusive of all items of express that would be incurred in carrying out the assignment. The proposal should reflect the cost-breakups indicating clearly all the items of expenses including remuneration for personnel to be deployed, overhead costs, consultant’s fee, and tax deductible at source. The firm may also indicate in their proposal the mode of payments to be made by the client for carrying out the assignment.

The evaluation of the proposal will be based on the comparison of the technical capability of the firms (which shall include experience of the firms, quality and stability of the approach and methodology, work program, experience and qualification of the personnel proposed to be assigned for the work). This evaluation is called Quality Based Selection. The evaluation will be carried out by SNV and DoR. The evaluation and the technical proposal of the highest ranking firm will be sent to the World Bank. Only the financial proposal of the firm with the technically best proposal will be opened and will be negotiated. The sealed proposals must be delivered at the following address not later than 13:00 hours of 26th October 2005:

The Director SNV Bhutan,
PO Box 815,
Thimphu, Bhutan

The contract will only be awarded when SNV and RGoB have a written agreement regarding the reimbursement of this consultancy.

7. Support services to be provided by the client

Any documents related to the project, if required for the purpose of study, shall be provided by the client upon receipt of a written request from the consultant. The consultant will work closely with the Department of Roads (DoR), SNV, NEC and, where necessary, Dzongkhag Administration officials. The client may also, at its discretion, consider fielding of its representative to accompany the consultant’s study team during field works upon receipt of a written request from the consultant. However, the responsibility of completing the assignment successfully will lie solely with the consultant.
APPENDIX 8 - LIST OF OFFICIALS MET
## List of Officials Met

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name</th>
<th>Designation</th>
<th>Department/Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C.K. Pradhan</td>
<td>Project Manager</td>
<td>RWP, Department of Roads (DOR)</td>
</tr>
<tr>
<td>2</td>
<td>David Annandale</td>
<td>Advisor</td>
<td>National Environment Commission (NEC)</td>
</tr>
<tr>
<td>3</td>
<td>Dorji Wangchuk</td>
<td>Asst. Engineer (EA)</td>
<td>Standard &amp; Quality Control Authority (SQCA)</td>
</tr>
<tr>
<td>4</td>
<td>K.D. Chamling</td>
<td>Environmental Specialist</td>
<td>Environmental Friendly Road Construction – Support Project (EFRC-SP), SNV/DOR</td>
</tr>
<tr>
<td>5</td>
<td>Kinzang Wangdi</td>
<td>Joint Director</td>
<td>Investigation and Development Division (IND), Department of Roads (DOR)</td>
</tr>
<tr>
<td>6</td>
<td>S.B. Suberi</td>
<td>NRE</td>
<td>DOR</td>
</tr>
<tr>
<td>7</td>
<td>S.N Rai</td>
<td>Project Manager</td>
<td>EFRC-SP, SNV/DOR</td>
</tr>
<tr>
<td>8</td>
<td>Singay Dorji</td>
<td>AE</td>
<td>Environmental Unit, IND, DOR</td>
</tr>
<tr>
<td>9</td>
<td>Sonam Desel</td>
<td>EA Officer</td>
<td>SQCA</td>
</tr>
<tr>
<td>10</td>
<td>Sonam Lhaden</td>
<td>PO/EA officer</td>
<td>NEC</td>
</tr>
<tr>
<td>11</td>
<td>Thinley Dorji</td>
<td>EA Officer</td>
<td>NEC</td>
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<tr>
<td>12</td>
<td>Tshering Wangdi (A)</td>
<td>Superintending Engineer</td>
<td>Survey &amp; Design Division, DOR</td>
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<td>13</td>
<td>Tshering Penjor</td>
<td>Project Manager</td>
<td>Rural Access Project, DOR</td>
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<td>14</td>
<td>Tshering Tashi</td>
<td>Joint Director</td>
<td>NEC</td>
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<tr>
<td>15</td>
<td>Tshewang Dorji</td>
<td>Junior Engineer</td>
<td>DOR</td>
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<tr>
<td>16</td>
<td>Yeshi Penjor</td>
<td>Under Secretary</td>
<td>NEC</td>
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<td>Yeshi Dorji</td>
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<td>Rural Access Project, DOR</td>
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<td>18</td>
<td>Ugyen D Shartsho</td>
<td>Dzongrab</td>
<td>Wangdue Dzongkhag</td>
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<td>19</td>
<td>Dorji Wangdi</td>
<td>Junior Engineer</td>
<td>Wangdue Dzongkhag</td>
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<tr>
<td>20</td>
<td>Kinga Dorji</td>
<td>District Engineer</td>
<td>Wangdue Dzongkhag</td>
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<tr>
<td>21</td>
<td>Gomathi</td>
<td>Asst Administrative Officer</td>
<td>Wangdue Dzongkhag</td>
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<td>22</td>
<td>Phub Tshewang</td>
<td>Gup</td>
<td>Dangchu Geog, Wangdue Dzongkhag</td>
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<td>Kinley Pem</td>
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<td>Peljorling Village, Dangchu Geog, Wangdue Dzongkhag</td>
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<td>Yangka</td>
<td>Tshogpa</td>
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<td>Gem Dorji</td>
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<td>Tshogpa</td>
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<td>28</td>
<td>Tashi Gyeltshen</td>
<td>Administrative Officer</td>
<td>Dagana Dzongkhag</td>
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<tr>
<td>29</td>
<td>Karma Tshewang</td>
<td>Junior Engineer</td>
<td>DOR, Drujegang, Sarpang Division</td>
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<tr>
<td>30</td>
<td>Jigme Tshering</td>
<td>Officiating Gup</td>
<td>Drujegang Geog, Dagana Dzongkhag</td>
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<tr>
<td>31</td>
<td>Kadar Rai</td>
<td>Gup</td>
<td>Tsangkha Geog, Dagana Dzongkhag</td>
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<tr>
<td>32</td>
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