May 2012

ENVIRONMENTAL ASSESSMENT GUIDELINE FOR POWER TRANSMISSION LINE PROJECTS

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Foreword

In 1999, the National Environment Commission published six sectoral environmental assessment guidelines for the mining, roads, industries, hydropower, power transmission lines and forestry sectors. These guidelines were intended to guide different project proponents through the process of acquiring an environmental clearance for their projects. These sectoral guidelines were later revised in the year 2003 to make them more practical and relevant to the Bhutanese context and also to streamline with the provisions of the Environmental Assessment Act 2000 and its Regulation 2002.

The revised sectoral guidelines of 2003 have played a very instrumental role in guiding the proponents and the sector agencies in the Environment Assessment (EA) process. However, these sectoral guidelines were long overdue for revision and through the World Bank IDF grant the guidelines were revisited and proposed for revision. All the relevant stakeholders were consulted several times for this revision and through the expert input from both local and international consultants the guidelines were revised to align with the changing government policies and rules and with the long-term objectives of protecting our pristine environment.

The NEC is grateful to the World Bank for their financial assistance to revise and update these guidelines. The revision and updating of these guidelines were accomplished through close consultation with all the relevant stakeholders. We would also like to express our gratitude and appreciation to all the ministries and stakeholders for their active participation, support and inputs. The NEC would also like to thank the team from the Centre for Science and Environment, New Delhi for their hard work and inputs in updating these guidelines especially Mr. Chandra Bhushan, Mr. Sujit Kumar Singh and Ms. Swati Singh Syambal. We are confident that the revised guidelines will be more useful documents that facilitate and expedite the environmental clearance process.

The environmental assessment process endeavors to mitigate and prevent undesirable impacts of developmental activities. It is in no way intended to hamper socio-economic development in Bhutan but to guide project proponents and sector agencies in making right investments in land, manpower, technology and mitigation measures to ensure that their projects have the least possible impacts on the environment. It's the sincere wish and hopes of NEC that all the stakeholders' make the best use of these guidelines, which in turn will help in protecting our fragile ecosystem. Sound implementation of these guidelines will go a long way in minimizing the negative impacts of developmental activities on Bhutan's environment.

Dr. Ugyen Tshewang
Secretary, NEC

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List of Abbreviations

BPCL	Bhutan Power Corporation Limited
KV	Kilo Volt
Km	Kilo meter
MVA	Mega Volt Ampere
MV	Mega Volt
RoW	Right of Way
GDP	Gross Domestic Product
GNI	Gross National Income
GNH	Gross National Happiness
PPE	Pollution Prevention Equipment

FDI	Foreign Direct Investment
EC	Environmental Clearance
EA	Environmental Assessment
EIA	Environmental Impact Assessment
NEC	National Environment Commission
CSE	Centre For Science and Environment
RGoB	Royal Government of Bhutan
TOR	Terms of Reference
EMP	Environment Management Plan
NOC	No Objection Certificate
EMS	Environment Management System
FDM	Fugitive Dust Model
EMF	Electro Magnetic Field
PCB	Poly-chlorinated Biphenyls
R&R	Resettlement and Rehabilitation
BAP	Biodiversity Action Plan
SAP	Species Action Plan
HAP	Habitat Action Plan
PAP	Project Affected Person

Chapter 1

An Introduction to the Transmission Line Project

1.1 Background

Transmission line projects in most countries today require an Environmental Impact Assessment (EIA) study before they are accorded environmental clearance. This holds true for Bhutan as well. It is regulated ***under the Environmental Assessment (EA) Act, 2000 and Regulation for Environmental Clearance of Projects 2002.*** The EA Act and its Regulation 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. According to the EA Act, Environmental Clearance (EC) is mandatory for any project/ activity that may have adverse impact(s) on the environment. The Regulation for Environmental Clearance of Projects 2002 defines responsibilities and procedures for the implementation of the EA Act concerning the issuance and enforcement of environmental clearance. According to the legal framework, the National Environmental Commission (NEC) is the nodal agency for administering and granting Environmental Clearance (EC).

The scope of the guideline is as follows:

- Provide guidance and assistance to various stakeholders involved in the EA process.
- Assist the regulatory agency and EIA practitioners to understand the main areas of concern and use that understanding to enhance the quality of the EIA study and report.
- Inform the regulatory agency and EIA practitioners about the best environmental management practices in the transmission line sector.
- Assist the regulatory agency to better assess the EIA report and arrive at a sound decision.

1.2 Introduction to Environmental Impact Assessment (EIA)

According to the United Nations Environment Programme's Division of Technology, Industry and Economics, an EIA is a tool used to identify the environmental, social and economic impacts of a project prior to decision-making. It aims to predict environmental impacts at an early stage in project planning and design, finding ways and means to

reduce the adverse impacts, shaping projects to suit the local environment, and presenting options to decision-makers.

An EIA can bring about both environmental and economic benefits, such as reduction in costs and time taken for implementation and design of a project and lesser intervention of legalities and regulations. A properly conducted EIA lessens conflicts by promoting community participation, informs decision-makers, and helps lay the base for environmentally sound projects (*See Box 1: Integration of EIA in the project cycle*).

1.3 Generic steps in the EIA process

The EIA process comprises of six key steps:

i. **Screening**: This first step helps decide whether an EIA is required for a project. An appropriately designed screening system can prove to be an effective tool to prevent the squandering of time and money on assessing projects with insignificant environmental impacts.

ii. **Scoping**: Scoping is considered the backbone of an EIA process, and is ideally undertaken at the project planning stage. The main objective of the scoping process is to establish the environmental and social priorities, set the boundaries for the study and define the Terms of Reference (ToR). Systematic and well planned scoping forms the basis of an effective and efficient EIA process. It also helps avoid unfocused and voluminous reports. Ideally, the role of scoping is to determine three key issues: (a) Site alternatives (b) Design alternatives and (c) Justifications for the project

SCOPING HELPS FIND ANSWERS TO QUESTIONS LIKE:

- What are the issues to be addressed?
- How should one proceed with the EIA or EA study?
- What is the extent of the analysis needed?
- What is the infrastructure needed?
- What kind of people should be involved in the assessment?

iii. **Baseline data generation**: Baseline data provides a detailed description of the existing status of various environmental and social components in the study area. Both primary and secondary data is collected to describe this status.

iv. **Impact assessment**: In this step, the characteristics of potential impacts are identified, predicted and evaluated using the baseline information on one hand and the features of the project on the other (cause-effect relationship). Impact predictions are normally done by using common methodologies and models.

v. **Mitigation of impacts**: At this stage, the possible preventive, remedial and compensatory measures for each adverse impact are determined and recommended.

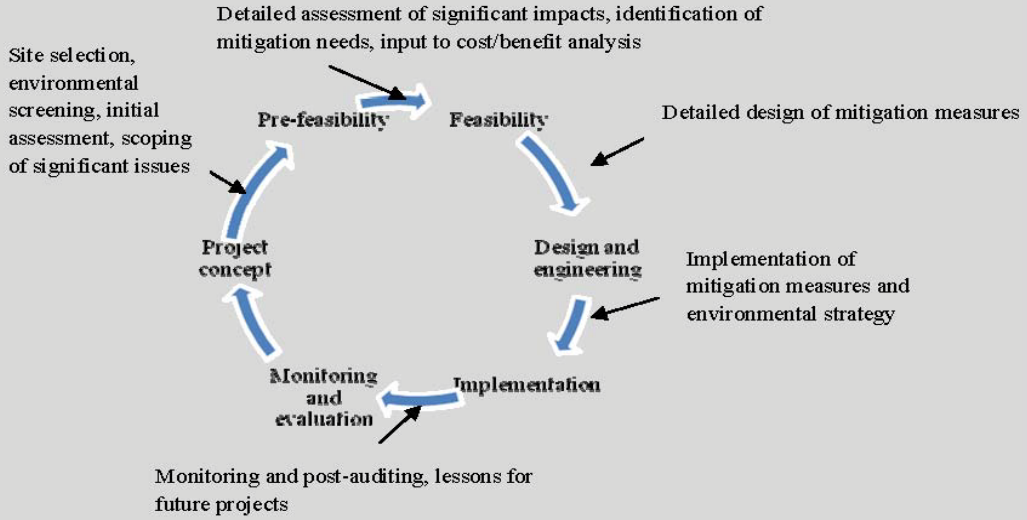
vi. **Environment Management Plan**: An environment management plan (EMP), also referred to as an impact management plan, is usually prepared as part of the EIA reporting process. It translates recommended mitigation and monitoring measures into specific actions that have to be carried out by the proponent. Depending upon specific requirements, the plan may be included in the EIA report or can be prepared as a separate document.

Box 1: Integration of EIA in the project cycle

Transmission line project is accomplished in six stages: (1) Project concept (2) Pre-feasibility (3) Feasibility (4) Design and engineering (5) Implementation and (6) Monitoring and evaluation. Environment Impact Assessment plays an important role in every stage of this cycle. Most of the EIA activities take place during the pre-feasibility and feasibility stages. Between project concept and pre-feasibility stage, the EIA process involves site selection, screening, initial assessment and scoping on significant issues. Detailed EIA assessment starts at the project feasibility stage. This includes an evaluation of significant impacts, including the gathering of baseline information, prediction and quantification of impacts, and a review of the EIA by the regulatory agency.

Following these initial steps, environmental protection measures are identified, environmental operating conditions are determined, and environmental management is established. In the last phase of the feasibility study, the monitoring needs are identified, and an environmental monitoring programme and environment management plan are formulated.

Environmental monitoring is designed to generate information on the actual impact due to the project activity, compliance with environmental conditions and the effectiveness of the environmental mitigation measures. The environmental management plan, which describes the mitigation measures, is considered in the project cycle right from the implementation of the project (during construction, operation and maintenance); the plan's aim is to reduce the environmental impacts.



1.4 Good practices in EIA

An EIA should not be used just as a tool for obtaining an environmental clearance; rather, the project implementer should see it as a management tool for sound planning of the transmission line project. On the other hand, it should be the responsibility of competent authorities to ensure that the project causes minimal environmental impacts and brings maximum economic benefits as a whole.

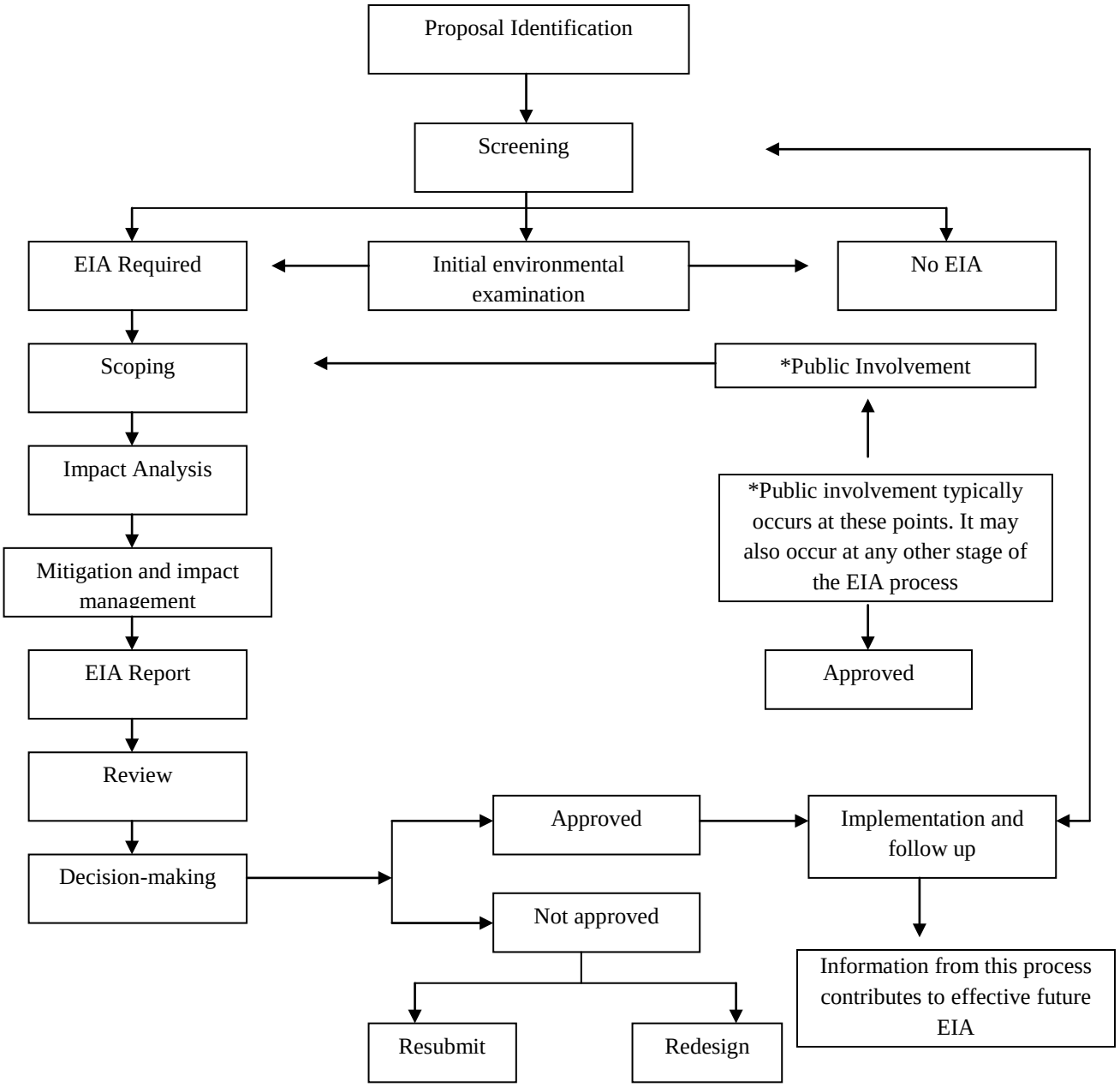
The effectiveness of the EIA process depends on many guiding factors – these include:

- the extent and kind of legal support it is getting in the host countries
- how the EIA is being conducted
- the stakeholders involvement at different stages
- the quality of the EIA report
- accreditation status of consultants who prepare the EIA
- how the environmental, social and economic findings are presented
- composition and skills of the review committee.

As a good practice, it is always recommended to conduct an initial environmental examination of the project to determine if it requires an EIA or not. It is also advisable to involve the public from the very beginning– in the scoping as well as during various stages of project development (*See Figure 1.1: Best Practices in EIA*). It is also recommended to consider location sensitivity along the Right-of-Way (RoW) while deciding the scope of the EIA.

Best practices in an EIA process include preparing a report which is comprehensive and focused; and contains only the significant parameters instead of data and information which are irrelevant to the overall assessment of the project. The extent of assessment should be decided after careful examination of likely impacts on the environmental and existing socio-economic settings along the RoW of transmission line. While laying transmission lines in a densely populated area or in eco-sensitive areas, option for realignment and diversion should be considered at the project planning stage to minimize the impacts.

Figure 1.1: Best practices in EIA

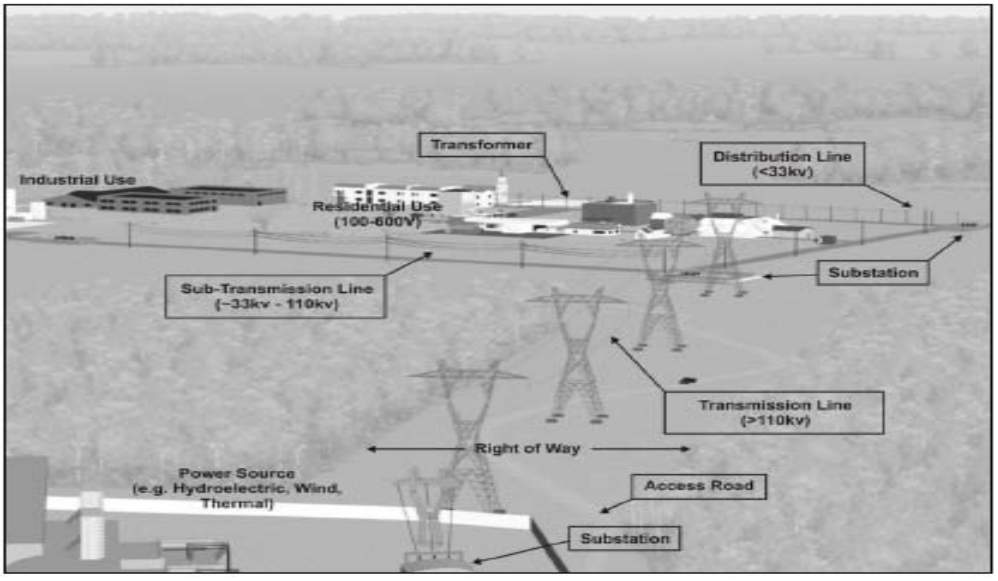


1.5 Potential environmental and socio-economic impacts of transmission line project

The transmission of electricity from the generating stations to the load uses wires suspended on large towers, known as transmission lines (*See Figure 1.2: Electric power transmission and distribution)*. The transmission line project is not an air, water polluting and resource intensive sector. However, there can be considerable environmental impacts during the initial construction phase — mainly due to civil works such as site preparation, construction of access roads, vehicle movement, RCC foundation, erection of tower etc. Construction phase impacts are usually temporary and are a localized phenomenon, except the permanent changes they might introduce in the local landscape and land use patterns along the Right-of–Way. However, these impacts should be given due consideration, wherever applicable.

The transmission projects may also cause significant impacts on socio-economic environment, if the project is passing through the populated area. The activities such as clearing of land for transmission line RoW and associated facilities can result in the displacement of local people. Moreover, if the route is selected through forest area, concerns such as impacts on biodiversity or changes in land use patterns also become significant.The impacts of transmission line projects on a hilly terrain vary as compared to a plain area. Therefore, magnitude of impact on forest, wildlife and water resources in a hilly area is much higher as compared to plain areas. The auxiliary activities such as construction of approach roads, cutting, filling etc. may lead to slope destabilization and thus causes landslides.

Figure 1.2 Electric power transmission and distribution



Source: *Environment, Health and Safety Guidelines*, Electric Power Transmission and Distribution, IFC, 2007

Sometimes, the transmission line projects can also affect the sensitive sites such as areas of archeological, historical or religious significance, if these sites fall along the RoW. The overall aesthetic effect of a transmission line is likely to be negative to most people, especially when proposed lines would cross natural landscapes and private properties. The transmission towers also pose threat to low flying aircraft and cause radar interference, if the proposed route/alignment is located near an airport or known flight paths.

Some of the potential impacts of transmission line project are summarized in *Table 1.1*.

Table 1.1: Impact during the construction phase

Activities/Issues	**Potential Impacts**
Land acquisition	• Displacement and loss of livelihood. • Loss of common properties. • Impacts on indigenous people, if applicable.
Site clearing	• Change in land use pattern • Land degradation • Landslides due to slope failure. • Erosion and loss of topsoil • Site runoff increases sediment load in the nearby water bodies. • Impact on natural drain
Civil works	• Loss of scenic value of the landscape • Fugitive dust and other emissions (e.g. from vehicle traffic, land clearing activities, and materials stockpiles) • Noise from heavy equipment and truck traffic; • Occupational hazard and annoyance to local residents
Biodiversity	• Fragmentation of forested habitat; • Loss of habitat; • Establishment of non-native invasive plant species; • Visual and auditory disturbance due to the presence of machinery, construction workers, transmission towers, and associated equipment • Transmission lines may also lead to forest fires if underlying growth is left unchecked or slash from routine maintenance is allowed to accumulate within Right-of-Way may pose forest fires • Electrocution and collision of birds
Disposal of construction wastes	• Water pollution • Occupational hazard and annoyance to local people
Influx of construction workers	• Pressure on local resource.
Potential impacts during project operation	• Aesthetic impact • Surface water or groundwater contamination due to spills and leakages of Polychlorinated Biphenyls (PCBs) from transformers etc • Ozone generation during transmission line operation • Potential risk includes (a) Live power lines (b) Working at height (c) Electric and magnetic fields (d) Exposure to chemicals

Source: Industry & Environnent Unit, Centre for Science & Environnent, 2012

CHAPTER 2

Scoping

2.1 Introduction

The primary function of scoping also referred to as setting the Terms of Reference (ToR) of an EIA, is to establish the environmental priorities and set the boundaries for the study. The objective of the ToR is to avoid creating a voluminous report and make the assessment process concise and focused. The ToR acts as a benchmark used by the appraisal committee to decide whether the EIA report has been complied meeting all the requirements or not.

There are various tools that can be used for scoping, such as ***questionnaire checklists, network method, comparison with other similar projects, matrix and ad-hoc methods, etc***. The selection of scoping tools largely depends on the size of the project and the existing environmental and social characteristics of the project area.

The ToR given below is a generic one and can be framed as per the project requirements. While framing the ToR, ground realities, background information such as site sensitivity along the RoW and project-specific peculiarities need to be added to make it relevant and realistic. Site visit is also recommended before framing the ToR; this enhances the scope of the EIA process and makes it more efficient.

2.2 Terms of Reference (TOR) for transmission line projects

The ToR of transmission line project should include the following:

2.2.1 General information:

- Executive summary of the project, which summarizes the project characteristics, environmental and social issues, and the proposed mitigation measures.

- Information about the project proponent and his/her experience in transmission sector with following details (a) Name of the project (b) Name of the applicant (c) Present mailing address including telephone number, fax, and email (if any) (d) Name of the environmental focal person (e) Telephone number of environmental focal person

- The justification for the project and consideration of alternative site with reference to environmental and social concerns.

- Project financial statement and the project activity schedule.

- Name of organization/consultant preparing the EIA report, qualifications and experience of experts involved in report preparation.

- List of all regulatory approvals and No Objection certificate (NOC) required for the project and the status of these approvals.
- A declaration stating that the information disclosed in the EIA report is correct.

2.2.2 Essential maps for EIA of transmission line projects:

- A map with appropriate scale showing the proposed project together with alternative options, the location of towers, sub-stations and existing infrastructure along the length of new route/ alignment.

- A map specifying the land use patterns of the proposed transmission line RoW.

- A map specifying the forest cover in transmission line RoW, if applicable, and marking the presence of migratory corridors, national park, sanctuaries, occurrence of any endangered/threatened flora and fauna species and/or plants and animals of economic/ecological, importance.

- A contour map *(with appropriate scale)* of the proposed transmission line RoW.

- **Topography –** Plot the transmission line layout on an appropriate scale; topographical map with a map scale and geographical North. Geology, seismicity and stability characteristics at all project facility locations and in the area of influence should also be incorporated.

- A map specifying the access roads and ropeways, *wherever applicable.*

Note: Depending upon the type, size and location sensitivity, NEC/Competent Authorities can decide the study area and recommend appropriate scale for Environmental Assessment.

2.2.3 Project details

- Type and nature of the project
    a) Source(s) and destination(s) of power
    b) Capacity

- Describe the route details of proposed alignment including political administrative location as mentioned in *Table 2.1: Transmission line route details*.

Table 2.1 Transmission line route details

Dzongkhag	Geog	Village	Distance (Km)
Total Distance (Km)			

- **Design and Engineering features**, such as:

  a) Voltage level…….KV
  b) Tapping Point……
  c) Termination Point……..
  d) Length of line……km
  e) Right of Way (RoW) width……..m
  f) Conductors: Number of lines and circuits, composition and diameter, minimum height over ground level for overhead lines, depth and trench and fill specifications for buried lines
  g) Number, type and composition of towers (number of towers on private land), manholes (if any)[1]
  h) Number and designs of substations to be constructed or modified or operated in conjunction with the transmission lines
  i) Points of interconnection with the existing grid
  j) Load Flow Analysis

- Design drawings for towers, manholes, trenches, substation and other facilities.

- Access roads for transmission lines, sub-stations and other facilities

  a) Means of access for each stretch of the route
  b) Detailed information on any roads to be constructed. If roads are being constructed mention whether they are 'Temporary' or 'Permanent.' If temporary, whether alternative means of transportation such as 'cableway' were considered or not. (**Note:** *If a permanent road is required, the applicant*

[1] EIA Technical Review Guidelines: Energy Generation and Transmission, 2011

will be required to submit a separate application for access road construction.)

- **Construction phase**

(a) Identify and provide a schedule for each phase of construction and operation for all project and ancillary facilities including the environmental issues associated with each ancillary activity, wherever possible:

i. Mobilization
ii. Road construction and improvements
iii. Land clearing
iv. Blasting, *if applicable.*
v. Borrow and spoil disposal
vi. Excavation and sub-grade preparation
vii. Foundation preparation
viii. Concrete work
ix. Construction and installation of each project facility,
x. Stabilization of disturbed areas[2]

(b) Construction camps (if applicable)

i. Location of the camp
ii. Water supply and distribution
iii. Waste generation, handling and disposal
iv. Fuel supply

(c) Waste handling and disposal – Provide the total quantity of excavated material that will be produced during construction period (in m^3), along with a management and disposal plan of the same.

2.2.4 Resource requirement

- The project should also examine the possibility of use of technologies which has less impact on the environment.
- Raw materials to be used for construction – A complete list of the raw materials with quantities to be used during construction and erection, an inventory of chemical, toxic or hazardous substances and storage mean etc., in case of sub-stations.

[2] EIA Technical Review Guidelines: Energy Generation and Transmission, 2011

- Description on water requirement.
- Details of workforce to be employed –skilled, semi-skilled and unskilled labour both during construction and operational phases of the project with specific attention to employment potential of local population as well as necessity for imparting any specialized skills to them to be eligible for such employment in the project.

2.2.5 Information on project environment

- **Land use/vegetation**

(a) The area required for transmission line RoW: In areas of steep topography not all of the forest within the RoW will require clearing. The actual area of the RoW that will require clearing to maintain conductor clearance can be based on an assumed cleared length of the RoW. For a particular transmission line project cleared length should be assessed (in %) and using this value the likely areas of forest that will be cleared for the project can be calculated. *Refer Table 2.2: Areas of landuse along transmission line RoW.*

Table 2.2 Areas of land use along transmission line RoW

Facility	Chushing	Kamshing	Tseri	Tsamdo	Sokshing	Broadleaf	Conifer forest	Scrub land	Total (km^2)
Transmission line RoW									
Actual corridor clearing required									

(b) Sub Stations – A complete information giving details of land use and vegetation that will be occupied within the sub-station boundary (m^2) should be furnished for every sub-station as mentioned in *Table 2.3*.

Table 2.3 Areas of land use required for sub stations (m^2)

Facility	Chushing	Kamshing	Tseri	Tsamdo	Sokshing	Broadleaf	Conifer forest	Scrub land	Total (km^2)
Substation 1									
Substation 1									
Total area requiring clearance (m^2)									

Note: *Scrubland also includes disturbed areas of Broad Leaf and Coniferous forest that have been logged and are now regenerating*

2.2.6 Baseline data

- Data on surface and sub-surface water characteristics including inventory of rivers, streams, springs, water crossings falling along the RoW of the transmission line.
- Detailed information on existing natural drainage/run-off patterns along the length of new alignment.
- If there will be any change in the drainage pattern after the proposed activity, details of changes to be furnished including the identification of areas vulnerable to erosion
- Baseline data on ambient air quality should include parameters such as PM_{10}, gaseous pollutants, and information on existing meteorological conditions such as temperature, humidity, rainfall and wind speed and direction, wherever applicable.
- List of potential project activities which can cause contamination of water resources.
- Details about the potential sources of fugitive emissions and list of activities that may generate fugitive dust.
- Details of the quantity and characteristic of solid/hazardous wastes likely to be generated including from utilities, if applicable.
- Discuss the characteristics of topsoil, its thickness and estimates the total quantity of topsoil to be generated during land clearing along the RoW, construction of the access roads, sub-stations, etc.
- Complete information on the use of hazardous materials such as insulating oils/gases (e.g. Polychlorinated Biphenyls [PCB] and Sulphur Hexafluoride [SF_6]) used in transformers used during the construction and vegetation maintenance of RoW should be enumerated in the EIA, if any.

- Details about the potential sources of noise generating equipments and activities that may cause noise pollution.

A. Data on biodiversity

- Obtain a list of vegetation, animals and birds from the nearest forest office and attach these finding to the EIA report.
- Conduct village interviews on the occurrence of vegetation, animals and birds in the project area and document the findings. Compare the finding with the list provided by forest office. Attach these finding to the EIA report.
- Location or identification of any area that may be considered restricted areas from a biodiversity perspective, if applicable.
- Type of forest being diverted for non-forest use and status of forest cover in the length of new alignment proposed
- Option for any alternative in case of areas which has unique habitant, endemic, threatened or declining species, or species of high economic and cultural value to society or ecosystem is providing important services.
- A study on endangered/threatened avifauna including location or identification of any area that may be considered restricted areas from an avifauna impact perspective.
- Authentication and verification of the wildlife corridor by the competent authority.
- **Protected Areas –** Mention if the transmission line will cross a Protected Area. If 'Yes' provide the information as mentioned in *Table 2.4*.

Table 2.4 Protected area details for transmission line

Name of protected area	Length of transmission line in different zones within the protected area (km)						Total Length (km)
	Enclave zone	Buffer zone	Core zone	Seasonal grazing zone	Administrative zone	Multiple use zone	

Mention if the Sub-station will cross a Protected Area. If 'Yes' provide the information in the following *Table 2.5*.

Table 2.5 Protected area details for sub-stations

Name of protected area	Area occupied by Sub-stations in different zones within the protected area (km)						Total Length (km)
	Enclave zone	Buffer zone	Core zone	Seasonal grazing zone	Administrative zone	Multiple use zone	

B. Socio-economic/Cultural

- **Cultural and heritage site –** List of cultural and heritage site falling along the RoW of the transmission line and sub-stations. *Refer Table 2.6: Culture and heritage site details*.

Table 2.6 Cultural and heritage site details

Name of cultural heritage	**Location** Easting	**Coordinates** Northing	**Describe the significance of site. Is the site listed with Department of Culture**

- Describe with the help of maps the number of villages getting affected, scope of land acquisition and how it is important from investment perspective. The report should provide option for alternative or any substitute to avoid or minimize land acquisition with appropriate justification.

- If land acquisition is involved, the report should give the extent of land to be acquired for the project along with name of affected people village wise with followings information:

(a) Village-wise list of the affected persons or family-wise along the RoW.
(b) The extent and nature of land and immovable property to be acquired from affected persons; including list of public utilities and government buildings which are affected or likely to be affected, details of public and community properties,

assets and infrastructure, likely to be affected. *For providing information refer Table 2.8: Losses of houses and other infrastructures.*

(c) A list of agricultural labourers in such area and the names of such persons whose livelihood depends on agricultural activities; if applicable

(d) A list of persons likely to lose their employment or livelihood or likely to be alienated wholly or substantially from their main sources of trade, business, occupation due to acquisition , if applicable.

(e) Non-agricultural labourers, including artisans in such area, if applicable.

(f) Land ownership of the acquired land; provide information as described in Table 2.7

Table 2.7 Land ownership and affected household details

Where HH= Households, O=Owner

Facility	Chu-shing		Kam-shing		Tseri		Tsamdo		Sok-shing		Forest		Scrub land	Wetland[3]	Total
	Ownership	Households (HH)	O	HH	O	HH	O	HH	O	HH	O	HH			
Sub-Station 1															
Sub-Station 2															
Transmission Line															
Total affected households (no.)															

Table 2.8 Losses of houses and other infrastructure

Facility	**Houses (no.)**	**Other infrastructure, describe**
Sub-station 1		
Sub-station 2		
Sub-station 3		
Transmission Line		
Total (no)		

Note: Other infrastructure losses could include shops, hotels, offices, health posts, schools, etc.

[3] Wetland is not paddy field but flat marshland areas which are normally rich habitats for terrestrial and aquatic life

2.2.7 Impact assessment

- Impact due to land acquisition.
- Impact of project on the hilly terrain due to slope destabilization caused due to site preparation, civil works, construction of access roads and other activities, if applicable.
- Impact of fugitive emissions on ambient air quality and on workers during the construction phase of project.
- Impact of transmission line project on biodiversity.
- Impacts of the project on local hydrology along the length of the new alignment including impact on surface and groundwater resources.
- Impact of project and its auxiliary activities on land and water contamination.
- Risk and hazard associated with transmission line, sub-station and other allied activities.
- Socio-economic impact of the project.
- Aesthetics (if applicable) – Mention whether the location of transmission line will significantly impair visual aesthetics. Explain in detail.

In addition to above, wherever applicable, the project proponent should provide following information, which are as follows:

(a) Electromagnetic Field (EMF): If EMF levels are confirmed or expected to be above the recommended exposure limits then:

- Evaluate potential exposure on workers, people living in existing residences, schools, other occupied buildings, and populated areas along the transmission corridor.
- Evaluate effects of EMF on wildlife and vegetation (if applicable).

(b) Landslides, earthquakes and snow avalanches - Based on the soil conditions, topography and geological features along each of the sections of the transmission corridor, evaluate areas of potential slope instability, potential seismic risk, debris flows, and rock fall hazards.

- Evaluate potential effects of landslides on the project.
- Evaluate potential effects of earthquakes on the project.
- Evaluate potential effects of snow avalanches on the project.

(c) Climate:

- Evaluate potential effects of wind on the project.
- Evaluate potential effects of precipitation on the project.
- Evaluate potential effects of lightning and storm events on the project.

(d) Substation failure: Identify potential effects due to accidents and malfunctions associated with mechanical failures of project-related substation and capacitor station equipment.

(e) Occupational health and safety: Assess the potential occupational health and safety issues that may arise out of:

- Live power lines (Electrical hazards)
- Electric and magnetic fields
- Working at height
- Fire/explosions from transformers
- Exposure to chemicals

2.2.8 Mitigation and Environment Management Plan (EMP)

The EMP should discuss the mitigation measures to be taken against each impact**,** the timeline for completion, the responsible departments for implementation, and the budget for the EMP, post-monitoring provisions and reporting to the concerned regulatory authority.

- Preparation of a Resettlement and Rehabilitation plan (R&R) if displacement is involved. The plan should include details of the compensation provided, including land-for-land compensation, employment or money; provisions at the resettlement colony (such as basic amenities including housing, educational facilities, infrastructure and alternate livelihood potential); a clear timeline for implementation; responsibility; budgets; grievance mechanism, etc.

- Detailed management plan to reduce landslides and ensure slope stabilization during transmission line construction, *wherever applicable*.

- Mitigation measures for control of erosion and run-off from the area where construction is to take place, especially if there is a river or agricultural land adjoining the project site.

- If the transmission line project passes through sensitive alignment, Biodiversity Action Plan must be prepared.

- Mitigation measures for noise abatement and control, wherever applicable.

- Management plan for topsoil utilisation and conservation.

- Management plan to reduce fugitive emissions during land-clearing, civil works, handling/transporting of construction material, construction of access roads, quarry operations, etc., *if applicable*.

- Mitigation plan to reduce, avoid or minimize spills and leaks from transformers, sub stations etc.

- Management Plan for reclamation of debris/spoil/ muck, *if applicable.*

- Mitigation plan for quarry related activities including its restoration, *if applicable*.

- Management plan to minimize or avoid electrocution of raptors and other large birds.

- Mitigation plan to minimize or avoid EMF exposure, *if applicable.*

- Mitigation measures against extreme weather events and natural catastrophes such as landslides, earthquakes and avalanches.

- Afforestation plan.

- Mitigation plan to minimize or avoid hazardous materials spills and leakages.

- A management plan for occupational health and safety of the workers and local community in the proposed transmission line RoW.

- A detailed mitigation plan and EMP for improving and enhancing socio-economic condition.

CHAPTER 3

Impact Assessment

3.1 Introduction

The scientific and technical reliability of an EIA study depends on the skills of the EIA practitioners/reviewers, who estimate and review the nature and magnitude of the environmental change that the proposed project may entail. Impact prediction and evaluation is a vital exercise for assessing impacts, deciding alternatives, setting down mitigation measures and developing an environmental management plan. Predicting the magnitude of impacts and evaluating their significance is the core exercise of impact assessment. This process is also known as impact analysis and can be broadly broken down into three overlapping phases:

- *Identification*: To specify the impacts associated with each phase of the project and the activities undertaken
- *Prediction:* To forecast the nature, magnitude, extent and duration of the main impacts; and
- *Evaluation:* To determine the significance of residual impacts after taking into account how mitigation will reduce a predicted impact.

In assessing environmental impacts and their significance, some key concerns have to be kept in mind:

- Identity who or what is affected
- Description of how they are affected
- Evaluation against a set of consistent assessment criteria

Normally, in impact assessment, potential impacts can be categorised into various parameters ranging from its type and nature to magnitude and reversibility, each signifying its importance in impact prediction and decision making (*See Table 3.1: Parameters which determine impact characteristics*).

Table 3.1 Parameters which determine impact characteristics

Parameters	Description
Type	Positive or negative
Nature	Direct, indirect, cumulative
Magnitude or severity	Low, moderate, high
Timing	Short term, long term, intermittent, continuous
Duration	Temporary/permanent
Reversibility	Reversible/irreversible
Significance	Local, regional or global

Source: *EIA Training Resource Manual*, Second Edition 2002, United Nations Environment Programme (UNEP), p 263

3.2 Impact identification

In the EIA of a transmission line project, the potential impacts are globally well documented, and do not normally require extensive impact identification. However, there are some impacts such as displacement, loss of livelihoods, influence of topography and meteorology on water and air pollution, feasibility with respect to land use, geological characteristics, other sensitive receptors such as forest/biodiversity etc., which are site-specific and can only be identified once the data on them is available or generated. There are various tools that can be used for impact identification, such as questionnaires, checklists, network method, comparison with other similar projects, matrix and ad-hoc methods.

To ensure effective impact identification, one should always opt for a simple, logical and systematic approach. As a good practice in EIA, it is always recommended to consider all potential project impacts and their interactions. At the same time, it is important to ensure that indirect and cumulative effects which may be potentially significant are not unintentionally omitted. All the identified impacts may not require a detailed analysis and evaluation – the level of detailing should match the scale, sensitivity and complexity of the impact. The choice of the chosen methodologies should reflect these criteria.

3.3 Impact prediction

Predictions of impacts are normally based on commonly used qualitative and quantitative methods and models. Expert judgment and comparison with similar projects can also be used for impact prediction. While there are a number of models for predicting impacts on physical environment (air, water and noise), modeling socio-economic and cultural impacts is difficult and is generally done through qualitative assessment or economic analysis. A model can be effective only if the input data is correctly inserted. The use of models, therefore, should be done with care and prudence considering factors like availability and reliability of data.

The sophistication of the prediction methods to be used should be kept in proportion to the 'scope' of the EIA. For instance, a complete mathematical model of atmospheric dispersion should not be used if only a small amount of relatively harmless pollutants is emitted. However, if the project has very high air pollution potential then all possible modeling exercises should be done to predict the impact on ambient air quality. All prediction techniques involve assumptions and uncertainties. While quantifying and stating an impact, these assumptions should be clearly identified. Also, uncertainty of prediction in terms of probability and the margins of error should be mentioned. *Table 3.2* gives the list of general prediction models/methods used for assessing the impact of transmission line project.

Note: **Transmission line project is not like mining or any other polluting sectors. Instead of using models, more focus should be given to mitigation and EMP.**

Table 3.2: General models/methods used for impact prediction

Impacts	Assessment method/model
Air quality, *if required*	Air dispersion models • **ISCST 3** (appropriate for point, area and line sources; applicable for flat or rolling terrains; requires source data, meteorological data and receptor data as inputs). Note: *ISCST 3 is a common model widely used in India for the air pollution modeling* • Fugitive dust model (FDM)
Soil erosion, *if applicable*	• Soil loss models such as revised universal soil loss equation (RUSLE)
Water quality, *if applicable*	• **QUAL-IIE**, the model is found excellent to generate water quality parameters.
Ecology	• Ecological models • Comparative evaluation of conservation value • Expert opinion
Land use	• Map overlay techniques • GIS and Remote Sensing software • Comparative valuation against structure and/or local plans
Land slide, *if applicable*	• Land Slide Prediction Model
Noise, *if applicable*	• *Dhwani:* For prediction of impacts due to multiple noise sources, developed by NEERI, Nagpur, India • SoundPLAN: Noise and air pollution planning and mapping software
Socio-economic, *if applicable*	• Cost-benefit analysis • Metaphors and analogies: Experience gained in similar kinds of projects is used to predict the socio-economic impacts. • Extrapolative methods: Prediction based on the linear extrapolation of current trends. • Normative methods: Desired socio-economic goals specified, and an attempt made to project the social environment backwards in time to examine whether existing or planned resources and environmental programmes are adequate to meet the goals.
Potential risk and disaster	• Risk assessment

3.4 Impact evaluation: In impact evaluation, the predicted adverse impacts are judged for their significance. Therefore, the criteria for evaluating the significance of impacts and their effects should be set in advance (*See Box 2: Impact evaluation criteria*). The criteria for evaluating the significance should be based on local standards wherever possible. Where local standards are not available, acceptable international standards should be used (e.g. IFC, WHO or USEPA standards and guidelines of others countries, etc.). In all cases, the choice of the appropriate standard must be robust, defensible and relevant to the local situation. If there are no appropriate existing standards available, then the criteria should be developed and their use must be clearly explained in the EIA. As a good practice in impact evaluation, it is better to use established procedures or guidelines, or relevant criteria which are comparable. While doing impact evaluation, it is equally important to understand the nature and characteristics of impacts on potential target areas, such as air, water, land, human beings, etc. to understand the significance, importance and intensity (*See Box 3: Possible evaluation criteria for determining impact significance*). It is also essential to find out the answers to the following three questions:

Box 2: Impact evaluation criteria

- Comparison with laws, regulations or accepted national or international standards
- Consistency with international conventions or protocols.
- Reference to pre-set criteria such as conservation or protected status of a site, features or species.
- Consistency with government policy objectives.
- Comparison with best practices
- Existing environmental and social stress in the area.
- Extent of impact on biodiversity.
- Acceptability to local community or general public.
- Severity of the impact (reversible or irreversible).

Probability of potential

Box 3: Possible evaluation criteria for determining impact significance

- No impacts
- No significant impacts without or with available and practicable mitigative measures
- Impacts, but significance not quantifiable
- Significant impacts even with available and practicable mitigative measures
- Impacts cannot be mitigated

- Are there residual environmental impacts?
- If yes, are these likely to be significant?
- If yes, are these significant effects likely to occur? Is the probability high, moderate orlow?

CHAPTER 4

Mitigation and Environmental Management Plan (EMP)

4.1 Introduction

Mitigation is the process of providing solutions to prevent impacts, or reduce them to acceptable levels.

The objectives of mitigation are:

- To enhance the environmental and social benefits of a proposal;
- To avoid, minimize or remediate the adverse impacts; and
- To ensure that the residual adverse impacts are kept within acceptable levels.

A good transmission line project should incorporate environmental and social alternatives at the initial stages of project development. However, there are some impacts which can be managed only after impact identification and prediction.

Mitigation measures can be classified into **structural** and **non-structural measures**.

- ***Structural measures*** include design or location changes, engineering modifications and construction changes, landscape or site treatment, mechanization and automation, etc.

- ***Non-structural measures*** include economic incentives, legal, institutional and policy instruments, provision of community services and training and capacity building. Non-structural measures are increasingly being used now. They can be applied to reinforce or supplement structural measures or to address specific impacts.

An Environmental Management Plan (EMP) is a framework for the implementation and execution of mitigation measures and alternatives. It usually covers all phases of the project, right from pre-construction to the operation and maintenance phases of the transmission line project. The plan outlines mitigation measures that will be undertaken to ensure compliance with environmental laws and regulations and to eliminate adverse impacts. The objectives of an EMP, thus, are:

- To ensure that mitigation measures are implemented;
- To establish systems and procedures for this purpose;
- To monitor the effectiveness of mitigation measures;

- To ensure compliance with environmental laws and regulations;
- To take any necessary action when unforeseen impacts occur;

The EMP outlines:

- The technical work schedule to carry out the mitigation, including details of the required tasks and reports, and the necessary staff skills and equipment;
- The detailed accounting of the estimated costs to implement the mitigation plan;
- A plan for operation or implementation of the mitigation plan, including a staffing chart and proposed schedules of participation by the members of the project team, and activities and inputs from various government agencies;
- The EMP should also address the formation of a monitoring committee, with the objective of finding out whether different pollution-related issues and social development programmes related to health, education, infrastructure, employment etc., are keeping to the time schedule or not. In case of delays, the reasons for the delays need to be identified and suggestions made for removing them.

A good EMP should contain the following:

- A summary of all potential impacts
- A detailed description of recommended mitigation measures
- A time-line for implementation of mitigation measures
- Resource allocation and responsibilities for implementation
- A programme for surveillance, monitoring and auditing
- A statement of compliance with relevant standards
- A contingency plan when the impacts are greater than expected

An EMP should also incorporate a monitoring plan that is carefully designed and is related to the predictions made in the EIA and to key environmental indicators. The EMP should also outline the need for monitoring, its duration and reporting procedures. The programme for surveillance, monitoring and auditing should clearly identify the following:

- Parameters for monitoring all significant impacts, including impacts on bio-diversity and socio-economic impacts.
- Monitoring locations, including sample surveys, to assess the socio-economic impacts
- Frequency of monitoring

- Reporting frequency to the regulatory agency
- Provision for annual environmental and social audit of the project

4.2 Mitigation measures and EMP for transmission line sector

Some of the mitigation measures related to transmission lines are illustrated in *Table 4.1*.

Table 4.1: Mitigation measures and EMP for transmission line projects

Land	**Mitigation measures** • Minimizing the area of ground clearance • Avoiding sensitive alignments, such as those which include steep hillsides • Balancing filling and cutting requirements through route choice • Avoiding the creation of cut slopes and embankments which are of an angle greater than the natural angle of repose for the local soil type • Scraped topsoil should be used immediately for plantation/agriculture/landscaping. • **Replanting** cleared areas and slopes for reducing erosion and ensuring stability problems; it should be undertaken as early as possible in the construction process, before erosion becomes too advanced. Vegetation should be selected to serve a specific engineering function such as *Vetiver grass* having special properties in stabilizing slopes and thus helps in resisting soil erosion. • **Slope Protection**: Some of the well-established engineering measures for slope protection include: a. Terraced or stepped slopes to reduce the steepness of a slope. A berm (or risberm) is the level section between slope faces, riprap, or rock material embedded in a slope face, sometimes combined with planting. b. Retaining structures, such as gabions (rectangular wire baskets of rocks), cribs (interlocking grid of wood or concrete beams, filled with earth or rock), or other types of wooden barricades and gridwork, usually battered back against the slope; c. Geotexiles, more expensive retaining structures can also be used to protect slopes.
Water resources	**Mitigation measures** • Avoid sensitive areas such as water bodies for construction of transmission line. Route survey to determine alternative transmission alignments. • Avoiding alignments which are susceptible to erosion, such as those crossing steep slopes; if area is unavoidable then consider construction of check dams, Gabion structures and garland dams. • Minimizing the number of water crossings wherever possible; • Using only “clean” fill materials around watercourses, such as quarried rock containing no fine soil • Cut/fill generated during construction shall be kept in an earmarked area to prevent water pollution. • Preventive measures for runoff, erosion and sediment control.

<table>
<tr><td></td><td>

Transformer area should be properly lined to avoid groundwater and soil contamination
Spill prevention and containment plan

</td></tr>
<tr><td>Air quality</td><td>
Mitigation Measures

See Table: Best practices for fugitive dust control

Table: Best practices for fugitive dust control
<table>
<tr><th>Activities</th><th>Best Practices</th></tr>
<tr><td>Land-clearing/civil works/construction of access roads</td><td>Water spray
Use of personnel protective equipments (PPE)</td></tr>
<tr><td>Transportation of construction materials</td><td>Covering of the trucks/dumpers to avoid spillage of material
Speed control
Water spray</td></tr>
</table>

Keep stockpiles and exposed soils compacted and re-vegetate as soon as possible.
Maintenance and inspection of equipment and vehicles

</td></tr>
<tr><td>Noise environment</td><td>
Mitigation measures

Provision of protective devices like earmuffs/earplugs to workers, who are continuously exposed to high levels of noise during construction activities.
Providing silencers or enclosures for noise generating machines such DG sets, compressors, etc.
Construction techniques and machinery selection to minimize noise and vibration.

</td></tr>
<tr><td>Biodiversity</td><td>
Mitigation Measures

Modify facility, activity locations and timing to avoid critical ecosystems, migratory routes and breeding areas
When planning new transmission lines or changes in width or alignment, sensitive natural environments should be identified early in the planning process so that alternate routes and designs may be considered.
If the site is very sensitive, the best practice in an EIA is to conduct a detailed biodiversity assessment. The mitigation measures for biodiversity include a Biodiversity Action Plan (BAP) for biodiversity conservation, Species Action Plans (SAPs) where mitigation is targeted for the protection of a specific species, and Habitat Action Plans (HAPs) to protect the habitats of rare and endangered species.
RoW vegetative maintenance plan
Restoration/Rehabilitation plan for disturbed areas
Control on hunting within the transmission line RoW
Transmission line design to minimize or avoid electrocution of raptors and other large birds.

</td></tr>
<tr><td>EMF</td><td>
Mitigation measures

Avoiding alignments adjacent to residential properties or locations with frequent human occupancy so as to avoid or minimize exposure to the public.
If EMF levels are confirmed or expected to be higher than the

</td></tr>
</table>

	recommended exposure limits, application of engineering techniques should be considered:- (a) Shielding with specific metal alloys (b) Underground transmission lines (c) Increasing height of transmission towers (d) Modifications to size, spacing and configuration of towers
Aircraft navigation	**Mitigation measures** • Avoid alignments of transmission lines and towers close to airports and flight paths • Adherence to regional or national air craft safety regulations • No Objection Certificate (NOC) from air traffic authorities prior to installation • If site is unavoidable, consider use of underground lines when installation is required in flight sensitive areas.
Culture and heritage sites	**Mitigation measures** • Modify facility and activity locations to avoid significant archaeological, historical and cultural sites. • If avoidance is not possible prepare a management plan to ensure least damage to cultural, archaeological sites.
Socio-economic environment	**Mitigation measures** • Route selection to avoid existing settlements and minimize disturbance. • If the site is unavoidable then a proper R&R plan should be carried out. • Best practices in land acquisition and R&R are as follows: a. Land should not be acquired without the consent of the majority of the project-affected population. The project proponent should receive 'free, prior and informed consent' from the affected population. b. The affected population should include not only landholders but also people dependent on land for livelihood like share-croppers, landless labourers, etc. c. Compensation for land should be based on the current market price. d. There should be a provision for land-for-land compensation for indigenous communities. e. The R&R plan should be framed in consultation with the PAP. f. The affected population should have a say in the selection of the resettlement site and design of the housing and other infrastructure facilities. g. The R&R plan should recognise not only landholders, but also those dependent on land for livelihood like share-croppers and landless labourers, etc. Compensation should also be provided to them. h. Basic amenities should be provided at the new resettlement site. This should include roads, safe drinking water, sanitation facilities, educational and health facilities, markets, community centers, playgrounds, etc. i. Financial assistance and training for self-employment should be provided to the affected population.
Solid and Hazardous wastes	**Mitigation measures** • Appropriate disposal of domestic waste from colonies and labour camps, wherever applicable. • Construction wastes to be managed in accordance with national standards. • Provision of mobile toilets, movable accommodation for construction workers.

	• Hazardous waste such as spent transformer oil should be collected/disposed through an authorized dealer. • Scrap steep and other salvaged materials to be disposed/recycled off-site by licensed vendors.
Quarry, *if applicable*	**Mitigation measures** • Waste rock/spoil materials should be placed at designated areas with proper biological reclamation. • Compaction and re-vegetation of exposed areas as soon as possible. • Water spray • Topsoil deteriorates in quality while stockpiled. To help maintain soil quality, topsoil should be kept separate from overburden and other materials; and should be protected from erosion. Also, wherever possible, stripped topsoil should be placed directly onto an area being rehabilitated. • If the topsoil is to be stored for a long duration, it should have a vegetal cover of, preferably, leguminous species (grasses and shrubs). • Good housekeeping.
Risk and Hazards	**Mitigation measures** • Transmission line design must comply with the national and international limits of electromagnetic interference from overhead power lines • Housekeeping and maintenance at sub-stations in accordance with Bhutan standards. • Fire/explosion (a) Right of Way and vertical clearance will be defined to avoid fire hazards due to short circuiting in forests (b) Fire safety design and fire-fighting equipment consistent with Bhutan standards to avoid fire hazards from transformers/sub-stations. (c) Trees allowed growing up to a height within the RoW by maintaining adequate distance between the top of the tree and the conductor as per design standards (d) Preparation of fire emergency action plan and relevant staff training. • Oil/fuels and other hazardous materials to be securely stored to prevent spill and contamination. • Safety awareness for staff for identification of occupational EMF levels, working at height and dealing with chemicals. • Electric shock Hazards (a) Barriers to prevent climbing on transmission towers (b) Appropriate colour coding and warning signs on facilities • Preparation of emergency plan to avoid unforeseeable events/natural calamities etc.

CHAPTER 5

Review of an EIA report for a transmission line project

5.1 Introduction

The purpose of reviewing an EIA report is to take decisions with respect to the following:

- Should the project be cleared in the form proposed by the project proponent?
- Should the project be modified to reduce the impacts and then cleared?
- Is the 'No project' option justified, considering the social and environmental costs?
- If the project is cleared, then what conditions may be prescribed for compliance by the project proponent during design, construction and operation of the project?

5.2 Composition of the EIA review team

To ensure a proper review of the EIA report, the review committee should include experts from diverse fields with a good understanding of the transmission project and potential impact areas. The reviewers should be technically sound and competent enough to review the report. They should be able to make valuable suggestions/ recommendations to the project proponent for taking corrective action. Ideally, in the case of transmission line projects, the team should comprise of the following experts:

- **A civil engineer/electrical engineer and expert** who is well versed with the process, technology and potential impacts of transmission line projects.
- **An environmental scientist/engineer** to overview the adequacy of mitigation options suggested for air, water and waste management.
- **A groundwater expert/hydrologist** to review and assess the hydrology of the study area and the drainage pattern.
- **A social science expert/anthropologist** to review the social issues and the resettlement and rehabilitation plan.
- **A biodiversity expert/botanist** who can review the biodiversity issues, biodiversity conservation and afforestation plan.
- **A geologist** to review the geological risks and associated impacts.
- **A safety engineer and occupational health expert** who can review the levels of safety, mechanization, disaster management plans, occupational hazards and mitigation strategies to combat these hazards at the planning and operational stages.
- **Nominees** of the regulatory agency.

5.3 Reviewing an EIA report of a transmission line project

While reviewing the EIA report, the following key aspects needs to be carefully examined:

- Has the EIA report evaluated the beneficial and adverse impacts of the project properly and clearly?
- Which are the unavoidable adverse impacts? Are they acceptable?
- Is the proposed mitigation plan sufficient to manage and control all adverse impacts?
- What kinds of safeguards need to be incorporated to ensure that the mitigation plan is implemented effectively?
- What are the parameters which need to be monitored during project construction and operation so that the state of the environment can be studied throughout the project life?
- Is the project acceptable to the local communities?
- Are the concerns of the local communities genuine and has the EIA report adequately addressed these concerns?
- Will the project improve the socio-economic status of the local communities?

Guidelines for using the reviewer checklist:

By using the *reviewer checklist for a transmission line project*, the reviewer will be able to gauge the acceptability of the EIA report. This can eventually assist in determining the environmental feasibility of the project being assessed.

Scorecard approach: The checklist is designed to follow a "scorecard" approach, using a possible scoring range of 0-10. Scores for each relevant item in the checklist are totaled, and a calculation of the percentage of the total possible score is made.

Relevance: The checklist is a generic checklist for the transmission line projects. Not all questions may be relevant to all the transmission line projects. Therefore, the first step is to determine the ***relevance*** of each question, for the specific project being considered. For each question that is relevant, "1" is entered in the box under Column "A" of the checklist, "Is question relevant for *this* project?" Because the number of relevant parameters varies from project to project, the possible total score for each EIA report will vary accordingly.

Adequacy: It is then necessary to determine the ***adequacy*** of the EIA report in answering only those questions that are judged to be relevant. Under the "adequacy" heading (Column "B"), the reviewer is asked to assign a numeric score from 0-10. The numeric scoring for the various elements of the EIA report, based on their level of completeness, clarity, and quality, is as follows:

9-10: **Excellent:** Information provided is clear, comprehensive and detailed, with no gaps or weaknesses.

7-8: **Good:** Information provided is comprehensive, has only very minor weaknesses which are not of importance to the decision-making process.

5-6: **Adequate:** Information provided has some minor weaknesses, but the deficiencies do not strongly compromise the decision process; no further work is needed to add to the environmental information.

3-4: **Weak:** Information provided has gaps and weaknesses which will hinder the decision process; some additional work is needed to complete the information.

1-2: **Very poor:** Information provided has major gaps or weaknesses which would prevent the decision process from moving ahead; major work is required to rectify.

0: **Absent:** Information needed for decision-making is not included in the report, and needs to be provided in its entirety.

Importance: It is also necessary to determine the importance. In many cases, some of the issues is relevant for the project but is not very important or significant in impact assessment. For instance; name of project, project schedule is relevant for the project but it has not much importance in environmental and social impact assessment. Therefore, while assigning the value for ***importance***, reviewer should always keep in his/her mind the level of importance, a) relevant but least important, b) relevant but average important, c) relevant but most important.

In addition, for each relevant item, the reviewer is instructed to fill in comments for each relevant item. This should be made a mandatory procedure, so that the justification for assigning a specific value for adequacy as well as importance is well documented. For those items where the information provided in the EIA report is not adequate, it should be indicated in the far-right column what types of information are still required, in order to adequately address the question.

As a rule of thumb, an EIA report achieving a score in the range of 50-60% or higher should be considered acceptable. Borderline scores, or scores much lower than this limit, indicate that the EIA report is likely not acceptable. It should be noted, that while this design (i.e., using a numeric scorecard, and requiring reviewers to provide comments and justifications for their itemized determinations) is intended to minimize subjectivity, this "semi-quantitative" approach cannot totally eliminate all subjectivity from the review

process, because the assignment of numeric scores is itself, by nature, a subjective process.

At the end of each section of the checklist, space is left for "other questions." The space provided here may be used to elaborate on the listed questions in each section (referencing the question number), or to add questions that may have specific relevance for the project being reviewed.

Overall Evaluation: There are six components that need to be evaluated to give the total score.

1. Applicant Information
2. Project Description
3. Baseline information
4. Impact Assessment
5. Mitigation and Environmental Management Plan (EMP)
6. Other Requirements

The final section of the checklist provides a framework for giving an overall evaluation of the EIA report. Each topic covered in the checklist is assigned a score, from 1-10, according to the same system used in the main section of the checklist. The resulting value provides a further basis for determining whether or not the environmental information presented is adequate ("acceptable" or "not acceptable") for making an informed determination about the quality of the EIA report. This is simply a way to cross-check the results that were obtained through a detailed itemized review of the EIA report *(Refer reviewer checklist).*